



Drainage Strategy Report

Newport CWL01 and CWL02

Prepared for:

RED Engineering

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1 INTRODUCTION

Pinnacle Consulting Engineers Ltd have been commissioned by RED Engineering to carry out a Drainage Strategy Report (DSR) as part of our pre-app pack for the proposed development of a site off Celtic Way, Coedkernew, Newport NP10 8FS. An existing site plan is enclosed at Appendix A.

This DS report has been prepared in accordance with the requirements contained within the (i) Planning Policy Wales (PPW, Feb 2021): Chapter 6 Water and Flood Risk, (Page 146); ii) Technical Advice Note 15: Development and Flood Risk; (iii) Newport City Council Strategic Flood Consequences Assessment (SFCA); (iv) guidance from CIRIA C697: The SUDS Manual; and (v) Other statutory laws and local bylaws and legislations.

The flood consequence assessment produced by JBA Consulting is part of the precautionary framework required to evaluate the following:

- Ensuring the nature of the proposed development is suitable for the Flood Zone it is located in.
- Ensuring the proposed location of the development satisfies the LPA's development plans; and
- Ensuring the potential consequences of a flood event for the development have been considered and found acceptable.

This report has been prepared to address the requirements of TAN15 and has derived the following data/information from various sources including:

- Information published or explicitly provided by Natural Resources of Wales.
- Information published by local planning authorities.
- A Geo Environmental Summary from Geotechnics (July 2021)
- Geotechnics Preliminary Risk Assessment
- Newport City Council Local Flood Risk Management Strategy (October 2014)
- British Geological Survey Information.
- A site-specific topographical survey (June 2021)
- JBA Consulting's Celtic Way Flood Consequences Assessment (August 2022)

2 EXISTING SITE CONDITIONS

2.1 Site description

The proposed development is located at National Grid Reference (NGR) ST279842 (327909, 184216) and can be accessed via Celtic Way, Coedkernew, Marshfield, Newport NP10 8FS. The 16.49Ha site is currently situated south of the A48 and is within the Imperial Park Industrial estate, southwest of the city of Newport.

Historical mapping identifies the proposed development site to be formerly occupied by Quinn Radiators Ltd. The site is therefore considered previously developed land.

The site is found situated within the community of Coedkernew, located between an unnamed road off the A48 to the west and Celtic Way to the east. Coedkernew is located 4km southwest of Newport in Wales. The site is predominantly enclosed by greenfield land to the south and west of the site which is also a Site of Special Scientific Interest (SSSI). At present, the land surrounding the current existing building infrastructure within the site boundary is mostly laid to hardstanding with some areas of greenfield land around the east and south-eastern parts of the site. The site is bounded by Industrial units to the north, Celtic Way to the east, Dyffryn lane to the South and Church Lane to the west.

The land use prior to the existing buildings at the site and within the surrounding area are summarised in Table 2.1 below. Details of the existing development site are enclosed in Appendix A and illustrated in Figure 2.1 below.

Map Date	Description	
1882	On Site	The site is entirely field land with roads surrounding the site. Embankments /cuttings are sited along the eastern boarder of the site. A pathway runs along the western boarder of the site which connects south of the site to a local well situated east of New dairy.
	Off site	A river is found running from the south through the east and onto the northern regions surrounding the site. Fair Orchard situated south-west of the site and Whitecross farm North-west of the site.
1902	On Site	As 1882
	Off site	The well situated east of New Dairy had been removed and the footpath leading to the well had been extended and split into 2 separate footpaths, one connecting onto a road directly north of New house and the other passing dire. Mud deposits had formed within the river running from the south through the east and onto the northern regions surrounding the site.
1922	On Site	As 1902
	Off site	Salting's formed on the left side of the river channel east of the site. This was where spring tides deposited mud.
1954	On Site	As 1922
	Off site	Mud and stones filled the southern side of the river surrounding the site leaving a small river channel (EBBW river) connecting east of the site from the River Usk and flowing towards the northern region surrounding the site.

Table 2.1 – Historical Land Use



Figure 2.1 – Aerial View of the existing development site (approximate site boundary edged red)

2.2 Topography

The development site is relatively flat with ground levels across the site varying between 14.91m and 9.42m Above Ordnance Datum (AOD). The site generally falls in a south westerly direction.

The topographical survey providing the existing site levels was conducted by Laser Surveys Ltd (Worcester). The drawing reference is N1082-2d-R2 and can be found enclosed in Appendix B.

2.3 Flood Zone

According to JBA consulting's Celtic Way FCA, the proposed site is situated within Flood Zone 1 of the flood map for planning for rivers. This means that there is less than a 0.1% Annual Exceedance Probability (AEP) of fluvial flooding in any given year, including climate change.

2.4 Proposed development details

The proposals for the site include the demolition and clearance of the existing buildings/hardstanding followed by the construction of a new data centre comprising of two buildings with associated areas of access roadways, hardstanding, a substation, water treatment works and car parking. It is understood that the proposed development will include areas of soft landscaping and three surface water retention ponds.

The proposed development site plans are enclosed in Appendix C.

3 EXISTING SITE DRAINAGE

3.1 Existing surface water management

The National Strategy for FCERM (Flood and Coastal Erosion Risk Management in Wales) sets out how the government intend to manage the risks from flooding and coastal erosion across Wales over the next 10 years, whilst strengthening and clarifying roles and responsibilities. It sets out the policies and direction for all Welsh Flood Risk Management Authorities to follow, with measures to explain how this will be achieved, which can be considered as its action plan.

Caldicot and Wentlooge Internal drainage board oversee and manage the water levels of the proposed site in Coedkernew. They undertake the works to reduce flood risk to people and property and manage water levels for agricultural and environmental needs within the district.

The Topographical survey drawing produced by Laser Surveys in May 2021 outlines the existing sewers within the vicinity of the site which is enclosed in Appendix B. The proposed site's existing drainage network has unrestricted discharge into the ponds located south of the site.

3.1.1 Existing Public Surface Water Sewer

The Welsh Water sewer record identifies an existing surface water overflow sewer crossing the site. This has been confirmed by the drainage condition survey carried out by Laser Surveys. The existing public surface water overflow drainage network runs parallel to Celtic way and curves inwards onto the site and back out of the site in a south easterly direction. Refer to Appendix H for sewer record.

3.1.2 3rd Party Surface Water Networks

There are two 3rd party surface water sewers networks which run through the proposed site. The first one flows along the proposed site boundary from the north-western corner of the site to the south-western corner of the site where it then discharges into an existing 3rd party pond via a maintained connection south of the site. The second one flows adjacent to the proposed site boundary from the north-eastern corner of the site to the south-eastern corner of the site where it then discharges into an existing 3rd party pond via a maintained connection south of the site.

3.2 Existing Foul Water Management

3.2.1 Existing Public Combined Sewer

The Welsh Water sewer record identifies an existing public combined sewer running adjacent to the existing public surface water sewer into and out of the site. This has been confirmed by the drainage condition survey by Laser Surveys. Refer to Appendix H for sewer record.

3.2.2 Existing 3rd Party Foul Water Sewer

A 3rd party foul water network is identified by the drainage condition survey flowing along the northern site boundary in an easterly direction toward the eastern border of the site and then runs adjacent to the 3rd party surface water sewer before it connects back into the existing public combined sewer via rising main. There is a private pumping station located within the site boundary serving the third party foul water runoff and the existing site foul water runoff.

3.3 Estimated Existing surface water discharge rates

The proposed development site is approximately 16.49 Ha and is situated within the West Coast of Wales. Using the greenfield runoff rate estimation tool on the UK Suds website, it identifies the proposed site to have an estimated Qbar (greenfield runoff rate) of 46.58 l/s.

The UK SuDS Website uses the IH124 method to estimate Qbar from SPR (Standard percentage runoff) and SAAR (Seasonally adjusted annual rate) data. The table below outlines the hydrological characteristics used in identifying the estimated greenfield run-off rates for the site.

HYDROLOGICAL INFORMATION	
SAAR (mm)	1018
Hydrological Region	9
SPR	0.3

Table 2.3 – Hydrological information obtained from www.uksuds.com/tools/members/greenfield-runoff-rate-estimation-members on the UK suds website.

GREENFIELD RUNOFF RATES	
Qbar (l/s)	46.58
1 in 1 year (l/s)	40.99
1 in 30 year (l/s)	82.91
1 in 100 year (l/s)	101.54
1 in 200 year (l/s)	114.58

Table 2.4 – Greenfield Run-off rates predictions

4 SURFACE WATER RUNOFF

As part of the flood risk management strategy, the Drainage Strategy is required to address surface water management and measures to prevent flood risk elsewhere. This is in accordance with Section 8 of TAN15 (paragraph 8.3) which states, "Development in one part of a catchment may increase run-off and hence flood risk elsewhere, therefore, the aim should be for a new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce run-off where possible. It is accepted that there may be practical difficulties in achieving this aim."

The proposed surface water strategy includes the use of three existing ponds with two maintained connections to the two ponds located in the 3rd party land south of the site and one proposed surface water connection into an existing pond subject to agreement from Newport City Council Suds Approval Body. As outlined in Appendix E of this report within the proposed drainage strategy, a 6m wide private drainage easement is proposed with public and private sewer diversion routes outlined with respective easements and an existing public surface water sewer and combined sewer located within the site to be abandoned.

4.1 Surface Water Management Strategy

Traditional approaches to urban drainage have comprised of underground tanks and pipe networks. More recently, the benefits and opportunities to use Sustainable Drainage Systems (SuDS) have been realised and encouragement to use such systems is promoted throughout Flood Risk Management policy at all levels. SuDS is a term which encompasses a variety of approaches to managing surface water in a way which is more sympathetic to the natural and human environment than conventional piped drainage systems. Management of surface water is an essential element for reducing flood risk and SuDS techniques are often designed to achieve this in a way that mimics the natural environment. The Building Regulations (H3) states the priority for discharging surface water runoff from a development is as follows:

1. Infiltration into the ground.
2. Discharge into a watercourse.
3. Discharge into a sewer.

In conjunction with Building Regulations H3, the primary approach to the drainage of surface water runoff is infiltration into the ground. 'Geotechnics' GeoEnvironmental summary, indicates that made ground was encountered in all exploratory borehole and comprised of either hardstanding (concrete or asphalt) or reworked topsoil comprising soft brown slightly sandy slightly gravelly silt with rootlets with gravel composed of mixed lithologies including sandstone, brick, clinker and quartzite. These ground materials allow for a limited amount of surface water infiltration into the ground.

It is therefore assumed that infiltration for the site is not a viable solution. As infiltration is deemed not viable the next method of discharge, in conjunction to Building Regulation H3, is to discharge into the nearest watercourse. There are 3 existing ponds, two maintained connections into 3rd party land and a proposed connection into an existing pond subject to agreement from Newport City Council approval body. An additional pond connection was proposed in order to allow for excess surface water overflow storage.

The proposed Data Centres roof and hardstanding areas will be drained by a series of gravity systems, where surface water is conveyed via rainwater downpipes, road gullies, swales and drainage channels. These flows from the western Data Centre plot and eastern Data Centre plot are captured and treated separately, before being discharged into the SuDS bodies and discharged into the existing watercourse at the south of the site. Refer to Appendix E for the proposed Drainage Strategy.

The proposed development has an impermeable area of 8.291 Ha with a maximum restricted greenfield discharge rate of 46.6 l/s. Using the Micro Drainage software quick storage estimate tool, the site requires an approximate storage volume of up to 11, 234m³ to provide adequate surface water storage for all storms up to a 1 in 100 year plus 40% climate change.

The surface water management has been split into two separate systems for each Data Centre plot. Both systems use swales and pipe network, which is designed to collect surface water runoff, to treat for hydrocarbons via a petrol interceptor, and to be stored within the respective retention pond which then allows for the gradual discharge of surface water from the retention ponds into external existing ponds past the site boundary at a designated discharge rate.

4.2 Residual Matters

If the drainage system is overwhelmed either by a storm event with a magnitude greater than that designed for, or due to a blockage, any resulting overland flows will be conveyed towards the existing ponds south of the site and the excess surface water overflow would be discharged into them. Refer to Appendix F for the flood exceedance flow plan.

4.3 Maintenance Requirements

It is anticipated that a private management company will be employed to maintain the completed drainage network for the development incorporating the following activities and frequency for each SuDS component.

4.3.1 Gullies/Channels/Pipes/Manholes

All components are to be periodically cleaned of foreign particles and silt accumulation, on a quarterly basis. Components located in unadopted areas will be maintained by the landowner. Those located in adopted areas will be maintained by the adopting authority.

4.3.2 Oil Separators/ Petrol Interceptors

Units are to be inspected at least every six months in accordance with the manufacturer's recommendations. A log should be kept detailing the depth of oil found, any oil volume and silt removed, or cleaning carried out. Alarm probes should be removed and cleaned at each inspection.

4.3.3 Proprietary Systems

Proprietary systems will require routine maintenance by the owner to ensure continuing operation to design performance standards. A typical maintenance schedule is detailed below in table 14.2 from the CIRIA SuDS manual.

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

4.3.4 Proposed Ponds

The proposed ponds will require routine maintenance by the owner to ensure continuing operation to design performance standards. A typical maintenance schedule is detailed below in table 23.1 from the CIRIA SuDS manual.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the 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, eg penstocks	Half yearly
	Hand out submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m 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 1–6 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 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, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows	As required

4.4 Level of Pollution Risk

To ensure that we deliver adequate treatment for surface water runoff from our proposed development site, the below equation must be satisfied.

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard Index}$$

(for each contaminant type) (for each contaminant type)

Outlined below are the pollution hazard indices specific to the proposed site's land use based on the classifications provided within the SuDS manual pollution hazard indices (See table 26.2 below).

- Other Roofs:

TSS	Metals	Hydrocarbons
0.2	0.2	0.05

- Commercial Yard, Non-Residential Car Park and high traffic roads:

TSS	Metals	Hydrocarbons
0.7	0.6	0.7

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, hamweaves and general access roads) and non-residential car parking with infrequent change (eg schools, offices) (< 300 traffic movements/day)	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, utility, all roads except low traffic roads and trunk roads/motorways)	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where domestic and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.8 ²

4.5 Mitigation Measures

$$\text{The SuDs mitigation Index} = \text{mitigation index}_1 + 0.5 (\text{mitigation index}_2)$$

Below are the SuDs mitigation Indices proposed for each land use classification of the proposed site. The mitigation Index Values used are taken from the table 26.3 within the SuDs manual shown below.

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ³	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{2,4}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

- Other Roofs:

SuDs Mitigation Component	Mitigation Indices ¹		
	TSS	Metal	Hydrocarbons
Pond	0.7	0.7	0.5
Total SuDs Mitigation Index	0.7	0.7	0.5
Pollution Hazard Index	0.2	0.2	0.05
Is the proposed treatment adequate?	YES	YES	YES

- Commercial Yard, Non-Residential Car Park and high traffic roads:

SuDs Mitigation Component	Mitigation Indices ¹		
	TSS	Metal	Hydrocarbons
Swales	0.5	0.6	0.6
Pond	0.7	0.7	0.5
Total SuDs Mitigation Index	0.85	0.95	0.85
Pollution Hazard Index	0.7	0.6	0.7
Is the proposed treatment adequate?	YES	YES	YES

Based on the above figures the mitigation indices exceeds all pollution indices for every catchment on this site.

5 CONCLUSION

The existing site is brownfield, comprising buildings, roads, car park and associated infrastructure.

The proposed site is located within Flood Zone 1.

The development site is relatively flat with ground levels across the site varying between 14.91m and 9.42m Above Ordnance Datum (AOD), falling in a south westerly direction.

'Geotechnics' GeoEnvironmental summary, identified made ground in all exploratory boreholes and comprised of either hardstanding or reworked topsoil. Infiltration discharge method for surface water is not viable based on the existing ground profile.

The proposals for the site include the demolition and clearance of the existing buildings/hardstanding followed by the construction of a new data centre comprising of two buildings with associated areas of access roadways, hardstanding, a substation, water treatment works and car parking.

The proposed site plan shows that there is a 35% reduction in impermeable area from the existing site.

The proposed development has an impermeable area of 8.291 ha with a maximum restricted greenfield discharge rate of 46.6 l/s. Using the global variables, the site requires an approximate storage volume of 11,234m³ to provide adequate temporary surface water storage for all storms up to a 1 in 100 year plus 40% for climate change.

Due to the proposed decrease in impermeable area of the site, a drainage strategy proposal drawing has been prepared to ensure that excess surface water overflow is accommodated for, and all SUDs mitigation measures are adequate for the proposed land use in line with the CIRIA SuDS Manual.

The drainage strategy has been designed to achieve the SuDS mitigation indices set out in chapter 26 of the CIRIA SuDS manual and it is anticipated that a private management company will be employed to maintain the completed drainage network for the development with respect to the level of frequency needed for each SUDS component.

Appendix A – Existing Site Plan



GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.
5. THIS DRAWING IS TO BE PRINTED IN COLOUR.
6. THIS DRAWING IS NOT FOR CONSTRUCTION.

LEGEND

— SITE BOUNDARY

File Location: \\WEL\FILE\2020-2029\PROJECTS\2021\PROJECTS\C210420-PIN-XX-XX-DR-C-02000\LOCATION PLAN.DWG

POI	FOR INFORMATION	SC	-	XX.XX.XX
REV	DESCRIPTION	BY	CHK	DATE

CLIENT
MSFT

PROJECT
CWL01 & CWL02

DRAWING TITLE
LOCATION PLAN



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HERTS
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DRAWING STATUS				INFORMATION			
SCALE	AI	DATE	DRAWN BY	CHECKED	REVISION	DATE	BY
1:2500		AUG ' 22	SC	-			
DRG NO.				REVISION			
C210420-PIN-XX-XX-DR-C-02000				P01			

Appendix B – Topographic Survey

Appendix C – Proposed Site Plan

Appendix D – Drainage Calculations

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1018	1018
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	46.58	46.58
1 in 1 year (l/s):	40.99	40.99
1 in 30 years (l/s):	82.91	82.91
1 in 100 year (l/s):	101.54	101.54
1 in 200 years (l/s):	114.58	114.58

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Quick Storage Estimate

MICRO Drainage

Variables

FEH Rainfall

Return Period (years) 100

Version 1999

Site GB 328750 194950 ST 28750 84950

C (1km) -0.026 D3 (1km) 0.361

D1 (1km) 0.413 E (1km) 0.293

D2 (1km) 0.377 F (1km) 2.429

Cv (Summer) 0.750

Cv (Winter) 0.840

Impemeable Area (ha) 8.819

Maximum Allowable Discharge (l/s) 46.6

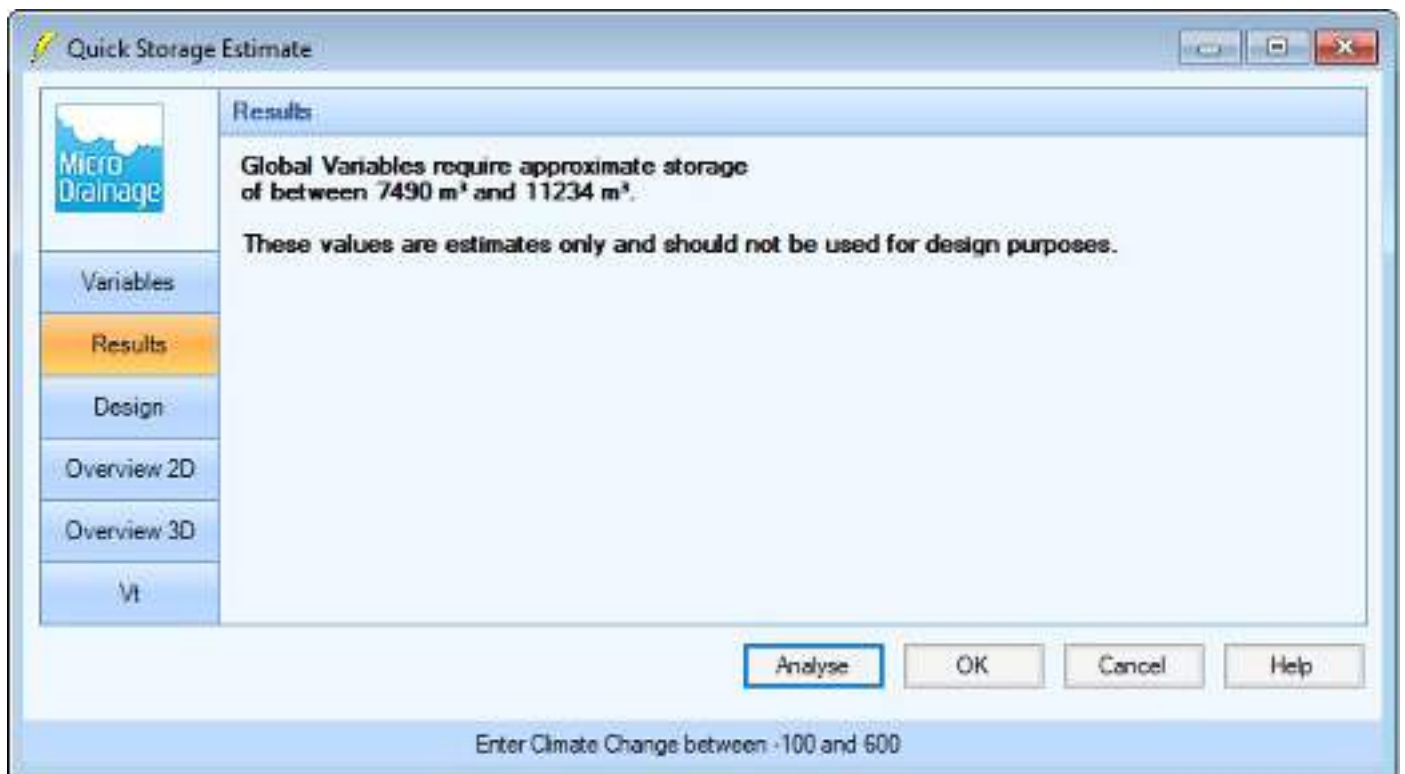
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 40

Analyse OK Cancel Help

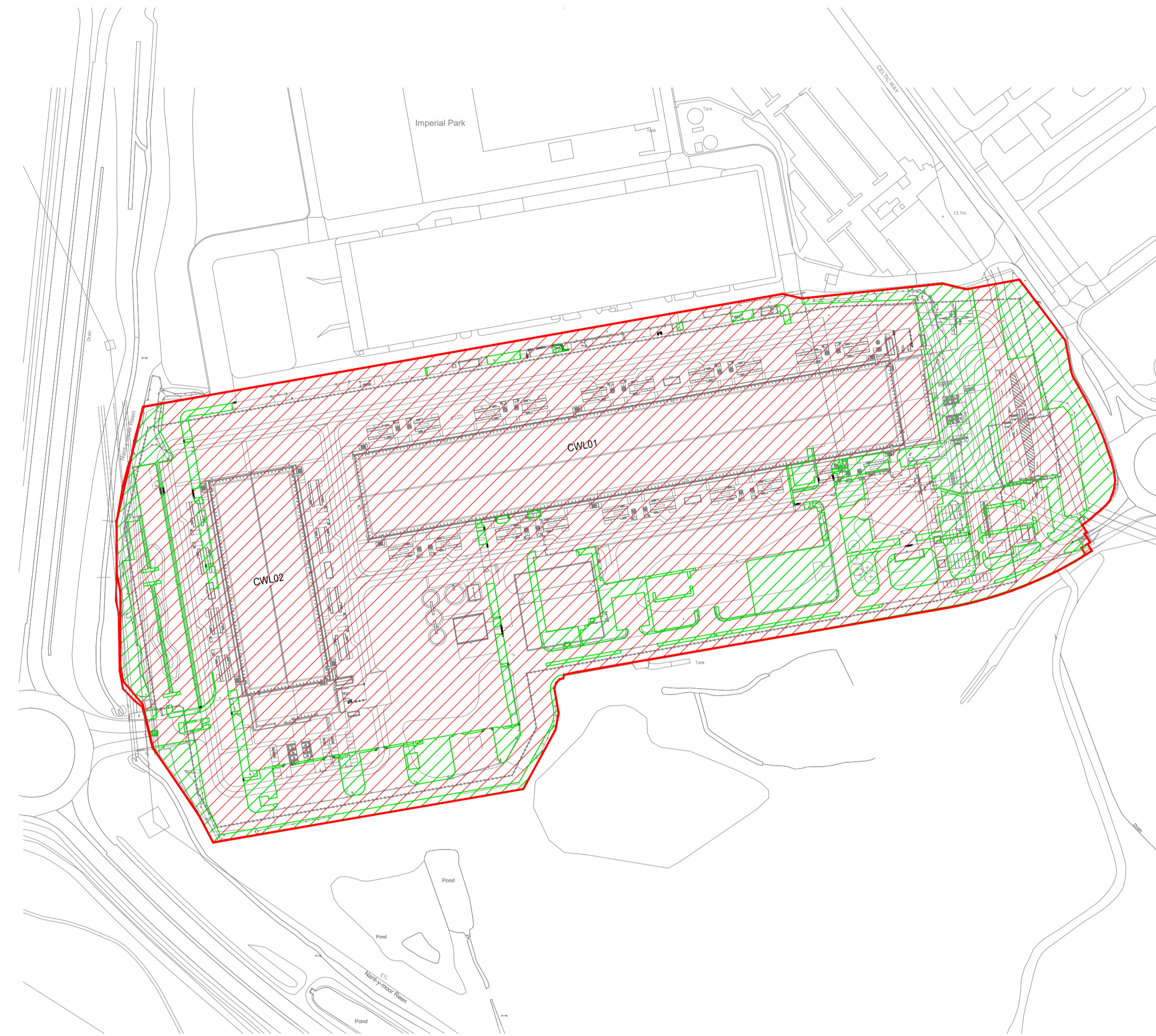
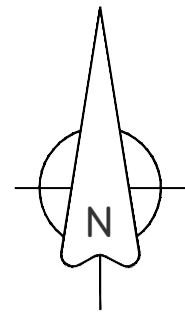
Enter Climate Change between -100 and 600



Appendix E – Proposed Drainage Strategy

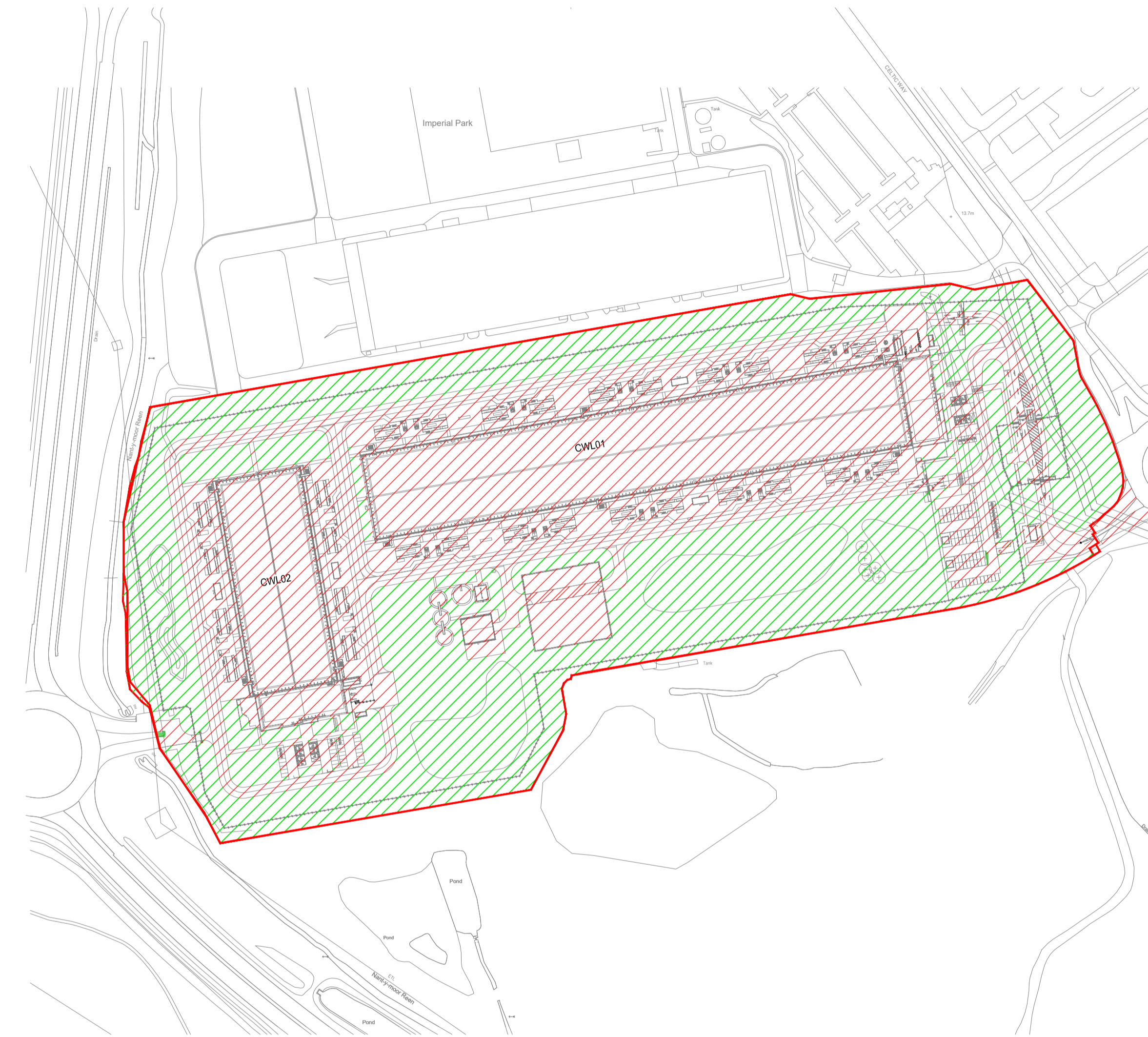
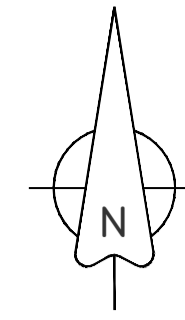
Appendix F – Exceedance Flow Plan

Appendix G – Permeable and Impermeable Areas Plan



EXISTING SITE

TOTAL IMPERMEABLE AREA = 135,143M²
 TOTAL PERMEABLE AREA = 29,945M²
 TOTAL AREA = 165,088M²



PROPOSED SITE

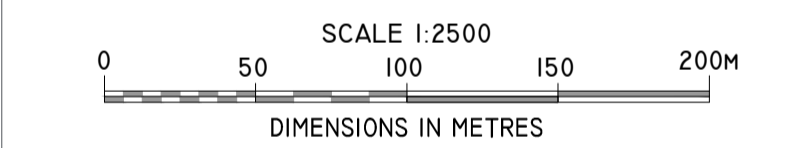
TOTAL IMPERMEABLE AREA = 82913M²
 TOTAL PERMEABLE AREA = 82175M²
 TOTAL AREA = 165,088M²

GENERAL NOTES

- DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
- FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
- ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.
- THIS DRAWING IS TO BE PRINTED IN COLOUR.
- THIS DRAWING IS NOT FOR CONSTRUCTION.
- EXISTING SITE AND LEVEL INFORMATION TAKEN FROM LASER SURVEYS TOPOGRAPHICAL SURVEY DRAWING REF NO N 1082 DATED 02/06/20.
- THIS DRAWING HAS BEEN PREPARED USING THE PROPOSED SITE LAYOUT FROM GENSLER DRAWING CWL XX-SK-106 DATED 18/06/21.

LEGEND

- SITE BOUNDARY
- PERMEABLE AREA
- IMPERMEABLE AREA



P03	FOR PLANNING	DJ	JJ	20.10.23
P02	FOR INFORMATION	SC	JJ	15.08.22
P01	FOR INFORMATION	SC	JJ	05.08.22
REV	DESCRIPTION	BY	CHK	DATE

CLIENT

MSFT

PROJECT

CWL01 & CWL02

DRAWING TITLE

IMPERMEABLE AREAS PLAN

PINNACLE
 CONSULTING ENGINEERS

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 BESSEMER ROAD,
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DRAWING STATUS			
INFORMATION			
SCALE @ AI	DATE	DRAWN BY	CHECKED
1:2500	AUG ' 22	SC	JJ
DRG NO.	REVISION		
C210420-PIN-XX-XX-DR-C-02330	P03		

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REF: C210420

Appendix H – Sewer Plan



Dŵr Cymru
Welsh Water

PPA0005772 Sewer Plan



LEGEND(Representative of most common features)

Waste network:	
	Foul chamber
	Surface water chamber
	Combined chamber
	Combined sewer overflow
	Special purpose chamber
	Treatment works
	Pumping station
	Outfall
	Lampole
	Storm Overflow
	Rising main
	Gravity sewer
	Private sewer
	Private sewer subject to Sect. 104 adoption agreement
	Private Sewer Transfer
	Lateral Drain
	Inspection Chamber

(NB: Sewer symbol colour indicates the type)
 RED - Combined
 GREEN - Surface Water
 BROWN - Foul
 Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

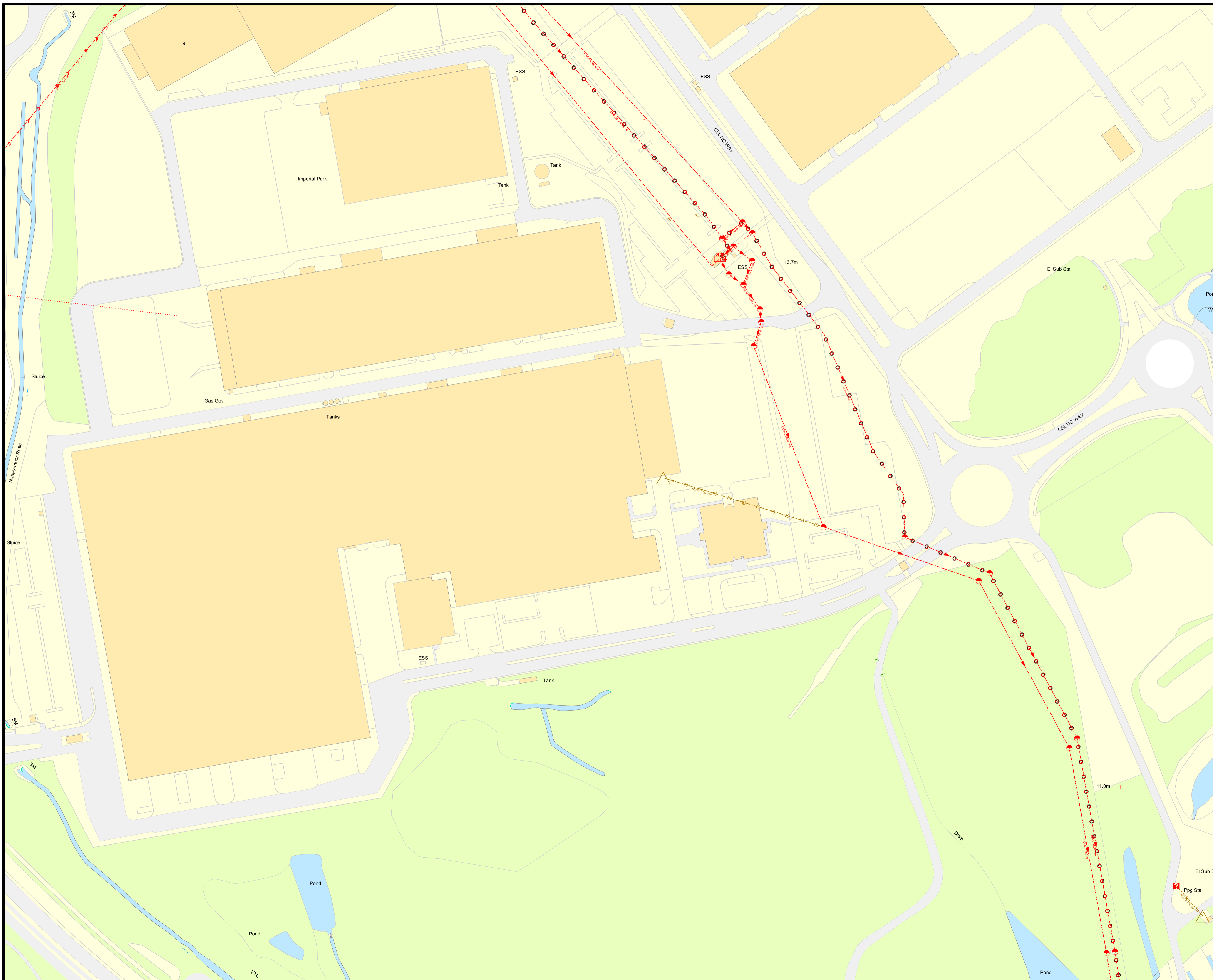
Dŵr Cymru (Welsh Water) (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the understanding that it is based on the best information available and no warranty as to its correctness is stated upon the event of excavations or other works made in the vicinity of the Company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company is done so in accordance with statutory requirements of sections 158 and 159 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provisions of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map scale: 1:1250
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