



Clifton Scannell Emerson
Associates

Engineering Planning Report

Art Data Centre 110 kV GIS Substation and Grid Connection – Ennis Campus

**ART DATA
CENTRES**



**TOM MCNAMARA
& PARTNERS**
CONSTRUCTION COST MANAGERS
PROJECT MANAGERS

Client: ART Data Centres

Date: June 2022

Job Number: 20_110A

Civil
Engineering

Structural
Engineering

Transport
Engineering

Environmental
Engineering

Project
Management

Health
and Safety

CONSULTING ENGINEERS



Document Control Sheet

Project Name: Art Data Centre 110 kV GIS Substation and Grid Connection

Project Number: 20_110A

Report Title: Engineering Planning Report

Filename: RPT-20_110A-001 Engineering Planning Report

| Issue No. | Issue Status | Date | Prepared by | Checked by |
|-----------------|--------------|------------|-------------|------------|
| 1 st | Draft | 02/12/2021 | PS | RG |
| 2 nd | Planning | 03/06/2022 | PS | RG |

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1 Introduction

Clifton Scannell Emerson Associates (CSEA) have been commissioned to prepare an Engineering Planning Report for submission as part of the Strategic Infrastructure Development (SID) Application for the proposed Art Data Centre 110 kV GIS Substation and Grid Connection.

The proposed new 110 kV GIS substation is to be located on lands at Cahernalough, to the northeast of Ennis, and to the north of the Tulla Road (R352). The proposed 110kV GIS substation is located to the northeast of a proposed data centre development subject to a separate concurrent application to Clare County Council under Reg. Ref.: P21-757.

The proposed substation consists of two storey 110kV GIS substation building enclosed within a 2.6-metre-high security fence, together with a single storey client control building.

Two proposed 110kV underground transmission cables will run from the proposed 110 kV GIS grid substation, connecting to the existing Ennis 110 kV Grid Substation via a route southward along the proposed main campus internal road (proposed under concurrent application Reg. Ref.: P21-757), then turning west along the Tulla Road (R352) until they reach the existing Ennis 110kV substation.

The development includes enabling works, services diversions, adjacent access paths to serve the proposed transmission cables, joint bays, connections to the proposed and existing substations, landscaping, security fencing, lightning masts, artificial lighting, provision of internal access arrangements within the substation compound, services, all associated construction works, and all ancillary works.

This report addresses the following elements from an engineering perspective.

- Storm Water Drainage
- Foul Drainage
- Water Supply

1.1 Site Description

The proposed Art Data Centre Substation site subject to this report is part of the of the overall Art Data Centre Project located in Ennis, Co. Clare and bordered to the West by the M18 and to the South by Tulla Road (R352). The proposed substation compound has an area of approximately 0.65ha while the overall Art Data Centre project has an area of approximately 61 hectares. This SID application site has an area of approximately 9 hectares.

The topography of the substation compound is highly variable with an overall level difference of approximately 10 m in existing ground levels from a higher elevation in the east to a lower elevation to the west of the site.

Access to the proposed substation compound will be provided by a proposed internal road layout subject to planning permission (Ref. No. P21/757).

Please refer to **Figure 1** below for a site location map. Where the red lines represents the planning boundary.

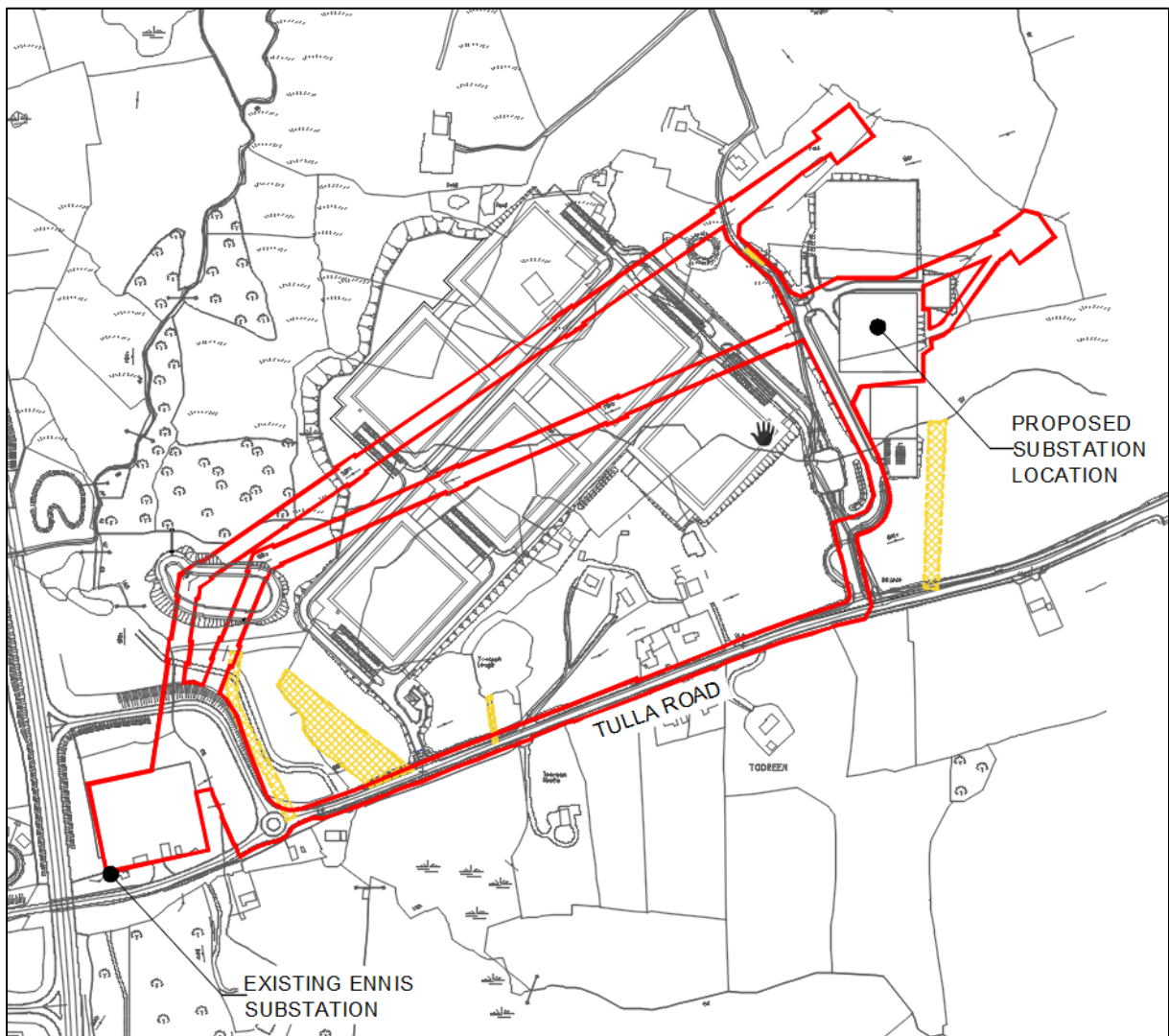


Figure 1 - Site Location - Art Data Centre Substation

1.2 Description of the Proposed Development

The proposed substation consists of two storey 110kV GIS grid substation building (with a gross floor area of 1,431 sq.m.) enclosed within a 2.6 metre high security fence; a single storey client control building (with a gross floor area of 467 sq.m), 2 No. 110kV hybrid GIS circuit breakers; 2 no. 110/10kV dual output step down transformers (separated by isolators and metering equipment), and 4 No. medium voltage output switch rooms for distribution to the site and connection to the onsite energy center generators (proposed under concurrent application Reg. Ref.: P21-757), all within a 2.6m high fenced compound.

Two existing overhead 110 kV transmission cables circuits traversing the site from south-west to north-east will be undergrounded via 2 no. dropdown. masts with two proposed 110kV underground transmission cables (within ducts) to connect the proposed dropdown masts with the proposed 110kV GIS grid substation. Each of the two new circuits will terminate in a cable – overhead line/cable (L/C) interface compound containing air-insulated electrical equipment mounted on concrete plinths. Adjacent to each L/C interface compound, an overhead line tower will be erected to facilitate connection of the new underground cables to the two existing 110 kV overhead lines. Each proposed

dropdown mast will be c. 17 metres in height, set on concrete foundations. The obsolete sections of the two existing overhead 110kV lines from the proposed dropdown towers to the existing Ennis 110kV substation, including the supporting poles /masts will be removed / demolished.

Two proposed 110kV underground transmission cables (within ducts) will run from the proposed 110 kV GIS grid substation, connecting to the existing Ennis 110 kV Grid Substation via a route southwards along the proposed main campus internal road (proposed under concurrent application Reg. Ref.: P21-757), then turning west along the Tulla Road (R352) until they reach the existing Ennis 110kV grid substation.

The development includes enabling works and services diversions; adjacent access paths to serve the proposed transmission cables; joint bays; connections to the proposed and existing substations; landscaping; security fencing; lightning masts; provision of internal access arrangements within the substation compound; services, and all associated construction and ancillary works.

The proposed 110kV GIS substation is located to the northeast of a proposed data centre development subject to a separate concurrent application to Clare County Council under Reg. Ref.: P21-757.

The methodology behind the construction of the proposed development is that the developer will be responsible for the design, construction, fit-out and pre-commissioning of the proposed Art Data Centre 110kV GIS Substation and the 2 no. underground double circuit 110kV transmission lines from the proposed dropdown towers and to the existing ESB Ennis 110kV Substation.

Upon completion of the works by the Developer, the proposed Art Data Centre 110kV GIS Substation and 2 no. underground double circuit 110kV transmission lines, including the circuit from the dropdown masts to the proposed GIS Substation, will be handed over to EirGrid, whom in conjunction with ESB Networks (ESBN) will carry out the final commissioning and energisation of the substation and transmission lines.

Once energised, the proposed Art Data Centre 110kV GIS Substation and the 2 no. underground double circuit, including the circuit from the dropdown masts to the proposed GIS Substation, will form part of the ESBN infrastructure, which EirGrid will be responsible for operating.



1.3 Compound Layout

The proposed overall layout of the Art Data Centre 110kV GIS Substation is shown on Figure 2 below. It comprises of an entrance to the west and an internal road layout that will provide access to the client/developer building, to the west and to the GIS building to the east.

The internal road layout has been analysed regarding vehicle access and it can conformably accommodate a maintenance vehicle of approximately 8.0m long. In the event of a replacement of a transformer, it is envisaged that a long-articulated vehicle will be required. In such an event, a provision has been made on the design so that the transformers can be lifted from the north side or the south side of the compound.

The GIS Substation compound is serviced (Surface water drainage, Foul Drainage, Water Supply) by connection into the each proposed overall Art Data Centre underground service. Further section on this report will detail how the site is proposed to be serviced

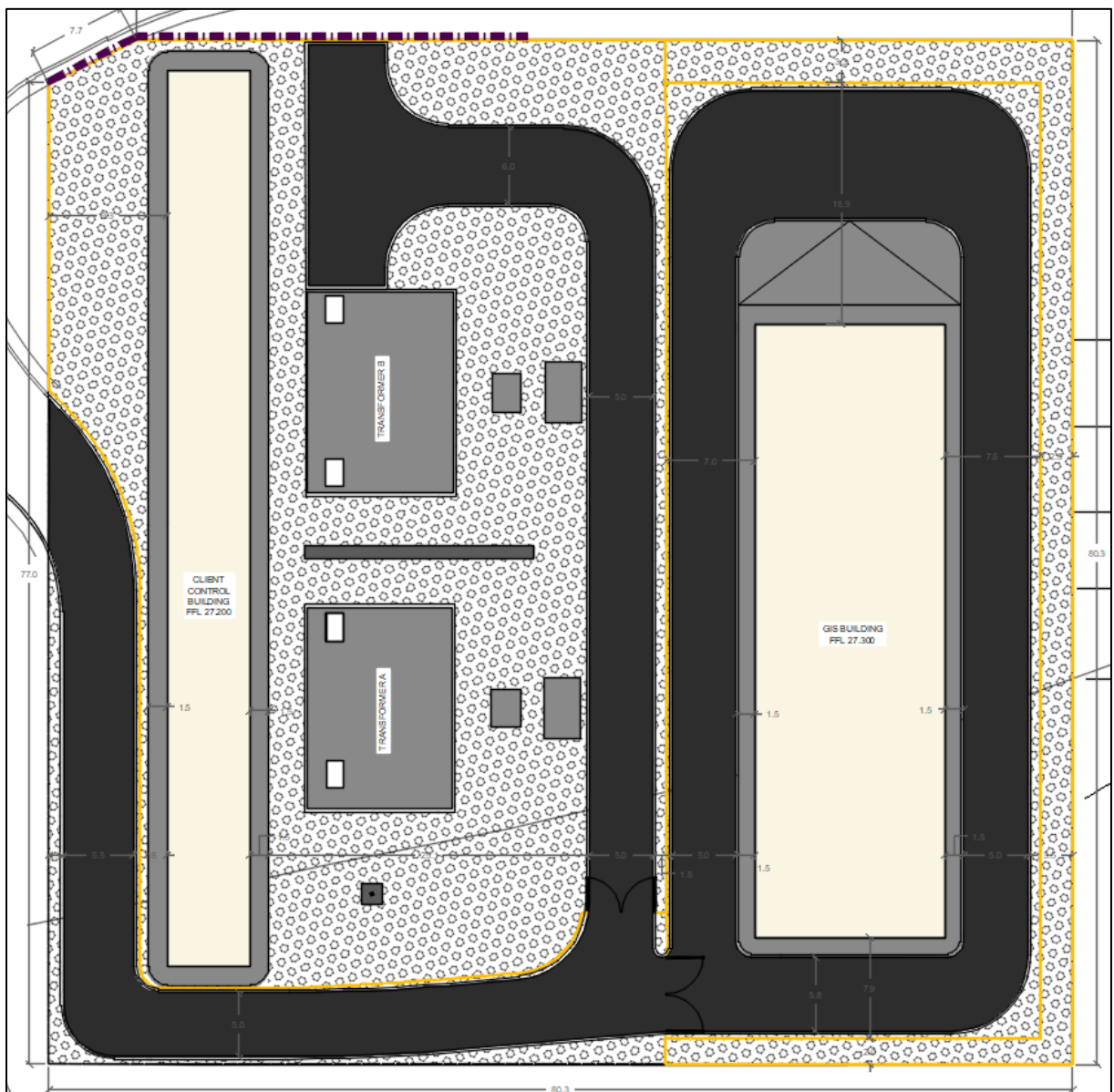


Figure 2 – Compound Layout

2 Surface Water Drainage

This section outlines the surface water drainage proposals for the proposed Art Data Centre 110kV GIS Substation development and should be read in conjunction with CSEA engineering drawing 20_110A-CSE-ZZ-XX-DR-C-2500.

2.1 Existing Surface Water Drainage

There is no existing surface water network within the site boundary of the proposed Art Data Centre 110kV GIS Substation.

There are 2no. attenuation basins at the western boarder of the overall land take located at the North and South banks of the Ballymacahil River. Both existing basins currently discharge into the river at the upstream side of the existing culvert which crosses the M18 Motorway.

2.2 Proposed Surface Water Drainage

The proposed surface water network for the Art Data Centre 110kV GIS Substation collects runoff from roofs, roads, and other hard standing areas in a sealed system of pipes and gullies. The surface water drainage system discharges to a proposed manhole (MH09) of the overall Art Data Centre site (Planning Ref No. 21/757), which has been designed to facilitate the proposed 110kV GIS Substation catchment area. The proposed surface water is designed in accordance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS).

As the Art Data Centre 110kV GIS Substation proposed surface water system comprises of 9 manholes, and the GIS Substation catchment area has been accounted for as part of the overall catchment of the overall Art Data Centre site development (Planning Ref No. 21/757).

The adopted rainfall values, soil characteristics and allowable discharge of the overall Art Data Centre site (Planning Ref No. 21/757) are summarized in Table 1 conveyed below. Table 2 displayed below shows the adopted design rainfall return period for each drainage infrastructure component.

| Characteristic | Value |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Mean Annual Rainfall SAAR mm | 1220 ⁽¹⁾ |
| Overall Development area ⁽³⁾ (Planning Ref No. 21/757) | 17.92ha |
| Soil SPR value % runoff | 0.37 (SOIL TYPE 3) |
| Allowable discharge per 1 hectare area (Qbar) | 5.50 l/s/ha ⁽²⁾ |
| Allowable discharge for overall development area ⁽³⁾ (Qbar) | 98.61 l/s |
| <p>(1) Average historical annual rainfall at Ennis</p> <p>(2) Ennis Calculation of Qbar based on IHE-124 method</p> <p>(3) Including the area of the Art Data Centre 110kV GIS Substation</p> | |

Table 1 - Summary of Allowable Discharge and Soil Characteristics

The proposed stormwater drainage networks for the GIS Substation will range from 300mm to 450mm pipe diameter depending on the required flow capacity. A surface water model report can be reviewed in **Appendix A**.



As the overall Art Data Centre site includes a pollution control measure located downstream of the attenuation pond (Planning Ref No. 21/757), the proposed network for the GIS substation does not include the same on the surface water system.

3 Foul Drainage

This section outlines the Foul drainage proposals for the proposed Art Data Centre 110kV GIS Substation development and should be read in conjunction with CSEA engineering drawing 20_110A-CSE-ZZ-XX-DR-C-2510.

3.1 Existing Foul Drainage

According to Clare County Council and Irish Water record, there is an existing 225mm diameter foul drain that forms part of an existing foul drainage network that services the existing Knockanean area southwest of the proposed site along the existing Tulla Road/R352. This existing 225mm diameter foul drain discharges to the existing Pumping Station of Gort Na mBlath located approximately 550m further west from the proposed development. It is proposed to convey and discharge all domestic foul flows generated from the overall proposed development (Planning Ref No. 21/757) into the existing Gort Na mBlath Pumping Station.

3.2 Proposed Foul Drainage

A pre-connection enquiry (PCE) form was submitted to Irish Water on 22nd of April 2021 which addressed wastewater designed population, proposed foul sewer gravity and pumping system for the entire project site (including the proposed Art Data Centre 110kV GIS Substation) and the proposed connection point proposed as indicated in Section 3.1. above. The PCE application submitted on behalf of the Art Data Centre Development was issued and responded confirming feasibility to serve the site by Irish Water (PCE Reference Number: CDS21002422).

The proposed Art Data Centre 110kV GIS Substation, subject to this planning application, comprises a gravity foul sewer network consisting of 150mm diameter pipes size.

The design Dry Weather Flow DWF of the entire development (Planning Ref No. 21/757) is 20.9 m³/d. The proposed foul drainage service attributed to the overall site development will incorporate a foul pumping station and associated rising main which will also include 24-hour emergency storage tank in the unlikely event that the proposed foul pump malfunctions. The proposed 24-hour emergency storage tank shall be situated in an open space located southwest of the proposed Data storage buildings. Maintenance access to both the pump chamber and 24-hour emergency storage tank. This proposed pumping system will transfer the generated wastewater via a rising main of DN80 to the existing Gort Na mBlath Pumping Station.

The proposed Foul Drainage system for the Art Data Centre 110kV GIS Substation includes a pollution control measure specified as 'Full Retention Oil Separator NSFA010' that will cater for any oil spillage from the transformers. Figure 3 below details the technical information for the full retention oil separator proposed for the GIS Substation.

| Technical information ^ | | | | | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------|----------------------|---------------------|-------------|---------------|-------------------------------|---------------------------|----------------------------|------------------------|----------------------------|
| Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr. On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems. | | | | | | | | | | | |
| Product Code | Flow (l/s) | Drainage Area (m ²) | Silt Capacity (ltrs) | Oil Capacity (ltrs) | Length (mm) | Diameter (mm) | Manhole Cover Dimensions (mm) | Base to Inlet Invert (mm) | Base to Outlet invert (mm) | Min. Inlet Invert (mm) | Std Pipework Diameter (mm) |
| NSFP003 | 3 | 170 | 300 | 30 | 1700 | 1350 | 600 | 1410 | 1335 | 550 | 160 |
| NSFP006 | 6 | 335 | 600 | 60 | 1700 | 1350 | 600 | 1410 | 1335 | 550 | 160 |
| NSFA010 | 10 | 555 | 1000 | 100 | 2610 | 1225 | 600 | 1050 | 1000 | 500 | 200 |

Figure 3 – Full Retention Oil Retention Technical Information

4 Water Supply

This section outlines the Water Supply proposals for the proposed Art Data Centre 110kV GIS Substation development and should be read in conjunction with CSEA engineering drawing 20_110A-CSE-ZZ-XX-DR-C-2600.

4.1 Existing

According to Clare County Council and Irish Water record, there is an existing 150mm diameter watermain that forms part of an existing Ennis town watermain network of the proposed development along the existing Tulla Road/R352. In addition to this watermain, the records show another 200mm runs under the Millbank Road.

4.2 Proposed

A pre-connection enquiry (PCE) form was submitted to Irish Water on 22nd of April 2021 which addressed the following in relation to water supply proposal for the entire project development (Planning Ref No. 21/757):

- Business/staff water demand = 0.24l/s to 1.2l/s
- Industry-specific water requirements (on site storage) = 5 l/s to 16 l/s (relates to the water demand for the adiabatic cooling system)
- Proposed water supply layout.

Figure 4 below is an extract from the PCE and it shows the estimation for the population within the proposed GIS Substation (named as SS1).

| 1. Industrial/Business staff water demand: | | |
|-----------------------------------------------|---------------|-------------------------------------------------------------------|
| Populations Estimate: | | |
| Building No. | Description | Population |
| Building 1 | DC6 | 25 |
| Building 2 | DC5 | 25 |
| Building 3 | DC 3 | 25 |
| Building 4 | DC 4 | 25 |
| Building 5 | DC 2 | 25 |
| Building 6 | DC 1 | 25 |
| Building 7 | Vertical Farm | 40 |
| Building 8 | SS1 | 5 |
| Building 9 | Energy Centre | 5 |
| Building 10 | Gas AGI | 5 |
| Building 11 | Security Hub | 2 |
| | | 207 persons |
| Water demand = 100 l/Person/day | | |
| - Total Average water demand per day | | = 20,700 l/d (0.24 l/s) |
| - Peak Industrial/Business staff water demand | | = Five times average water demand per day = 0.24l/s X 5 = 1.2 l/s |

Figure 4 – Extract from PC

The calculation of the business water demand element for the overall site development was based on a water demand per person = 100 L/day and a population number of 207 persons.

The watermain for the proposed Art Data Centre 110kV GIS Substation will be feed through the proposed watermain system for the overall site development and it has been included on the calculations for water demand.

The PCE application submitted on behalf of the Art Data Centre Development (Planning Ref No. 21/757) was issued and responded confirming feasibility to serve the site by Irish Water (PCE Reference Number: CDS21002422).

The PCE was responded by Irish Water on 30th of August 2021 confirming that the proposed site could be facilitated.

Project Number: 20_110A

Project: Art Data Centre 110 kV GIS Substation and Grid Connection

Title: Engineering Planning Report



Clifton Scannell Emerson
Associates

Appendix A – Drainage Model Report

Seefort Lodge
 Castledawson Avenue, Blackrock
 Dublin, Ireland



Date 22/03/2022 15:34
 File Art Substation -

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 Checked by

Innovyze Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section | Type | Auto Design |
|--------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|------|----------------|
| P1.000 | 66.517 | 0.333 | 199.8 | 0.060 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | | |
| P1.001 | 5.678 | 0.028 | 202.8 | 0.057 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | | |
| P1.002 | 29.470 | 0.147 | 200.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | | |
| P1.003 | 39.088 | 0.195 | 200.5 | 0.045 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | | |
| P1.004 | 37.582 | 0.219 | 171.6 | 0.049 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | | |
| P1.005 | 44.679 | 0.223 | 200.4 | 0.026 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | | |
| P2.000 | 20.395 | 0.102 | 200.0 | 0.066 | 4.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | | |
| P2.001 | 58.201 | 0.291 | 200.0 | 0.119 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | | |
| P2.002 | 8.426 | 0.042 | 200.6 | 0.095 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | | |

Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|--------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| P1.000 | 50.00 | 5.20 | 25.923 | 0.060 | 0.0 | 0.0 | 0.0 | 0.92 | 36.6 | 8.2 |
| P1.001 | 50.00 | 5.31 | 25.590 | 0.118 | 0.0 | 0.0 | 0.0 | 0.91 | 36.4 | 15.9 |
| P1.002 | 48.80 | 5.84 | 25.562 | 0.118 | 0.0 | 0.0 | 0.0 | 0.92 | 36.6 | 15.9 |
| P1.003 | 46.53 | 6.55 | 25.415 | 0.162 | 0.0 | 0.0 | 0.0 | 0.92 | 36.6 | 20.5 |
| P1.004 | 45.35 | 6.95 | 24.995 | 0.211 | 0.0 | 0.0 | 0.0 | 1.55 | 246.4 | 25.9 |
| P1.005 | 43.93 | 7.47 | 24.776 | 0.237 | 0.0 | 0.0 | 0.0 | 1.43 | 227.9 | 28.2 |
| P2.000 | 50.00 | 4.31 | 25.783 | 0.066 | 0.0 | 0.0 | 0.0 | 1.11 | 78.3 | 9.0 |
| P2.001 | 50.00 | 5.18 | 25.681 | 0.185 | 0.0 | 0.0 | 0.0 | 1.11 | 78.3 | 25.1 |
| P2.002 | 50.00 | 5.31 | 25.390 | 0.281 | 0.0 | 0.0 | 0.0 | 1.11 | 78.2 | 38.0 |

Innovyze Network 2020.1

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.300
 Region Scotland and Ireland Cv (Summer) 0.750
 M5-60 (mm) 16.500 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 20, 20, 20

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|--------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| P1.000 | MH1 | 15 Winter | 100 | +20% | 100/15 Winter | | | | 26.152 |
| P1.001 | MH2 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 26.050 |
| P1.002 | MH3 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 25.980 |
| P1.003 | MH4 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 25.817 |
| P1.004 | MH5 | 15 Winter | 100 | +20% | | | | | 25.163 |
| P1.005 | MH6 | 15 Winter | 100 | +20% | | | | | 24.961 |
| P2.000 | MH7 | 15 Winter | 100 | +20% | 100/15 Summer | | | | 26.099 |
| P2.001 | MH8 | 15 Winter | 100 | +20% | 100/15 Summer | | | | 26.072 |
| P2.002 | MH9 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 25.803 |

| PN | US/MH Name | Surcharged | | Flooded | Half Drain | | Pipe | Status | Level Exceeded |
|--------|------------|------------|-------------|-------------------|-------------|------------|------|------------|----------------|
| | | Depth (m) | Volume (m³) | Flow / Cap. (l/s) | Time (mins) | Flow (l/s) | | | |
| P1.000 | MH1 | 0.004 | 0.000 | 0.64 | | | 22.8 | SURCHARGED | |
| P1.001 | MH2 | 0.235 | 0.000 | 1.35 | | | 36.8 | SURCHARGED | |
| P1.002 | MH3 | 0.193 | 0.000 | 1.07 | | | 36.6 | SURCHARGED | |
| P1.003 | MH4 | 0.178 | 0.000 | 1.38 | | | 48.0 | SURCHARGED | |
| P1.004 | MH5 | -0.282 | 0.000 | 0.29 | | | 62.5 | OK | |
| P1.005 | MH6 | -0.265 | 0.000 | 0.35 | | | 71.0 | OK | |

Seefort Lodge
 Castledawson Avenue, Blackrock
 Dublin, Ireland



Date 22/03/2022 15:34
 File Art Substation -

Designed by pedro.santos
 Checked by

Innovyze Network 2020.1

Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged | | Flooded | Flow / Overflow Cap. (l/s) | Half Drain | Pipe | Status | Level Exceeded |
|--------|---------------|--------------|-----------------------------|----------------|----------------------------------|---------------|------|------------|-------------------|
| | | Depth (m) | Volume (m ³) | Time (mins) | | Flow (l/s) | | | |
| P2.000 | MH7 | 0.016 | 0.000 | 0.37 | | 25.2 | | SURCHARGED | |
| P2.001 | MH8 | 0.091 | 0.000 | 0.91 | | 68.0 | | SURCHARGED | |
| P2.002 | MH9 | 0.113 | 0.000 | 1.73 | | 102.3 | | SURCHARGED | |

Clifton Scannell Emerson Associates Limited, Civil & Structural Consulting Engineers

3rd Floor The Highline, Bakers Point, Pottery Road, Dun Laoghaire, Co. Dublin, A96 KW29

T. +353 1 288 5006 F. +353 1 283 3466 E. info@csea.ie W. www.csea.ie

