

Reference	Cover Level	Invert Level
EXMH1	104.530	103.100
MH.01	106.200	105.649
MH.02	106.125	105.130
MH.03	106.050	104.650
MH.04	105.680	103.850
FC.01	106.175	105.462
FC.02	106.150	104.688

Reference	Cover Level	Invert Level
P.01	106.325	106.075
P.02	106.325	105.662

P1	19.12.21	Preliminary Issue	AJH	ABP
Rev	Date	Details	By	Chk

6 NEPTUNE COURT
 VANGUARD WAY
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 CARDIFF CF24 5PJ

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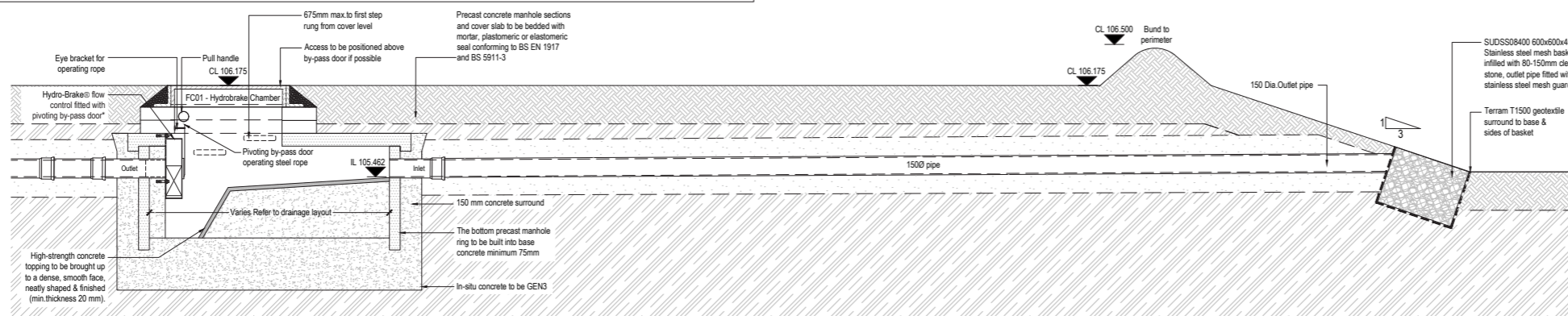
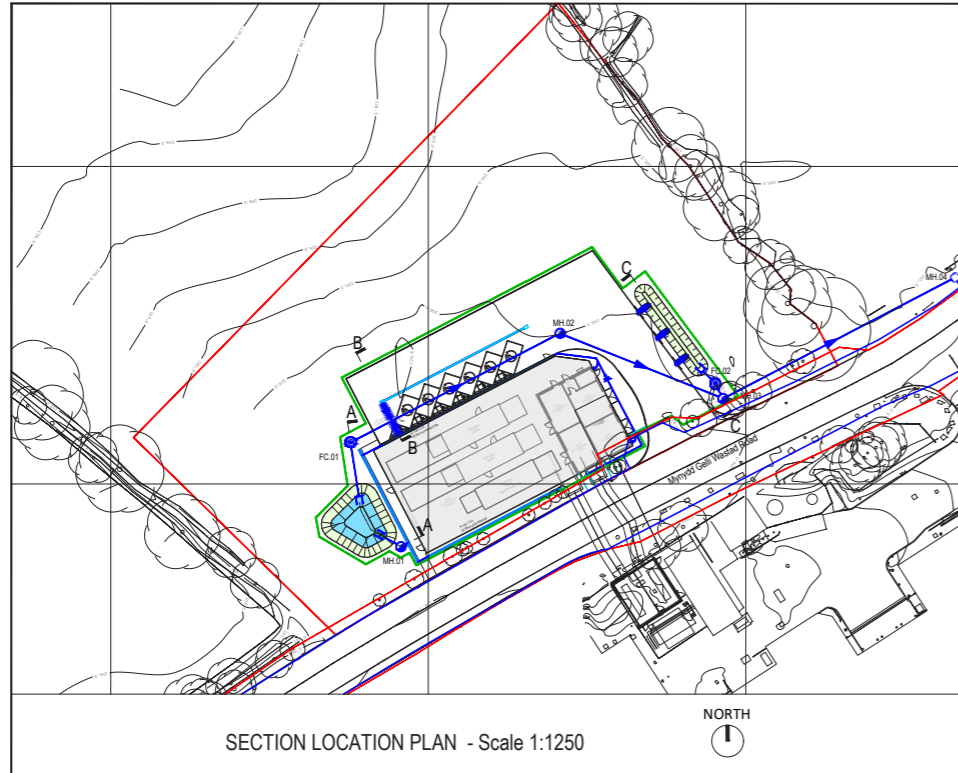
Project:
 MORRISTON GENERAL HOSPITAL - PHASE 2

Title:
 Proposed Drainage Layout

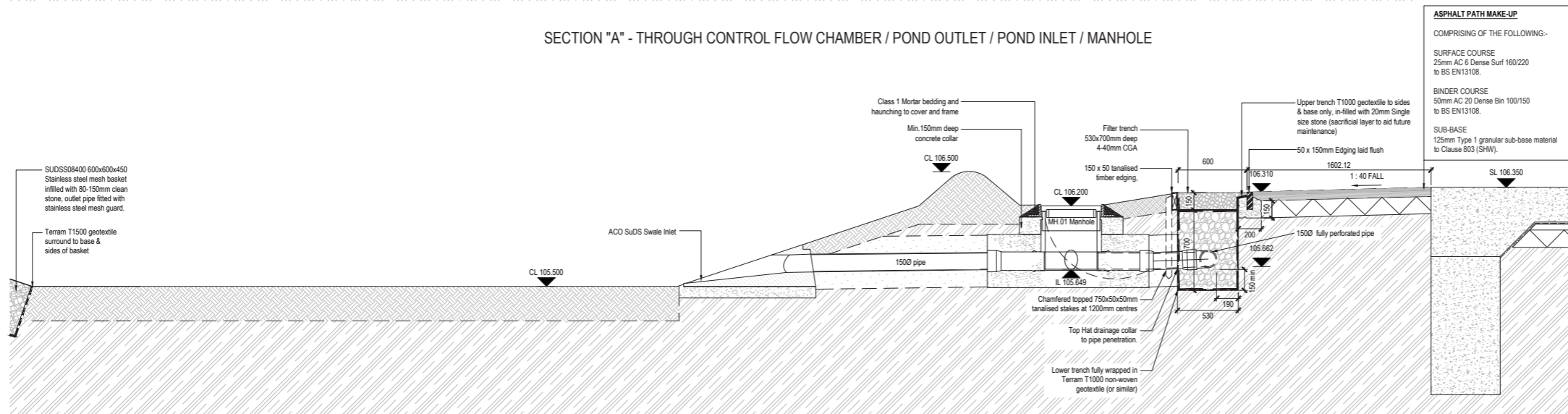
Drawn: AJH
 Checked: ABP
 Date: 09.12.21
 Drawing Status: PRELIMINARY

Scale(s) at A1: 1 : 200
 Revision: C6986
 Satability: P1 S0

Drawing N°: MHP2-RVW-S6-00-DR-C-000020



SECTION "A" - THROUGH CONTROL FLOW CHAMBER / POND OUTLET / POND INLET / MANHOLE



SECTION "A" - THROUGH CONTROL FLOW CHAMBER / POND OUTLET / POND INLET / MANHOLE - CONTINUED

- NOTES-
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RWV CONSULTING LIMITED PROJECT DRAWINGS AND SPECIFICATIONS.
 - ALL EXISTING DRAINAGE LEVELS AND OUTFALL POINTS SHALL BE SURVEYED AND VERIFIED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
 - PIPEWORK UNDER ADOPTABLE HIGHWAY WITH LESS THAN 1.2m COVER, AND OTHER TRAFFICKED AREAS WITH LESS THAN 0.9m COVER TO RECEIVE CONCRETE ENCASEMENT.
 - MANHOLE/INSPECTION CHAMBER COVERS SHOULD NOT BRIDGE DIFFERENT SURFACES.
 - WHERE TWO PIPELINES (OTHER THAN PLASTIC PIPES) CROSS WITH LESS THAN 300mm SEPARATION PIPES ARE TO BE SURROUNDED WITH CLASS 2 CONCRETE SURROUND FOR NOT LESS THAN 1m CENTRED ON THE CROSSING POINT. CONCRETE SURROUND TO BE EXTENDED AS NECESSARY TO WITHIN 150mm OF NEAREST FLEXIBLE JOINTS.
 - ALL PIPEWORK TO BE LAID WITH SOFFIT TO SOFFIT CONNECTIONS UNLESS NOTED OTHERWISE.
 - ALL CONNECTIONS TO THE PUBLIC SEWERAGE SYSTEM ARE TO BE MADE TO THE SATISFACTION OF THE ADOPTING AUTHORITY AND WILL BE SUBJECT TO A SECTION 106 APPLICATION.

This drawing to be read in conjunction with drawing number: MHP2-RVW-S6-00-DR-C-00020

"The specification in all respects shall be in accordance with the current Design Manual for Road and Bridges and The Specification for Highway Works and any other construction publication in force in the county at the time of construction."

Rev.	Date	Details	By	Chk.
P1	19.12.21	Preliminary Issue	AJH	ABP

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Project: **MORRISTON GENERAL HOSPITAL - PHASE 2**

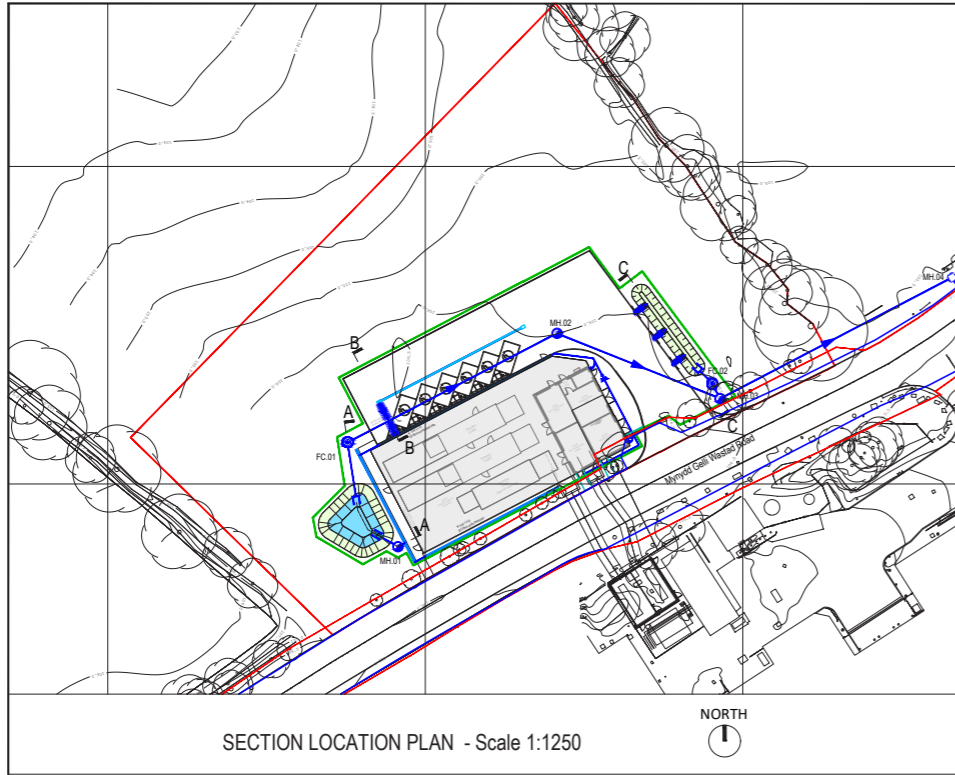
Title: **SAB Application Construction Detail Sections Sheet 1 of 3**

Drawn: AJH
Checked: ABP
Scale(s) at A1: 1:20

Date: 09.12.21
RVW Job N°: **C6986**
Revision: **P1**
Subsidiary: **S0**

Drawing Status: **PRELIMINARY**

Drawing N°: **MHP2-RVW-S6-00-DR-C-00021**



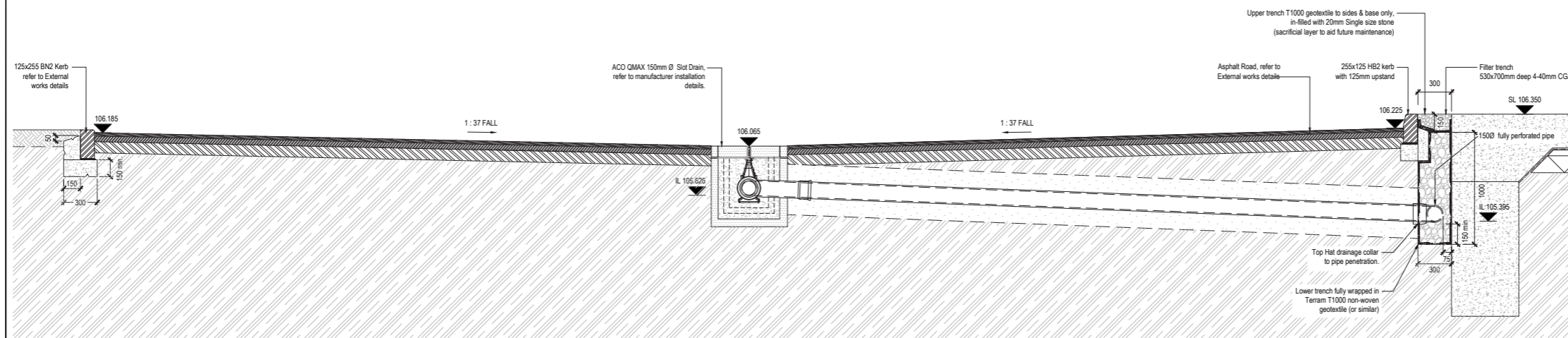
SECTION LOCATION PLAN - Scale 1:1250

NOTES-

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RWV CONSULTING LIMITED PROJECT DRAWINGS AND SPECIFICATIONS.
- ALL EXISTING DRAINAGE LEVELS AND OUTFALL POINTS SHALL BE SURVEYED AND VERIFIED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
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This drawing to be read in conjunction with drawing number: MHP2-RVW-S6-00-DR-C-000020

"The specification in all respects shall be in accordance with the current Design Manual for Road and Bridges and The Specification for Highway Works and any other construction publication in force in the county at the time of construction."



SECTION "B" - THROUGH CONTROL ROAD SLOT DRAIN / KERB / FILTER TRENCH / SUB STATION CONCRETE SLAB EDGE

P1	19.12.21	Preliminary Issue	AJH	ABP
Rev.	Date	Details	By	Chk.
Amendments				

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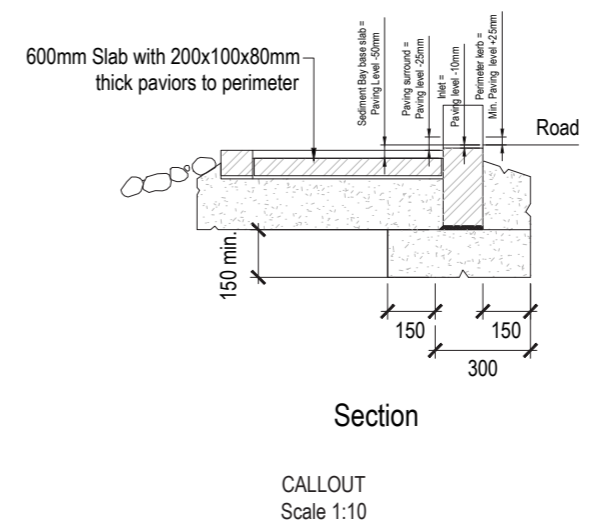
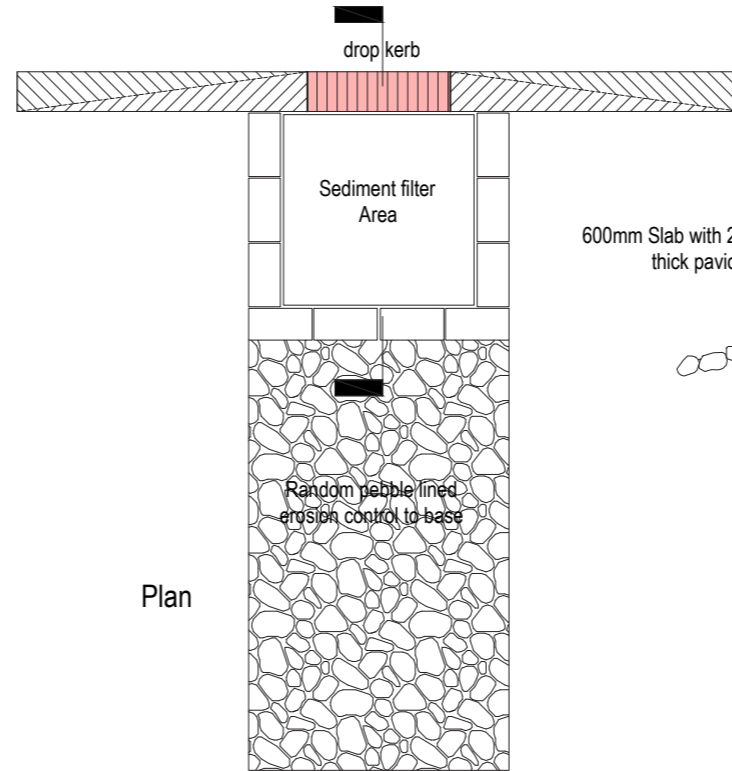
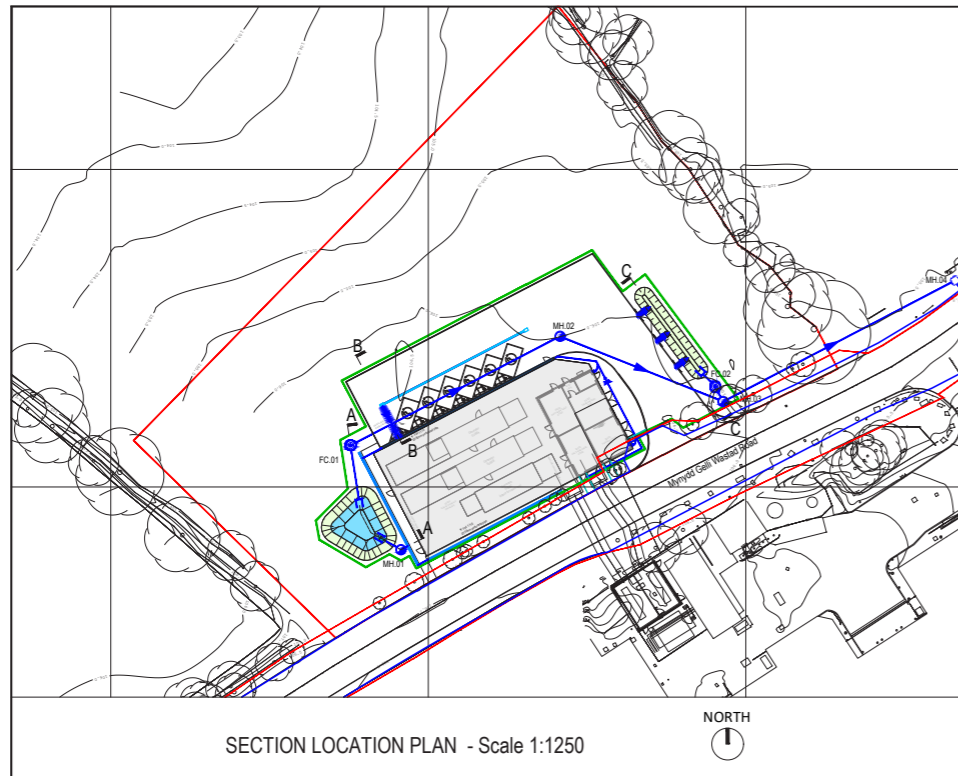
Project: **MORRISTON GENERAL HOSPITAL - PHASE 2**

Title: **SAB Application Construction Detail Sections Sheet 2 of 3**

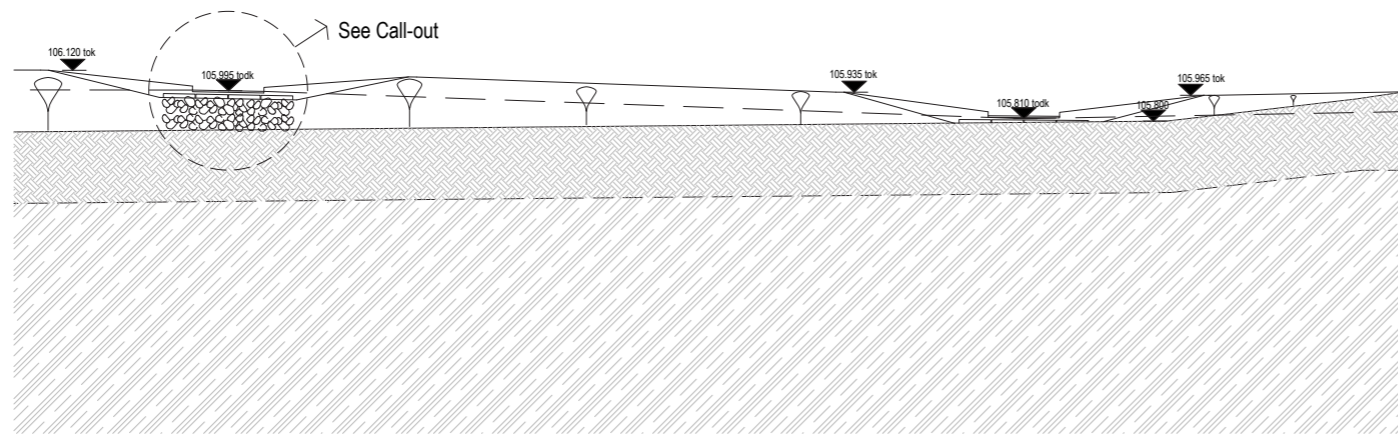
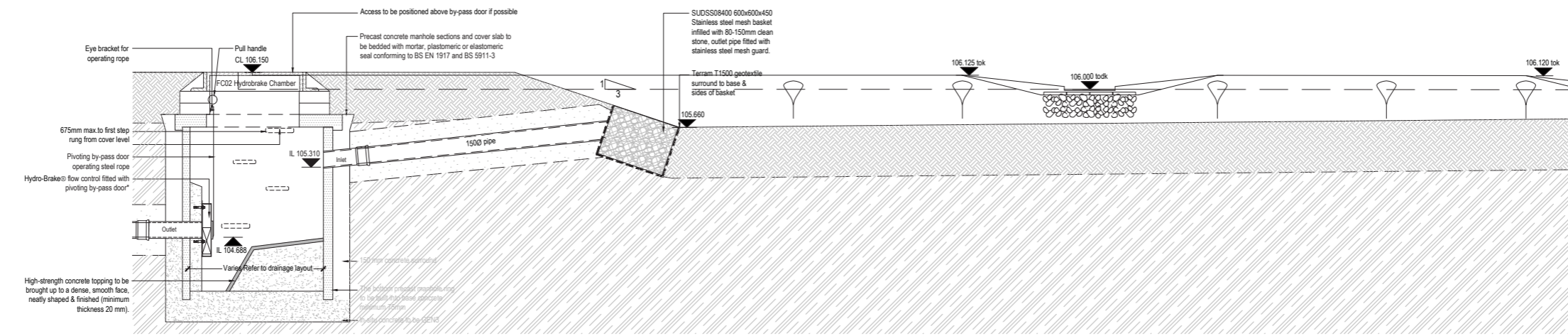
Drawn:	Checked:	Scale(s) at A1:
AJH	ABP	1 : 20
Date:	RVW Job N°	Revision:
09.12.21	C6986	P1
Submittal:		S0

Drawing Status: **PRELIMINARY**

Drawing N°: **MHP2-RVW-S6-00-DR-C-000022**



- NOTES-
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RWV CONSULTING LIMITED PROJECT DRAWINGS AND SPECIFICATIONS.
 - ALL EXISTING DRAINAGE LEVELS AND OUTFALL POINTS SHALL BE SURVEYED AND VERIFIED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
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- This drawing to be read in conjunction with drawing number: MHP2-RVW-S6-00-DR-C-000020
- "The specification in all respects shall be in accordance with the current Design Manual for Road and Bridges and The Specification for Highway Works and any other construction publication in force in the country at the time of construction."*



P1	19.12.21	Preliminary Issue	AJH	ABP
Rev.	Date	Details	By	Chk.
Amendments				

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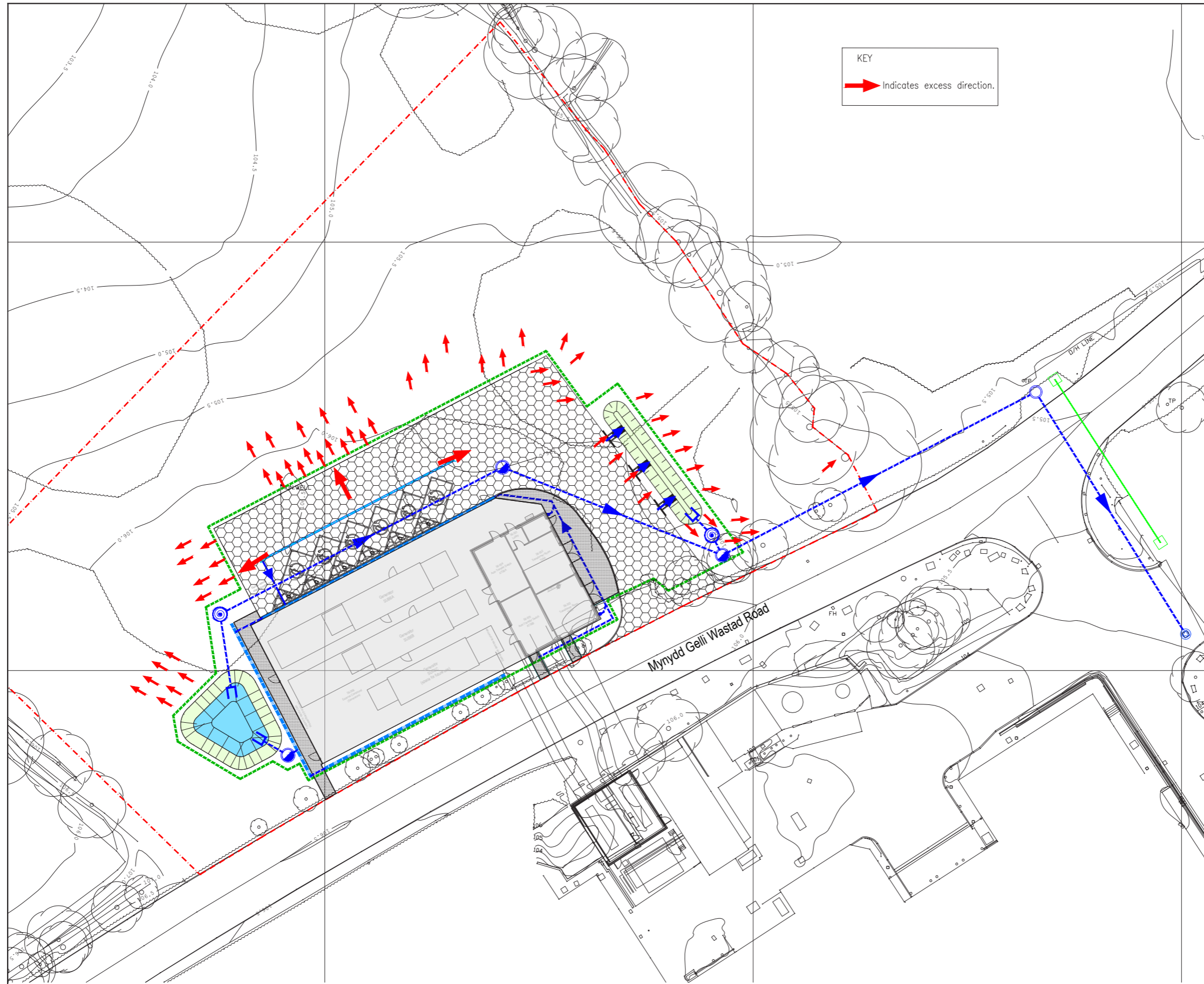
Project: MORRISTON GENERAL HOSPITAL - PHASE 2

Title: SAB Application Construction Detail Sections Sheet 3 of 3

Drawn:	Checked:	Scale(s) at A1:
AJH	ABP	1 : 20
Date:	RVW Job N°	Revision:
09.12.21	C6986	P1
Subsidiary:		S0

Drawing Status: PRELIMINARY

Drawing N°: MHP2-RVW-S6-00-DR-C-000023



KEY
 Indicates excess direction.

SAFETY, HEALTH & ENVIRONMENT (SHE BOX) RESIDUAL HAZARDS

CONSTRUCTION PHASE:
 SPECIFIC RESIDUAL HAZARDS HAVE BEEN IDENTIFIED ON THIS DRAWING BY THE FOLLOWING SYMBOLS.

KEY: DETAILS OF RISK

DRAINAGE LEGEND

- Existing storm drain
- Proposed storm drain
- Proposed storm manhole
- Hydrobrake chamber
- ACO Channel with sump unit & rodding c
- Trenched perforated drain 1500
- Road direct outlet to Swale
- Swale

Rev.	Date	Details	By	Chk.
P01	19.12.2021	Preliminary Issue	NT	ABP

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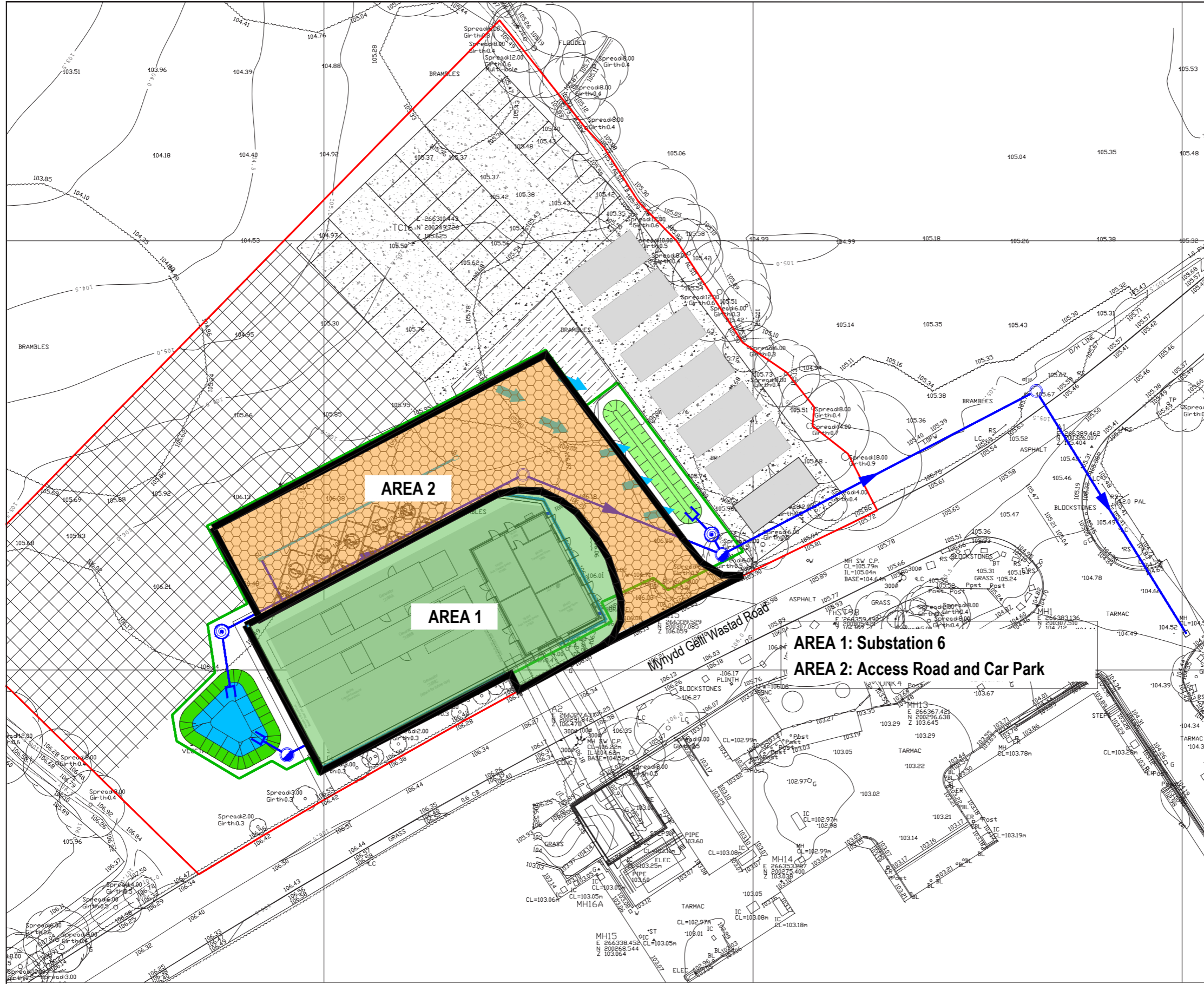
Project: MORRISTON GENERAL HOSPITAL - PHASE 2

Title: Site Overflow Plan

Drawn	Checked	Scale(s)	
NT	BP	NTS @A1	
Date	RVW Job No	Revision	Submittal
DEC '21	C6986	P01	S0

Drawing Status: **PRELIMINARY**

Drawing No: MHP2-RVW-S6-00-DR-C-000024



SAFETY, HEALTH & ENVIRONMENT (SHE BOX) RESIDUAL HAZARDS

CONSTRUCTION PHASE
SPECIFIC RESIDUAL HAZARDS HAVE BEEN IDENTIFIED ON THIS DRAWING BY THE FOLLOWING SYMBOLS.

KEY: [Symbol] DETAILS OF RISK

Rev.	Date	Details	By	Chk.
P01	19.12.2021	Preliminary Issue	NT	ABP

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Project: MORRISTON GENERAL HOSPITAL - PHASE 2

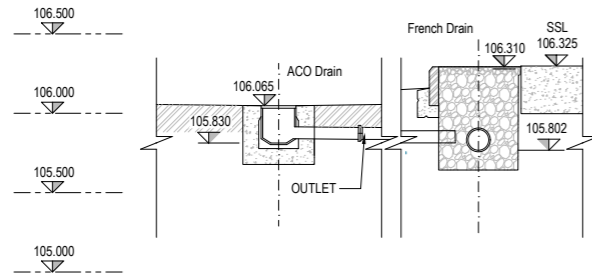
Title: Drainage Areas

Drawn: NT Checked: BP Scale(s) at A1: NTS @A1

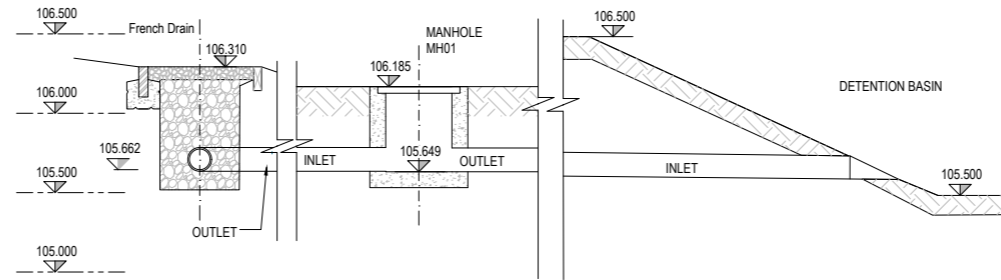
Date: DEC '21 Rev: C6986 P01 Revision: S0 Submittal:

Drawing Status: **PRELIMINARY**

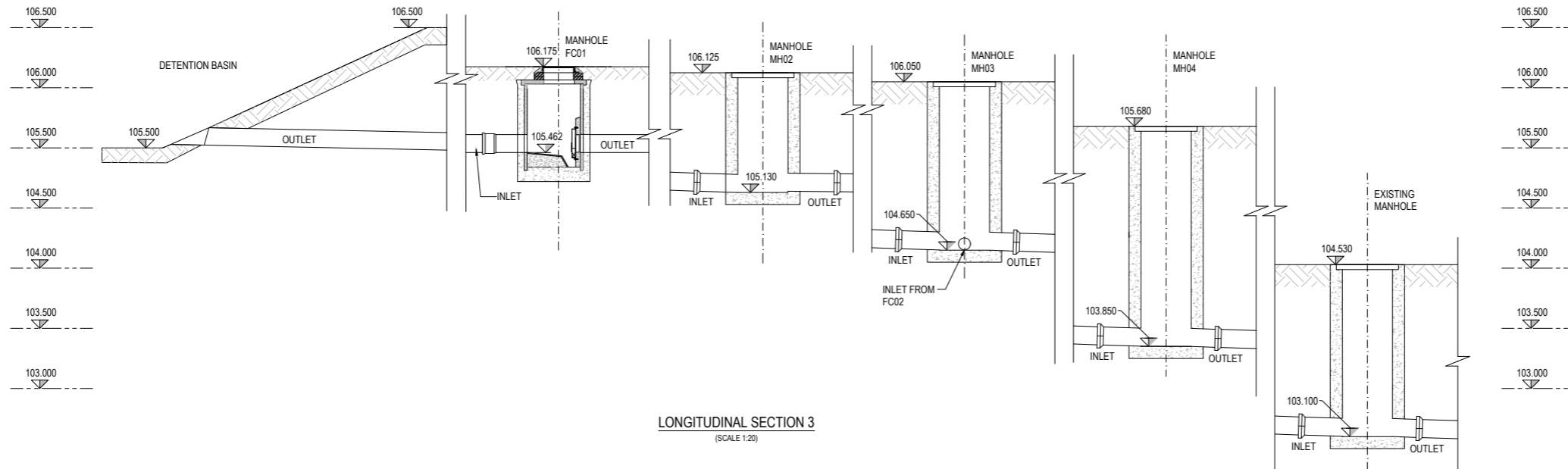
Drawing No: **MHP2-RVW-S6-00-DR-C-000025**



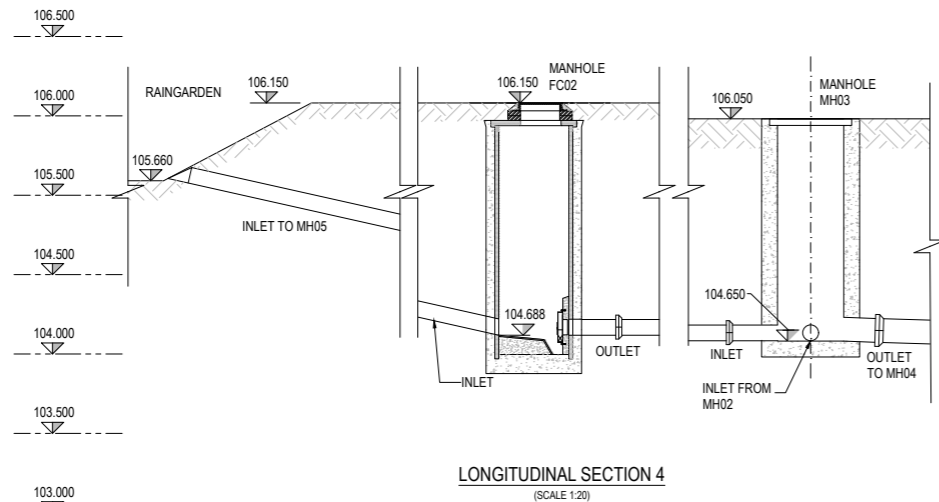
LONGITUDINAL SECTION 1
(SCALE 1:20)



LONGITUDINAL SECTION 2
(SCALE 1:20)



LONGITUDINAL SECTION 3
(SCALE 1:20)



LONGITUDINAL SECTION 4
(SCALE 1:20)

GENERAL NOTES

- DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
- DRAWING TO BE READ IN CONJUNCTION WITH THE LATEST DRAINAGE LAYOUT AND DRAINAGE DETAILS SECTIONS.

P01	19.12.21	PRELIMINARY ISSUE	NT	BP
Rev.	Date	Details	By	Chk.

Amendments

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Project: **MORRISTON GENERAL HOSPITAL - PHASE 2**

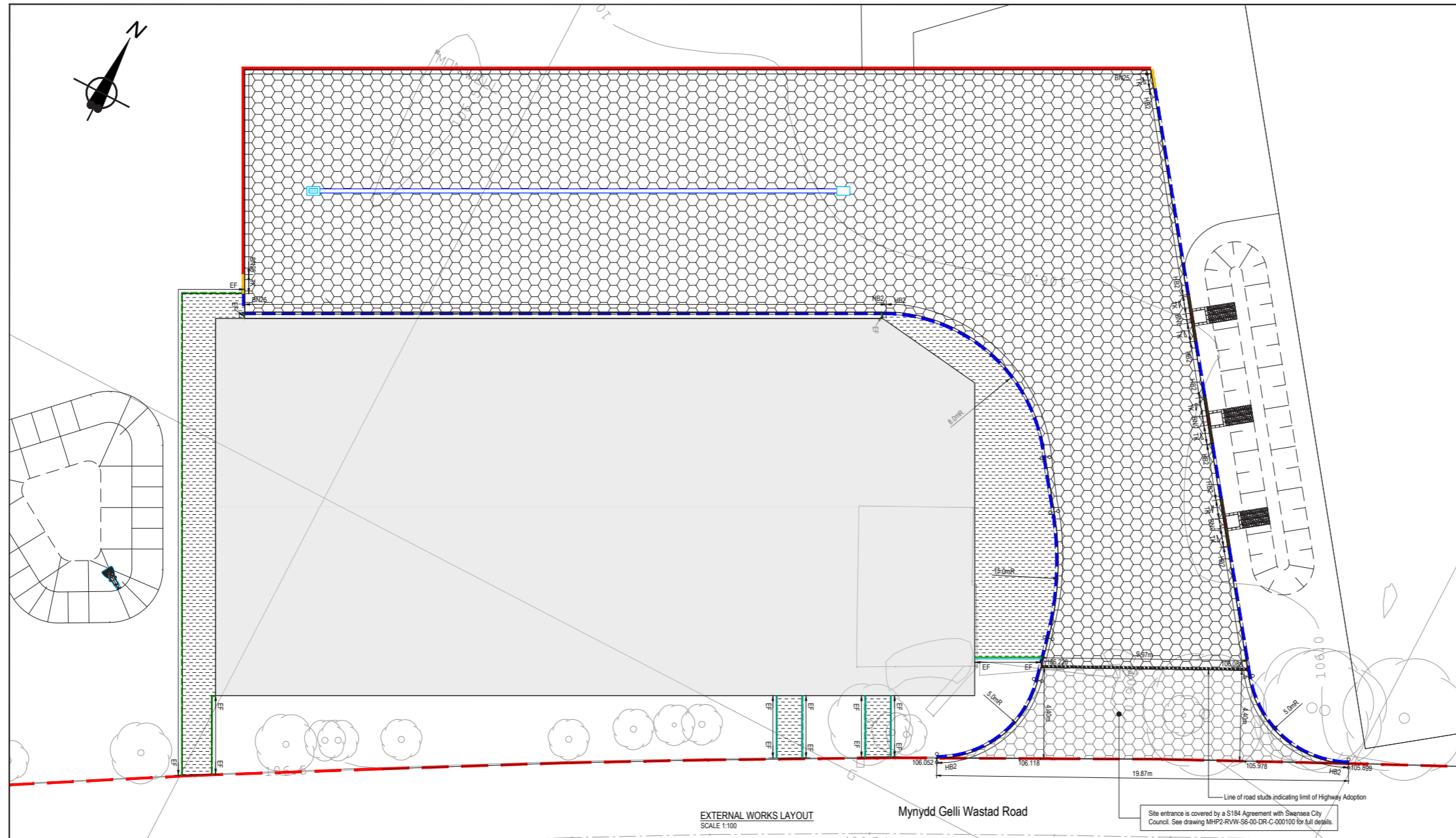
Title: **Longitudinal Sections**

Drawn:	Checked:	Scale(s) at A1:
NT	BP	1:20

Date:	RVW Job N°	Revision:	Submittal:
Dec 21	C7014	P01	S0

Drawing Status: **PRELIMINARY**

Drawing N°: **MHP2 - RVW - S6 - 00 - DR - C - 000030**



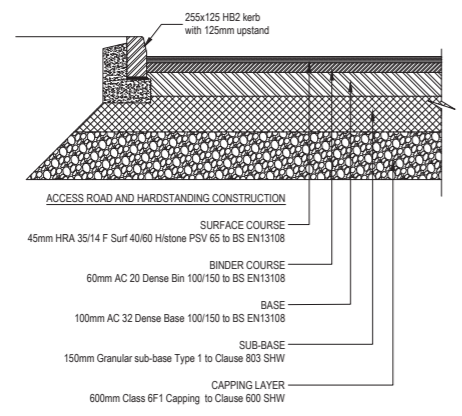
- NOTES**
- All dimensions shown are in Metres unless stated otherwise.
 - Do not scale from this drawing, use figured dimensions only.
 - This drawing to be read in conjunction with all relevant RVW Consulting project drawings and specifications.

- CONSTRUCTION LEGEND**
- Access Road and Hardstanding Construction
 - Footpath Construction
- KERBING LEGEND**
- HB2 125 x 255mm grey precast concrete HB2 kerbs - (125mm upstand)
 - BN25 125 x 255mm grey precast concrete BN kerbs - (25mm upstand)
 - BN3 125 x 150mm grey precast concrete BN kerb - (laid flush)
 - Transition Kerbs: HB2 to Flush BN
 - EF 50 x 150mm grey precast concrete EF edgings - (Laid Flush)

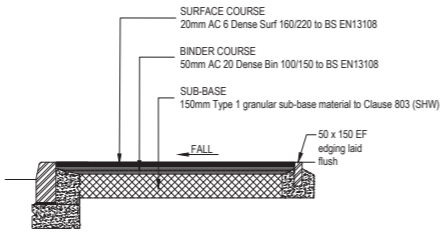
EXTERNAL WORKS LAYOUT
SCALE 1:100

Mynydd Gelli Wastad Road

Line of road studs indicating limit of Highway Adoption
Site entrance is covered by a S184 Agreement with Swansea City Council. See drawing MHP2-RVW-S6-00-DR-C-000100 for full details.



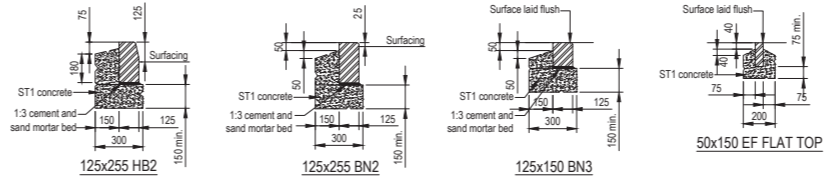
ACCESS ROAD AND HARDSTANDING CONSTRUCTION



TARMAC FOOTPATH CONSTRUCTION

LAYER	CBR VALUE		
	Below 2%	2% - 5%	>5%
Sub-base	150mm	150mm	300mm
Capping layer*	600mm	350mm	0mm

*Capping layer Material to be min. Class 6F1 or 6F2 as specified in Table 6/1 SHW



NOTES

- When coated macadam is laid as road base and is not covered immediately with the binder course or binder course is laid and not immediately covered with surface course, then apply grit to BS 4987 Part 1 Clause 7.9 to seal the surface.
- Ditto above but apply tack coat bituminous spray 40% cationic emulsion at a rate of spread of 0.3 - 0.5 litres/m².
- Laying/compaction requirements:
 - Sub-base - Clause 802.
 - Capping layer - Clause 612.
 - Macadam Roadbase/Binder Course/Surface Course - Clause 901.
- The minimum overall construction thickness of carriageway shall be 450mm.
- The cross section of the carriageway should be crowned to provide a balanced camber. This will ensure that surface water from higher ground will not drain across the carriageway to the lower side.
- Weed killer to be applied at formation level or top of the sub-base to the approval of the Engineer.
- All dimensions are in millimeters unless otherwise stated.

EXTERNAL WORKS CONSTRUCTION DETAILS
SCALE: N.T.S.

P1	19.12.21	Preliminary Issue	AJH	ABP
Rev.	Date	Details	By	Chk.

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Project: **MORRISTON GENERAL HOSPITAL - PHASE 2**

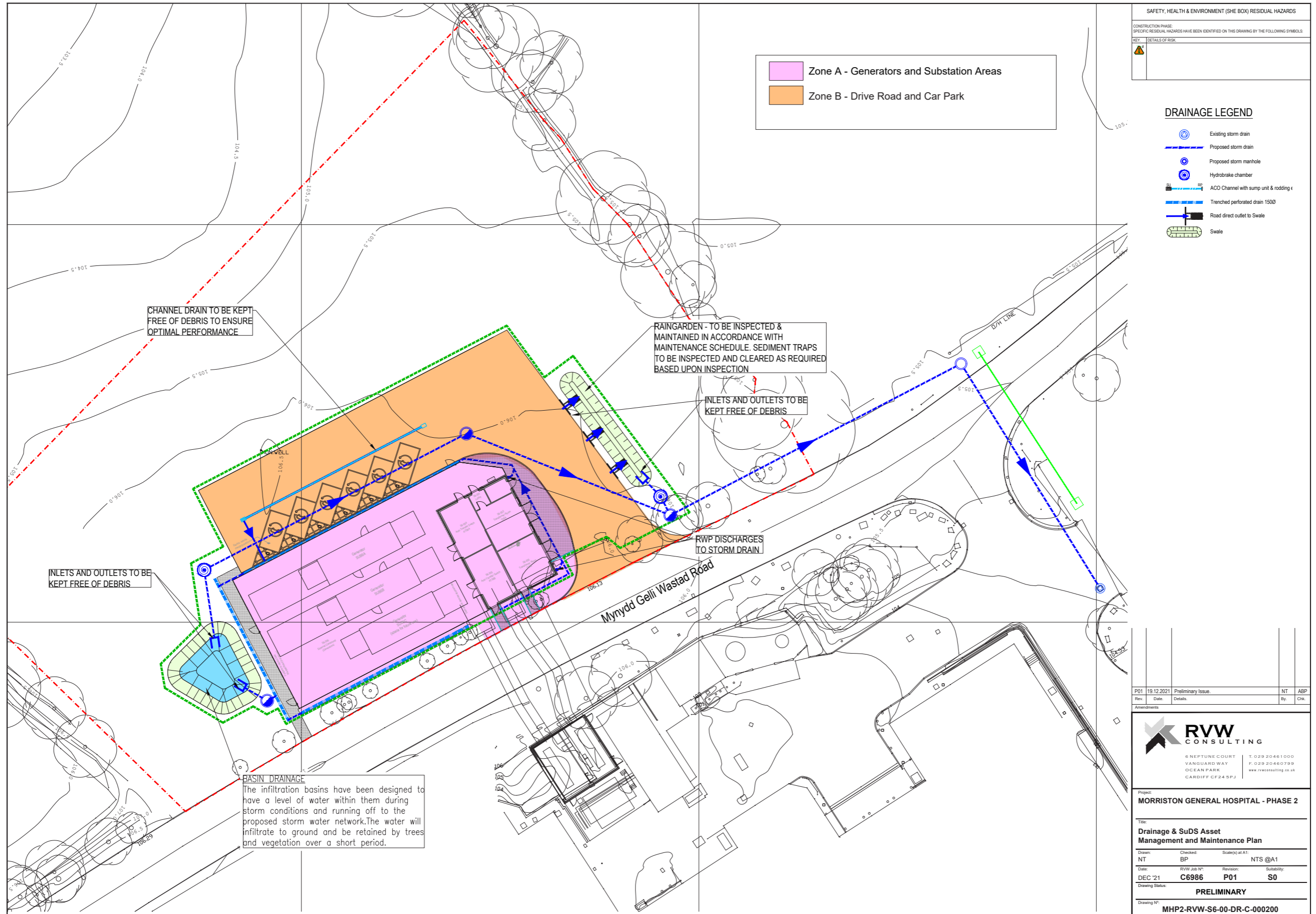
Title: **External Works Layout and Construction Details**

Drawn: KJW | Checked: ABP | Scale(s) at A1: 1:100

Date: 16.12.21 | RVW Job N°: C6986 | Revision: P1 | Subtitle: S0

Drawing Status: **PRELIMINARY**

Drawing N°: **MHP2-RVW-S6-00-DR-C-000101**



	Zone A - Generators and Substation Areas
	Zone B - Drive Road and Car Park

SAFETY, HEALTH & ENVIRONMENT (SHE BOX) RESIDUAL HAZARDS

CONSTRUCTION PHASE:
SPECIFIC RESIDUAL HAZARDS HAVE BEEN IDENTIFIED ON THIS DRAWING BY THE FOLLOWING SYMBOLS.

KEY	DETAILS OF RISK

DRAINAGE LEGEND

- Existing storm drain
- Proposed storm drain
- Proposed storm manhole
- Hydrobrake chamber
- ACO Channel with sump unit & rodding
- Trenched perforated drain 1500
- Road direct outlet to Swale
- Swale

CHANNEL DRAIN TO BE KEPT FREE OF DEBRIS TO ENSURE OPTIMAL PERFORMANCE

RAIN GARDEN - TO BE INSPECTED & MAINTAINED IN ACCORDANCE WITH MAINTENANCE SCHEDULE. SEDIMENT TRAPS TO BE INSPECTED AND CLEARED AS REQUIRED BASED UPON INSPECTION

INLETS AND OUTLETS TO BE KEPT FREE OF DEBRIS

RWP DISCHARGES TO STORM DRAIN

INLETS AND OUTLETS TO BE KEPT FREE OF DEBRIS

BASIN DRAINAGE
The infiltration basins have been designed to have a level of water within them during storm conditions and running off to the proposed storm water network. The water will infiltrate to ground and be retained by trees and vegetation over a short period.

Rev.	Date	Details	By	Chk.
P01	19.12.2021	Preliminary Issue	NT	ABP

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Project: **MORRISTON GENERAL HOSPITAL - PHASE 2**

Title: **Drainage & SuDS Asset Management and Maintenance Plan**

Drawn:	Checked:	Scale(s) at A1:
NT	BP	NTS @A1
Date:	RVW Job N°	Revision:
DEC '21	C6986	P01
Submittal:		S0

Drawing Status: **PRELIMINARY**

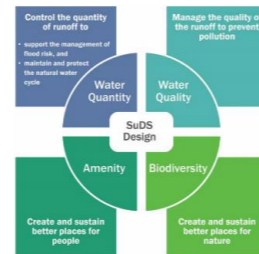
Drawing N°: **MHP2-RVW-S6-00-DR-C-000200**



Flood & Water Management Act 2010

Schedule 3 Sustainable Drainage

SuDS Scheme Application for SuDS Approving Body (SAB) Approval – Wales



Application Form for Full Application Approval of SuDS on new developments, in accordance with The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018

Full Application Structure	
Full Application Form	(To complete & return)
Guidance on Completing the Full Application Form – including specific information and evidence required to support the application.	(For guidance)

(Use hyperlinks above to directly access the Form and Guidance)

Full Application Form

This form is based on the requirements provided by Welsh Government for the sole purpose of submitting information to the SuDS Approving Body (SAB) in accordance with the legislation detailed on this form and other relevant items of primary and subordinate legislation.

Please be aware that once you have downloaded this form, the SAB and Welsh Government will have no access to the form of the data you enter into it. Subsequent use of this form is solely at your discretion, including the choice to complete and submit it to the SAB in agreement with the declaration section.

Upon receipt of this form and any supporting information, it is the responsibility of the SAB to inform you of its obligations in regard to the processing of your application. Please refer to its website for further information on any legal, regulatory and commercial requirements relating to information security and data protection of the information you have provided.

Please Note:

- This form is for a Full SuDS Scheme Application for SAB approval ONLY;**
- Approval of this application will be based on compliance with the [Statutory National Standards for Sustainable Drainage Systems \(SuDS\) for Wales](#) and [Statutory Instruments](#);
- Once this application is made to SAB, it will be determined solely on the written technical and other information submitted with the full application;
- You are strongly advised to have previously submitted a Pre-Application form to SAB, and engaged early, and directly, with the SAB, the LPA and all other relevant organisations that may have an interest in your SuDS scheme proposal, including the SAB statutory consultees listed below:
 - Sewerage undertaker
 - National Resources Wales
 - Highway Authority
 - Canal & River Trust
 - Internal Drainage Districts (NRW);
- For a valid SuDS Scheme Full Application to the SAB, all sections of this form MUST be fully completed; and**
- You are also required to provide technical information as indicated in the [Guidance](#) (or as otherwise directed by the SAB during Pre-Application discussions).**

We will process the information you provide so that we can deal with your application. We may also process or release the information to offer you documents or services relating to environmental matters and consult the public, public organisation and other organisations; provide information from the public register to anyone who asks or prevent anyone from breaking environmental law, investigate cases where environmental law may have been broken and take any action that is needed, and respond to requests for information under the Freedom of Information

SAB Information

Full-App Form FINAL Version 05_11_18 Rev

Act 2000 and the Environmental Information Regulations 2004 (if the Data Protection Act allows).

Please ensure that the information you submit is accurate and correct and does not include personal or sensitive information. If you require any further clarification, please contact the SAB directly.

If printed, please complete using block capitals and black ink prior to submitting to the SAB.

Please read through the [Guidance](#) and complete this application form carefully ensuring all boxes are completed fully. If you fill in the application form correctly first time, the SAB can process it quicker.

Prior to the submission of this Full Application, applicants are strongly advised to make a Pre-Application submission to discuss their proposals with the SAB and ensure that an acceptable SuDS scheme is submitted. Please note that pre-application fees may apply.

Submissions made in support of this application shall be based upon current legislation and industry best practice including documents referenced in [Guidance on Making SuDS Applications for SAB Approval](#).

Proposals submitted should be developed by a competent and suitability qualified professional, experienced in drainage/ SuDs / flood risk management design.

Where applicable, the LPA planning reference or unique identifier must be included.

Applicants should complete this form and submit it, together with the necessary supporting documents, to Swansea Council SuDs Approving Body.

Payment of the Full Application fee can be made via BACS, Cheque (made payable to City and County of Swansea) or in person at one of our Contact Centres. The following reference should be quoted xxx- xxxx. Your application will not be processed until the application fee is received and cleared in full.

When you have completed the application form please submit the form and associated documents electronically to: sab.applications@swansea.gov.uk

If you are not sure about anything contained in the application form, please contact us.

Full-App Form FINAL Version 05_11_18 Rev

Content

ALL sections of this form MUST be fully completed

1. Applicant Details

2. Site Details

3. Interest in Land

4. Application

5. Application Fee

6. Environmental Impact Assessment (EiA) Statement

7. Compliance with Statutory National Standards for Sustainable Drainage Systems (SuDS)

8. Assessment of Flood Risk

9. Surface Water Discharge Hierarchy

10. Infiltration Assessment

11. Non-performance Bond, Adoption, Operation & Maintenance

12. SuDS Scheme Application Checklist

13. Declaration

1. Applicant Details

Applicant Name and Address

Title and Name	Mark Gapper	
Company	Swansea Bay University Health Board	
Suffix (unit/name/number)	Capital Planning Dept, Morrision Hospital	
Address line 1	Heol Y Mynydd	
Address line 2		
Address line 3	, Morrision, ,	
Town	Swansea	
County		
Postcode	SA6 6NL	
Phone number	Mobile	
	Works	01792 703543
	Home	
e-mail address	Mark.Gapper@wales.nhs.uk	

Agent Name and Address

Title and Name	Barney Procter	
Company	RVW Consulting Limited	
Suffix (unit/name/number)	Unit 6	
Address line 1	Neptune Court	
Address line 2	Vanguard Way	
Address line 3	Ocean Park	
Town	Cardiff	
County		
Postcode	CF24 5PJ	
Phone number	Mobile	
	Works	02920461000
	Home	
e-mail address	Barney.procter@rvwconsulting.co.uk	

Preferred contact	Applicant	Agent
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2. Site Details

A general description of site location supported by a plan specifying the construction area and the extent of the drainage system for which approval is sought MUST be submitted. Plans shall be at a scale of 1:2500. All plans MUST show the direction of North.

Name of proposed development	Morrision Sub-Station
-------------------------------------	-----------------------

Grid Reference (E/N)	-3.934460	51.68578
Suffix (unit/name/number)	Morrision Hospital	
Address line 1		
Address line 2		
Address line 3		
Town		
County		
Postcode	SA6 6NL	

Description of proposed development	New Substation serving the Morrision Hospital	
Total application site area (Ha)	0.455 Total: Temp 0.269: Perm 0.186	
Is the existing site currently developed i.e. Brownfield or is it currently undeveloped i.e. Greenfield?	Greenfield	
Existing use	Grazing	
Proposed use	Substation	
Does the site cross more than one SAB area?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If "Yes", please confirm the proportionate area in each SAB below: (The main contact will be the SAB that has most of the surface water drainage system within its boundary.)		

SAB Information

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SAB	% of Site Area

3. Interest in the Land

What interest do you have in the land?		
Owner	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Prospective Owner	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Other (please provide details)		

4. Application

Has any prior advice been sought from the SAB about this application?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes, please complete the following information about the advice you were given. This will help the SAB to deal with this application more efficiently.			
Officer Name			
Reference number		Date	DD MM YYYY
Details of pre-application advice received			

Does this application relate to any other SAB application already made?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If "Yes", please provide SAB Reference number		

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Is this application part of a phased approach to development of the site, or one of multiple applications for the same site?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If "Yes", please provide brief details	<p>The first phase includes the contractor Compound.</p> <p>The second Phase the Contractors compound will be returned to grazing land</p>	

Is this application one of two or more applications made at the same time, each setting out an alternative proposal for construction of a drainage system	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If "Yes", please provide details of other applications made at the same time (include SAB Reference number if available)		

5. Application Fee

It is recommended you contact the SAB directly to ensure the correct fee is paid with the application.

	Area of Land (Ha)	Fraction	Fees
Application fee	N/A	N/A	£350.00
Each 0.1ha or fraction of 0.1ha, for first 0.5ha	£70.00		£350
Each 0.1ha or fraction of 0.1ha, from 0.5ha up to and including 1ha	£50.00		

Each 0.1ha or fraction of 0.1ha, from 1ha up to and including 5ha	£20.00			
Each additional 0.1ha or fraction of 0.1ha above 5Ha.	£10.00			
Is the applicant a town/community council?	If yes, application fee is half the amount		No	
If applicable – reduction of 50% application fee due to this being an alternative proposal made at the same time.				
If applicable – application fee adjustment due to cross-SAB area approvals needed.				
Total Fees				£700.00

6. Environmental Impact Assessment (EiA) Statement

Does this application relate to a development that is the subject of an EIA application under the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017(1)?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
--	---------------------------------	---

7. Compliance with Statutory National Standards for Sustainable Drainage Systems (SuDS)

All sustainable drainage systems **MUST** comply with the [Statutory National Standards for Sustainable Drainage Systems \(SuDS\) for Wales](#). You are advised to refer to the detailed text in the Standards that relate to the information required below. The Standards are re-produced, in the [Guidance](#) to assist in completing this application form.

Standard Principles

The Principles listed below will underpin the design of surface water management schemes to meet the Statutory National Standards. Please provide a brief summary in each of the boxes below relating to each of the bulleted Standard Principles and itemised Standards 1 to 6, showing how your proposed drainage scheme complies with this statutory requirement.

Compliance with Standard Principles
My proposed surface water drainage scheme will comply in the following way/s:
The water will be cleansed using filtration strips bioremediation basin and a swale.

The water will be disposed into the existing drainage infrastructure of Morriston Hospital at an attenuated rate of 4l/s
Refer to the drainage strategy document for more details:
6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

- 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M
- C6986-RVW-XX-XX-RP-C-FCA01_P01 - FCA Report
- B030182_MorristonInfrastructure_DTS_GIR Rpt_DRAFT ISSUE 06-09-21.
- MHP2-RVW-S6-00-DR-C-000001 SAB Application External Arrangements
- MHP2-RVW-S6-00-DR-C-000003 SAB Application Drainage Details
- MHP2-RVW-S6-00-DR-C-000010 SAB Application Location Plan
- MHP2-RVW-S6-00-DR-C-000020 Proposed Overall Drainage Site Plan
- MHP2-RVW-S6-00-DR-C-000021 Drainage Detail Sections - Sheet 1 of 3
- MHP2-RVW-S6-00-DR-C-000022 Drainage Detail Sections - Sheet 2 of 3
- MHP2-RVW-S6-00-DR-C-000023 Drainage Detail Sections - Sheet 3 of 3
- MHP2-RVW-S6-00-DR-C-000024 Site Overflow Plan
- MHP2-RVW-S6-00-DR-C-000025 Drainage Areas
- MHP2-RVW-S6-00-DR-C-000030 Longitudinal Sections
- MHP2-RVW-S6-00-DR-C-000101 External Works Layout and Details
- MHP2-RVW-S6-00-DR-C-000200 Drainage & SuDS Asset Management and Maintenance

Standards 1 to 6

Compliance with Standard S1 - Surface water runoff destination
My proposed surface water drainage scheme will comply in the following way/s:
Surface water will discharge to the Morriston Hospital network Refer to 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M for more details and justification.
Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in Table A and Table B of this Guidance MUST be listed below, and all relevant material submitted.
1. 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M

Compliance with Standard S2 - Surface water runoff hydraulic control

My proposed surface water drainage scheme will comply in the following way/s:

The Hydraulic control utilises temporary storage , attenuation and flow control devices

Refer to 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M for more details and justification.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M
- 2.
3. Etc.

Compliance with Standard S3 – Water Quality

My proposed surface water drainage scheme will comply in the following way/s:

The water Quality will be improved by filtrarion using filer strips bioremediation basin and a swale

Refer to 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M for more details and justification.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M
2. Etc.

Compliance with Standard S4 – Amenity

My proposed surface water drainage scheme will comply in the following way/s:

The Substation will not ordinarily be accessible by the public.

The substation will be inspected and maintained for safe operation by technical staff

The Bioremediation basin and Swale will provide amenity

The safe uninterrupted operation of Morryston Hospital will proved amenity.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. MHP2-RVW-S6-00-DR-C-000020 Proposed Overall Drainage Site Plan
2. Etc.

Compliance with Standard S5 – Biodiversity

My proposed surface water drainage scheme will comply in the following way/s:

Biodiversity will be provided by the Bioremediation basin and Swale.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. MHP2-RVW-S6-00-DR-C-000020 Proposed Overall Drainage Site Plan
- 2.
3. Etc.

Compliance with Standard S6 – Design of drainage for Construction and Maintenance and Structural Integrity

My proposed surface water drainage scheme will comply in the following way/s:

There is a full maintenance strategy with planned inspection and maintenance
Refer to 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M for more details and justification.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Strategy and O and M
- 2.
3. Etc.

8. Assessment of Flood Risk

Is the site within an area at risk of flooding? Refer to Natural Resources Wales Development Advice maps. (Natural Resources Wales / Development and flood risk)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If the proposed development is within the area at risk of flooding, you will need to consider whether it is appropriate to submit a flood consequences assessment. (Refer to Technical Advice Note 15 (TAN15)).		

Is the site located within an area susceptible to surface water flooding? Refer to NRW Surface Water Flood Maps .	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Is the site located within an area susceptible to groundwater flooding?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Is there a watercourse (as defined under Section 72 Land Drainage Act 1991) located within 20m of the proposed development?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

9. Surface Water Discharge Hierarchy

Surface water drainage arrangements shall demonstrate the proposed surface water drainage complies with National SuDS Standards. As much of the runoff as possible should be discharged to each hierarchy element before a lower hierarchy element is considered. Collection and infiltration methods of drainage are required to be considered in the first instance. With reference to the hierarchy levels below, please indicate your proposed drainage arrangements.

Level	Yes	No
1. Collect for use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Infiltration	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. To watercourse	<input type="checkbox"/>	<input checked="" type="checkbox"/>
a. Is it an Ordinary Watercourse?	<input type="checkbox"/>	<input type="checkbox"/>

b. Is it a Main River?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. To surface water sewer	<input checked="" type="checkbox"/>	<input type="checkbox"/>
a. Is it a Highway drain?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Is it a public sewer?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Is it a private sewer?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Other	<input type="checkbox"/>	<input type="checkbox"/>
5. To combined sewer	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Has advice been sought from the asset owners?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Has advice been sought from the land owners?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

10. Infiltration Assessment

Where infiltration drainage is proposed, testing should be carried out to a methodology agreed with the SAB e.g. [Infiltration Drainage - Manual of Good Practice \(CIRIA R156\)](#) and [BRE Soakaway Design \(DG 365 – 2016\)](#), and be used to inform the design, construction, maintenance, testing and assessment of infiltration systems.

Has infiltration testing been carried out?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Analysis of development Geology (including both bedrock and superficial deposits where known)		
Depth to groundwater (metres)	1.7 metres	

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Borehole testing	Reference	TP01 TP02		
	Date	17	07	2021
Has a Contaminated Land Assessment been undertaken?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Is the infiltration drainage proposed on contaminated land?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
Infiltration test result		ZERO X 10 ⁻²		

11. Non-performance Bond, Adoption, Operation & Maintenance

What are your proposals regarding cost of works, adoption and maintenance of the SuDS scheme?

Non-performance Bond – Estimated cost of work	Kier Construction are contracted to Swansea Bay University Hospital who would be liable for the Bond
Adoption (including land agreements etc)	None
Funded Maintenance Plan for the lifetime of the development	Swansea Bay University Hospital are aware of the maintenance required and will allocate appropriate funding for maintenance

12. SuDS Scheme Application Checklist

Please complete the following checklist and make sure you have read the Guidance on Making SuDS Applications for SAB Approval , the Guidance on completing the Full Application Form , and provided all the necessary information in support of your application:	
Correct Full Application fee.	Yes <input checked="" type="checkbox"/>
Completed, signed and dated Full Application form.	Yes <input checked="" type="checkbox"/>

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Plan/s specifying the construction area and the extent of the drainage system for which approval is sought. All plan/s shall be at a scale of 1:2500 and MUST show the direction of North.	Yes <input checked="" type="checkbox"/>
Taken account of SAB Guidance on technical information to be submitted to enable SAB to assess your Full Application.	Yes <input checked="" type="checkbox"/>

13. Declaration

- ze.

I/ we hereby apply for SuDS Approval as described in this form and the accompanying plans/drawings and additional information. I confirm that I have read and complied with the National SuDS Standards and, to the best of my knowledge, any facts stated are true and accurate and any opinions given are the genuine opinions of the persons giving them.

This form has been completed using evidence from the Flood Consequences Assessment where applicable, surface water drainage strategy and site plans and associated documents.

This form has been completed using accurate information. It can be used as a summary of the detailed surface water drainage proposals on this site, and clearly shows that these drainage proposals conform to the National SuDS Standards for Wales.

Form completed by	Barney Procter
Signature	
Qualification of person responsible for signing off this application	Chartered Civil Engineer Meng, CEng, MICE
Company	RVW Consulting Limited
On behalf of (Client's details)	Swansea Bay University Health Board
Date	24/12/2021

Disclaimer

Information provided on this form and in supporting documents may be published on the SABs SuDS register and website and be made publicly available.



Morrison Hospital New Substation

Drainage Strategy

&

Operation and Maintenance Plan

6986-RVW-XX-ZZ-RP-C-00001

Project Information

RVW PROJECT NUMBER	C6986
DOCUMENT REF.	6986-RVW-XX-ZZ-RP-C-00001
DOCUMENT TITLE	Drainage Strategy & Operation and Maintenance
AUTHOR	Olga Pavlidou – Associate Engineer
APPROVER	Barney Procter – Director
DATE	23 rd December 2021
STATUS	Final

Document History

REVISION	Date	Revision Notes
P01	23.12.21	First Issue

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1.0 INTRODUCTION

RVW Consulting Ltd. Have been commissioned to produce a design and drainage strategy for the new substation at Morryston Hospital.

This document aims to establish constraints, design requirements and appropriate principles for the safe conveyance and discharge of surface water from the substation. The report provides details and calculations for the overall drainage strategy, Operation and Maintenance.

The report will also look to identify possible sources of flooding, if any, and proposals for mitigation. However, the report is not intended to be read as a Flood Consequence Assessment.

From January 2019, all new permanent and temporary developments in Wales with a construction area of 100m² or more must have an approved sustainable drainage system (SuDS) to manage on-site surface water.

Surface water drainage systems must be designed and built following mandatory standards published by Welsh Government and must be approved by the council's Sustainable Drainage Approving Body (SAB) before work starts.

This report details how the proposed drainage scheme aims to comply with the Statutory Standards for Sustainable drainage and will be used as evidence within the SAB application.

2.0 EXISTING SITE INFORMATION

2.1 Site Location

The site is located at Heol Maes Eglwys, Morryston, Cwmrhydyceirw, Swansea SA6 6NL.

The grid co-ordinates are shown in Table 1. The site location is illustrated in Figures 1 below and occupies a plan area of approximately 0.455 Hectares of which the permanent area is 0.186Ha and the impermeable area is 0.143Ha and the temporary area during construction is 0.269Ha. Drawings showing scheme proposals are included within **Appendix A**.

Table 1: Site Location

Address	Morryston Substation SA6 6NL
Easting, Northing	-3.213112, 51.499115



Figure 1 – Site Location – Map not to Scale

2.2 Site Topography

Topographic survey has been undertaken by Alpine Land Surveyors Ltd. on 26/08/2021. The area of land is approximately flat and bounded by the Mynydd Gelli Wastad Road to the South West and open countryside to the East North and West. The site is near the top of the ridge and surface water would naturally flow from this area.

The proposed site is located at the top of a hill and is generally level, with an average ground level of 105.5m of AOD. The site possesses existing ground levels ranging from circa 106.5m to 105.3m AOD.

The proposed FFL of the substation building will be set at 106.50m AOD. This will ensure that the building will remain flood free for the lifetime of the development (up to the year 2121).

2.3 Existing Site use

The site is covered with grass and rough vegetation and used for grazing.

2.4 Geology

A ground investigation was issued in September 2021 and undertaken by Tetra Tech Limited.

BGS data does not indicate the presence of Made Ground on site.

Superficial deposits of Hummocky Glacial Deposits underlain by Devensian Till (diamicton) of are recorded across the site. The Hummocky Glacial till consists of poorly sorted sand, gravel and silty clay. The Devensian Till, comprises sandy clay with pebble to boulder sized clasts.

The bedrock geology for the site is shown on published mapping to comprise the Swansea Member Sandston, which consists of green-grey, lithic arenites ("Pennant sandstones") with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.

The superficial Devensian Till is designated as a Secondary Undifferentiated Aquifer. This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the aquifer.

The Hummocky Glacial Deposits and Swansea Member Sandstones are designated as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The site approximately 600m south of the Llan River catchment, with a smaller tributary of the Llan located approximately 200m northeast of the site.

Full details of infiltration testing, report referenced "B030182", executive summary can be found in **Appendix B**.

2.5 Site Permeability

Given the poor permeability of the natural soils as demonstrated by the soakaway undertaken in TP02 underlying the site entrance, it is anticipated that soakaway drainage or other infiltration features may not be feasible.

Full details of Geo-environmental Assessment and Ground Investigation Report, referenced "B030182", executive summary can be found in **Appendix B**.

2.6 Existing Land Use & Contributing Areas

The site is a yard and covered with grass and rough vegetation.

3.0 FLOOD RISK

Full details of Flood Consequence Assessment, referenced C6986-RVW-XX-XX-RP-C-FCA01, issued separately.

3.1 Develop Advice Map

Flood Risk Map - Sea: Very Low. Very Low risk means that each year, there is a chance of flooding of less than 1 in 1000 (0.1%).

Flood Risk Map – Rivers: Very Low. Very Low risk means that each year, there is a chance of flooding of less than 1 in 1000 (0.1%).

Flood Risk Map: Surface Water & Small Watercourses – Low. Low means that each year, this area has a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).

Map 4: Development Advice Map: Zone A. Zone A is considered to be a little or no risk of fluvial or tidal/coastal flooding.

3.2 Conclusion

The size and nature of the proposed development can be categorised as "highly vulnerable development" in accordance with TAN 15.

The Client has been advised of the very limited potential for flooding in this area and is aware of the residual risk.

In summary, based upon the published guidelines and relevant provisions

4.0 DRAINAGE STRATEGY

4.1 Drainage proposal

Temporary Compound and Site Accommodation

The site compound and lay down areas will have a gravelled permeable surface. The site compound access road and parking areas will have permeable asphalt. These areas are intended to behave in a similar fashion as the current site. In fact the gravel should allow more storage capacity than the current grassed top soil and thereby have a reducing effect on the risk of site run off.

The site accommodation roof areas are impermeable and will be discharged into a infiltration trench.

The infiltration trench will sit directly below the gravel paths serving the accommodation.

The infiltration trench will be unlined to maximise the opportunity for infiltration. However, in the event of low infiltration rates the trench has been sized to accommodate a 10 year return storm event.

Refer to Proposed site layout and Infiltration trench details.

Upon completion of the works the site will be returned to its current usage.

Permanent Works – Substation and Hardstanding

The infiltration on the site is poor. Therefore, it has been agreed that the impermeable areas can be connected to the Morrision hospital drainage network. It has been agreed that the site flow should be attenuated to 4l/s

The attenuation devices are a basin with 70m³ storage together with a flow control limited 2l/s and a Swale plus storm tank 5,5m³ and flow control limited to 2l/s. The basin and swale will remove sediment before entering the Morrision hospital network.

Please refer to the following drawings:

4.2 Surface Water Design Principles & Standards

• **Standard S1 is a Hierarchy Standard**

The Hierarchy Standard gives criteria for prioritising the choice of runoff destination

• **S2 to S6 are Fixed Standards**

Fixed Standards (Standards S2 to 6) give design Standards which state the minimum design criteria that all SuDS should satisfy; and standards which state how SuDS should be built, maintained, and operated.

A full SAB application is to be produced and submitted for approval. This drainage report is intended to support the application. The report summarises the proposals and means of compliance with the Statutory Standards and to clarify the drainage design ethos for the proposed development.

All standards will be further evaluated and detailed within the SAB Application, with reference made to this document and supporting information.

The proposed surface water drainage design will mitigate any negative impact of surface water runoff from the development on flood risk outside of the development boundary. It will also ensure that flooding does not

occur on any part of the site for a 1 in 30 year rainfall event, or in any part of a building for a 1 in 100 year rainfall event with an additional 30% allowance for climate change.

The overall drainage layout is shown on Drawing 6882-RVW-ZZ-ZZ-DR-C-0200, included in **Appendix D**

4.2.1 Standard S1 – Surface water Runoff Destination

Table S1 - Surface water Runoff Destination

<i>Priority Level 1: Surface water runoff is collected for use.</i>	Consideration has been given to the utilisation of rainwater harvesting. However, as the substation does not provide welfare facilities there is no requirement for water usage
<i>Priority Level 2: Surface water runoff is infiltrated to ground.</i>	<p>Temporary (Site Compound) This approach has been adopted for the contractors compound. Permeable surfaces have been used as far as possible to replicate natural greenfield runoff found at this site location. The impermeable are of the site accommodation roofs have been directed towards and infiltration trench with sufficient storage capacity for a 10-year storm event.</p> <p>Permanent The permanent works require impermeable surfaces and there is limited filtration on the site. Therefore this PL2 is not suitable</p>
<i>Priority Level 3: Surface water runoff is discharged to a surface water body.</i>	There is not a suitable surface water body accessible form this site.
<i>Priority Level 4: Surface water runoff is discharged to a surface water sewer; highway drain or another drainage system.</i>	<p>Permanent It has been agreed with the estates team for Morrision Hospital that this water can be connected to their asset. It has been agreed to limit the flows to 4l/s. In terms of the Hospital estate this additional flow was deemed to negligible, and that the existing system had the capacity to accommodate it.</p>
<i>Priority Level 5: Surface water runoff is discharged to a combined sewer.</i>	See Priority Level 4 above

4.2.2 Standard S2 – Surface water Runoff Hydraulic Control

Table S2 – Hydraulic Control compliance assessment

<i>Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5mm.</i>	<p>Temporary (Site Compound) The surface water has been designed to replicate the existing site conditions as far as possible by using permeable finishes. The accommodation roof surface water has been directed towards an infiltration trench. All surface water will be contained within the site bounds.</p> <p>Permanent The surface water from the substation and access roads is collected and passes through a filtration trench, a temporary storage basin and a swale each one of these components has the capacity to contain the first 5mm of rainfall.</p>
--	--

The surface water runoff rate for the 1 in 1 year return period event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.

Temporary (Site Compound)

The temporary contractor's compound has been designed to accommodate these flows through infiltration and will satisfy this requirement

Permanent

The substation and access road collect the surface water which passes through a filtration trench basin and swale. These structures control and to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies by cleansing the water and slowing the flows down from the site

The surface water runoff (rate and volume) for the 1% (1 in 100 year) return period event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.

Temporary (Site Compound)

This is a temporary site compound and the surface water drainage has been designed for a 10-year return period, which is suitable for the temporary nature of this structure. The infiltration emulates the greenfield run off for the site.

Permanent

The permanent drainage system provides enough attenuated storage on site to accommodate a 100 year + 30% climate change storm.

The surface water runoff for events up to the 1% (1 in 100 year) return period (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.

Temporary (Site Compound)

This is a temporary site compound and the surface water drainage has been designed for a 10-year return period, the level is below the proposed substation and excess flooding would be directed towards the surrounding fields away from properties which is the natural flood response for the site.

Permanent

The permanent drainage system provides enough attenuated storage on site to accommodate a 100 year + 30% climate change storm. The substation level is set above the surrounding area therefore it would be protected from flood.

The risks (both on site and off site) associated with the surface water runoff for events greater than the 1% (1 in 100 year) return period should be considered. Where the consequences are excessive in terms of social disruption, damage, or risk to life, mitigating proposals should be developed to reduce these impacts.

Temporary (Site Compound)

This site would not increase risk in terms of social disruption, damage, or risk to life. excess flooding would be directed towards the surrounding fields away from properties which is the natural flood response for the site.

Permanent

The permanent drainage system provides enough attenuated storage on site to accommodate a 100 year + 30% climate change storm. The substation level is set above the surrounding area therefore it would be protected from flood. Exceedance flows would be away from the properties and onto the adjacent fields

Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.

In the case of the failure of drainage system the exceedance flows would be away from the properties and onto the adjacent fields

4.2.3 Standard S3 – Water Quality

Standard S3 addresses the drainage design requirements to minimise the potential pollution risk posed by the surface water runoff to the receiving water body.

Table S3 - Surface Water Quality compliance assessment

Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Water from the site should be generally clean. Small elements of contamination would be filtered and bioremediated within the infiltration areas of the infiltration blankets in the temporary compound, infiltration trenches, bioremediation basin and swale of the permanent works would remove sediment and contaminants.

Areas where larger contamination risks exist would be banded and disposed from the site as a controlled waste by licensed contractors.

Land Use	Pollution Hazard Level	Requirements for discharge to surface waters, including coasts and estuaries	Requirements for discharge to groundwater
Residential roofs	Very Low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (e.g. cul-de-sacs, homezones, general access roads), non-residential car parking with infrequent change (e.g. schools, offices)	Low	Simple Index Approach ⁽¹⁾ Note: Additional measures may be required for discharges to protected resources ⁽²⁾	
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple Index Approach ⁽¹⁾ Note: Additional measures may be required for discharges to protected resources ⁽²⁾	Simple Index Approach ⁽¹⁾ Note: Additional measures may be required for discharges to protected resources ⁽²⁾ Risk Screening ⁽³⁾ must be undertaken first to determine whether consultation with Natural Resources Wales is required.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HD45/09 (Highways Agency, 2014)	
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, manufactured, stored, or used, industrial sites	High	Discharges may require an environmental licence or permit. Secure pre-permitting advice first from Natural Resources Wales. Risk assessment is likely to be required. ⁽⁴⁾	

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (commercial/industrial)	Low	0.3	0.2 ⁽¹⁾	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change (e.g. 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 (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways ⁽³⁾	Medium	0.7	0.6	0.7

Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites, sites where chemicals and fuels are to be delivered, handled, stored, used or manufactured, industrial sites, trunk roads and motorways ⁽³⁾)	High	0.8 ⁽²⁾	0.8 ⁽²⁾	0.9 ⁽²⁾
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- (1) Up to 0.8 where there is potential for metals to leach from the roof.
- (2) These should only be used as part of a detailed risk assessment
- (3) Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009)

Table 6 - Pollution hazard for different land use classifications – Reproduced from Table 26.2 CIRIA C753

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index, for each contaminant type, that equals or exceeds the pollution hazard index, (for each contaminant type).

Where the only destination of the runoff is to a surface water – that there is no infiltration from the SuDS to groundwater, the surface water indices should be used, as suggested in CIRIA C753 Table 26.3, reproduced at Table 7.

Where the principal destination off the runoff is to groundwater, but discharges to surface waters may occur once infiltration capacity has been exceeded the groundwater indices should be used, as suggested in CIRIA C753 Table 26.3, reproduced at Table 8.

Type of SuDS component	Mitigation indices ⁽¹⁾		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	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	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1in1yr return period event, for inflow concentrations relevant to the contributing drainage area		

(1) SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the CIRIA C753 technical component chapters

Table 7 – Indicative SuDS mitigation indices for discharges to Surface waters – Reproduced from Table 26.3 CIRIA C753

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	Mitigation indices		
	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant potential of at least 300mm in depth ²	0.6 ³	0.4	0.5
A soil with good contaminant attenuation potential of at least 300mm in depth ²	0.4 ³	0.4	0.4

Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e. graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm depth ²	0.4 ³	0.4	0.4
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Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by soil with good attenuation potential of at least 300mm depth ²	0.7	0.6	0.7
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Bioretention underlain by a soil with good contaminant attenuation potential of at least 300m depth ²	0.8 ³	0.8	0.8
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Proprietary treatment systems ⁴	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		
<ul style="list-style-type: none"> (1) All designs must include a minimum of 1m unsaturated depth of aquifer material beneath the infiltration surface and the maximum likely groundwater level (2) Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater (see note 1) (3) If significant volumes of sediment are allowed to enter the infiltration system, there will be a high risk of rapid clogging and system failure. (4) Proprietary treatment systems are only appropriate in exceptional circumstances where other types of SuDS components are not practicable. 			

Table 8 – Indicative SuDS mitigation indices for discharges to Groundwater – Reproduced from Table 26.4 CIRIA C753

Table 8, above, considers the mitigation of pollution where the principal destination of runoff is to groundwater but discharges to surface waters may occur once infiltration capacity has been exceeded.

The proposed drainage does not discharge to surface water offsite, but the mitigation within Table 8 has been followed to look to improve the quality of water discharging to Groundwater only

The following sections and table describes the drainage considering land use type, hazard index levels and an assessment of appropriate mitigation.

Site Hazzard Assessment

Based on the above table the surface water pollution hazard would generally be low or very low.

Areas where potential pollutants are stored will be bunded and spillages removed from site

Runoff area land use description	Pollution Hazard level	TSS	Metals	Hydrocarbons
Roof	Low	0.3	0.2	0.05
Access roads	Medium	0.7	0.6	0.7
Site compound	Medium	0.7	0.6	0.7
Hazardous material storage,	High	0.8	0.8	0.9

Pollution Mitigation Table

Runoff area land use description	SuDS Component Description	TSS	Metals	Hydrocarbons
Roof	Infiltration trench	0.4	0.4	0.4
Access Road	Infiltration trench	0.4	0.4	0.4
	Basin/ Swale	0.7	0.6	0.7
Commercial Yard	Permeable construction	0.7	0.6	0.7
Hazardous material storage	Bunded area Material controlled and removed from site by licensed operator	n/a	n/a	n/a

The pollution mitigation index exceeds or meets the pollution hazard index, it is therefore deemed compliant.

4.2.4 Standard S4 – Amenity

10.5

Table S4 – Amenity compliance assessment

<i>The design of the surface water management system should maximise amenity benefits.</i>	<p>The facility is critical infrastructure to the continued safe and uninterrupted operation of Morriston Hospital. This in itself offers great amenity value.</p> <p>The site does not have access to general public and will only be accessed by technicians for safety and operational checks and maintenance of the facility. Therefore, low maintenance has been a key driver in the development of the design. However, the bioremediation basin and swale will provide some amenity on the site.</p>
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4.2.5 Standard S5 – Biodiversity

Standard S5 addresses the design of SuDS to ensure, where possible, they create ecologically rich green and blue corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together. Biodiversity should be considered at the early design stage of a development to ensure the potential benefits are maximised.

Table S5 – Biodiversity compliance assessment

<i>The design of the surface water management system should maximise biodiversity benefits.</i>	<p>The site currently offers a restricted biodiversity as it has been set aside for grazing. The proposed scheme will provide a basin and swale where local species will be encouraged to grow. This will benefit the bioremediation of the surface water contaminants and sediment capture but also provide biodiversity for insects and birds.</p>
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4.2.6 Standard S6 – Design for Construction, Operation and Maintenance & structural Integrity

Standard S6 deals with designing robust surface water drainage systems so they can be easily and safely constructed, maintained and operated, taking account of the need to minimise negative impacts on the environment and natural resources.

Table S6 – Construction, Operation, Maintenance & Structural Integrity assessment

<p>All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).</p>	<p>See Section 5 below for details</p> <p>Temporary (Site Compound) Simple infiltration techniques have been used.</p> <p>The gravel areas should be inspected and maintained on a monthly basis as required. It is anticipated that localised redressing of the stone may be required depending of usage.</p> <p>The infiltration trench should be inspected and maintained as necessary on a 6 monthly basis. Removing debris and ensuring no local wash out of stone.</p> <p>Permanent The infiltration trench, basin, swale, and attenuation tank are all low maintenance devices.</p> <p>The infiltration trench has an upper 150mm layer which acts as a primary collector for sediment. This layer should be kept free from debris and leaves and vegetation on a six-monthly basis. If the infiltration trench stops performing as designed the top cleansing layer should be cleaned or replaced.</p> <p>The basin should be</p>
<p>All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).</p>	<p>See Section 5 below for details</p> <p>All drainage elements are accessible for future maintenance and operation. The contractor has reviewed the drainage scheme and has agreed to maintain the system as required through the lifespan of the project.</p>
<p>The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.</p>	<p>See Section 5 below for details</p> <p>All elements are designed to current codes of practice, British Standards, Building Regulations and Sewers for Adoption 7th Edition where appropriate.</p> <p>The drainage elements have been designed to provide a resilient scheme, having a minimum design life exceeding the anticipated duration of the project.</p> <p>All elements are designed with appropriate factors of safety, in accordance with current design guidance and industry best practices, taking account of anticipated loadings and locations.</p>

5.0 SUDS & DRAINAGE OPERATION & MAINTENANCE

Most of the maintenance required to ensure optimum performance and continued operation of the SuDS and drainage components will be covered by the site's normal overall space and landscape maintenance strategy and schedules. If the additional maintenance activities shown in the following chapters are incorporated into the general maintenance plans, then there should only be some additional costs associated where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape.

During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning, but in practice this may be difficult or impractical to arrange. Typical routine inspections will indicate when occasional or remedial maintenance activities are required, and/or when water quality requires investigation.

There are three categories of maintenance activities referred to in this report, in accordance with CIRIA Report C753 The SuDS Manual (available for free download at www.ciria.org);

Regular maintenance (including inspections and monitoring).

Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal and inspections.

Occasional maintenance

Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (silt /sediment removal is an example).

Remedial actions

Comprises tasks that may be required to rectify faults associated with the system.

Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

General maintenance requirements & recommendations

Avoid use of weedkillers and pesticides to prevent chemical pollution where possible.

Avoid de-icing agents wherever possible to allow bioremediation of pollutants in permeable surfaces.

Protect all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

Regular Maintenance & Inspections –

Regular SuDS Scheme inspections will:

- o Help to determine future maintenance requirements and frequency
- o Confirm water quality, amenity and hydraulic performance objectives are being met
- o Identify areas of performance or system failures.

Occasional Maintenance –

Occasional maintenance of SuDS Scheme inspections will:

- o Ensure optimum performance of SuDS components
- o Identify areas of filtration, or infiltration surfaces where vegetation growth is poor and likely to cause a reduced level of system performance and rectify.

5.1 Surface water drainage & SuDS component information

The following paragraphs describe the types of SuDS components and drainage features which are found on site and their intended purpose. Reference is made to the component maintenance schedule which lists the management and maintenance task frequency to ensure optimum performance of the systems. Maintenance and inspection checklists are provided within **Appendix F**.

- **Infiltration Trench** – Allows conveyance, filtration, and cleansing of surface water runoff as the water passes over its surface and then water is passes below for infiltration to the surrounding ground. Stone /gravel sits within a trench wrapped in a geotextile beneath the surface. - (*Maintenance Schedule 01*).
- **Access structures** - Manholes, Inspection chambers, rodding eyes etc. are used at heads of drainage runs, changes in direction and level or to provide points of access to the gravity drainage system for cleaning and maintenance - (*Maintenance Schedule 02*).
- **Inlet Structures** – Rainwater down pipes, hoppers, gullies, channel drains – Incorporated to direct surface water run off to SuDS features, silt traps & sumps within the inlets are provided as first stage sediment /silt removal – (*Maintenance Schedule 03*).
- **Cellular Soakaways** – Provided to store surface and allow water to infiltrate to the surrounding ground, during prolonged or intense storm events the tanks fill and allow water to be discharged in a controlled manner – (*Maintenance Schedule 04*).
- **Detention Basin/ Swale** – Allows conveyance, filtration, and cleansing of surface water runoff as the water passes across the basin base and sides to the surrounding ground. Stone erosion inlets are provided at headwall inlets to prevent erosion and trap sediment. Some water will be passed through the basins and onto the adjacent cellular soakaway for further conveyance to ground - (*Maintenance Schedule 05*).
- **Below ground gravity drainage** – Gravity drains, pipes & gully connections – Provided to direct surface water runoff to intended point of discharge - (*Maintenance Schedule 06*).

5.2 Scheme Checklist maintenance schedules

The following pages include maintenance and management schedules which detail maintenance requirements, maintenance frequency intervals and remedial actions.

As the SuDS components are designed to capture and retain, silt, sediments, and pollutants at source there is a requirement to clear and dispose of this sediment in accordance with current environmental permitting regulations, see section 4 for further details.

	Infiltration Basin	Cellular Soakaway	Catchpit /Silt Traps	Swale & Basin	Access Structures	Inlet Structures	Gravity Drainage
Inspection	■	■	■	■	■	■	■
Litter/debris removal	■	□	□	■	□	□	□
Grass cutting	■	□					
Weed /invasive plant control	□			■			
Shrub management				■			
Sediment management (*)	■	■	■	■	■	■	■
Vegetation /plant replacement		□		□			
Vacuum sweeping & brushing							
Structure rehabilitation /repair	□	□	□	□	□	□	□
Infiltration surface reconditioning		□		□			

■ Will be required

□ May be required

* - Sediment should be collected and managed in pre-treatment systems

5.2.1 Infiltration Trench

Surface water run off is conveyed from the roof to the trench. The surface water is distributed across the surface of the trench and flows pass through the surface into the infiltration trench and directed into the surrounding ground. During extreme events, some water may be stored and sit within the trench, this is intentional and will eventually pass to the basin.

The trenches are wrapped in a geotextile to prevent the ingress of the surrounding soil,

MAINTENANCE SCHEDULE 01 – INFILTRATION TRENCH		
Maintenance Schedule	Regular Maintenance	Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from surfaces	Monthly (or as required)
	Inspect trench surface for standing water and structural damage	Monthly (or as required)
	Inspect pre-treatment systems (filter strips), for silt accumulation and establish appropriate silt removal frequencies	6 monthly
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain	As required
	Remove upper geotextile and replace, replace overlying filter medium, 100mm depth	As required, based on performance
	Clear perforated pipework of blockages to ensure optimum performance	As required

5.2.2 Access structures – Manholes, Inspection Chambers & Rodding eyes

Access structures such as manholes, inspection chambers and rodding eyes are provided as part of the below ground gravity drainage system. These structures are provided for access and maintenance purposes and should be routinely inspected.

MAINTENANCE SCHEDULE 02 – ACCESS STRUCTURES		
Maintenance Schedule	Regular Maintenance	Frequency
Regular /Occasional Maintenance	Remove chamber covers and inspect, ensuring that water is flowing freely and that channels are free from obstruction.	6 monthly, then annually or based upon inspection
	Inspect and identify any areas not operating correctly and clear out any debris from chambers	6 monthly, then annually or as required.
Remedial Actions	Repair physical damage if required	As required, based upon inspections
Monitoring	Inspect all chambers and access points.	Annually

5.2.3 Inlet structures – Rainwater down-pipes, gullies, channel drains and hoppers

Inlet structures such as rainwater downpipes, gullies, channel drains etc. some are provided with sump units or silt traps. These are the first stage of pollution prevention and sediment retention and as such should form part of the routine maintenance and inspection regime. Refer to drawings for locations.

MAINTENANCE SCHEDULE 03 – INLET STRUCTURES		
Maintenance Schedule	Regular Maintenance	Frequency
Regular /Occasional Maintenance	Inspect rainwater downpipes, gullies, channel drains and hoppers to ensure that they are free from debris and that outlets are free from obstruction.	Monthly
	Remove covers and inspect, ensuring water is flowing freely and remove silt /sediment build up where required	6 monthly, then annually or as required.
Remedial Actions	Repair physical damage if required.	As required, based upon inspections
Monitoring	Inspect all inlets and record problem areas.	Annually

5.2.4 Cellular Crate Soakaways

There is one Cellular attenuation tank beneath the Swale, there are gully inlets within the surface of the basin that act as inspection access and water inlets, these must be kept free of debris and vegetation at all times

See appendices for locations and details. Heavy loads should be restricted from areas above the attenuation tanks above the permitted loading capabilities of the installed systems, information on loading can be found within the data sheets appended to this report.

Periodic inspection and maintenance are required to ensure effective long-term operation and storage capabilities of the soakaway tanks. An access chamber is provided which allows inspection to be undertaken, and for sediment removal purposes. Sediment, debris and silt ingress need to be prevented from entering the system which could reduce the effectiveness of the system.

MAINTENANCE SCHEDULE 04 - CELLULAR SOAKAWAYS		
Maintenance Schedule	Regular Maintenance	Frequency
Regular Maintenance	Inspect for sediment and debris in pre-treatment components (silt-traps), and floor of cellular soakaway	Annually
	Cleaning of gutters and any filters on downpipes	Annually, or as required based on inspections
	Trimming any roots that may be causing blockages	As required
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of soakaway	As required based on inspections

Remedial Actions	Reconstruct soakaway and/or replace or clean void if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

5.2.5 Detention Basin/ Swale

The Detention basins and Swales allow water to flow over the surface and infiltrate to ground. Any pollutant, sediment or floatable debris will be retained at surface level which will require periodic cleaning.

As there is poor infiltration at the site the basin and swale are connected to the drainage network using flow control devices and will act as attenuation storage in significant storm events.

The useful life and effective operation of an infiltration component is related to frequency of maintenance and the risk of sediment being introduced into the system. Forebays are provided at the inlet which will aid the capture and subsequent removal of the pollutants. Further maintenance operations are noted in schedule 04.

MAINTENANCE SCHEDULE 05 – DETENTION BASIN/ SWALE		
Maintenance Schedule	Regular Maintenance	Frequency
Regular Maintenance	Remove litter, debris & trash	Monthly
	Cut grass – for landscaped areas & landscape routes	Monthly (during growing season) or as required
	Cut grass – meadow grass around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional Maintenance	Reseed /Replant areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment systems when 50% full	As required
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign /reseat rip-rap /erosion control	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surface and reinstate design levels	As required
Monitoring	Inspect inlets, outlets, and overflows for blockages and clear if required	Monthly
	Inspect bankside, structures, pipework etc. for evidence of damage	Monthly

	Inspect inlets pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

5.2.6 Silt Traps /Catchpits

The catch-pits /sump units are placed upstream of the soakaway tank, and at outlets from the raingardens. They are provided to enable access and control sediment /silt ingress into the SuDS systems and gravity drainage network, it is important to inspect and clean the silt traps at regular intervals to ensure that they can continue to operate as intended.

MAINTENANCE SCHEDULE 06 – CATCH PITS /SUMP UNITS		
Maintenance Schedule	Regular Maintenance	Frequency
Regular /Occasional Maintenance	Remove sediment from catch-pits.	Monthly for 3 months, then annually
	Remove debris from catchment surface (where it may cause risk to performance).	Monthly
Remedial Actions	Replace sump unit if failure occurs	As required, based upon inspections
	Repair physical damage if required	As required
Monitoring	Inspect all inlets, outlets, overflows and vents to ensure that they are in good condition and operating as designed.	Annually

5.3 Collection and Disposal of silt, sediment and pollutants

As the SuDS components are designed to capture and retain, silt, sediments and pollutants at source there is a requirement to clear and dispose of this sediment in accordance with current environmental permitting regulations.

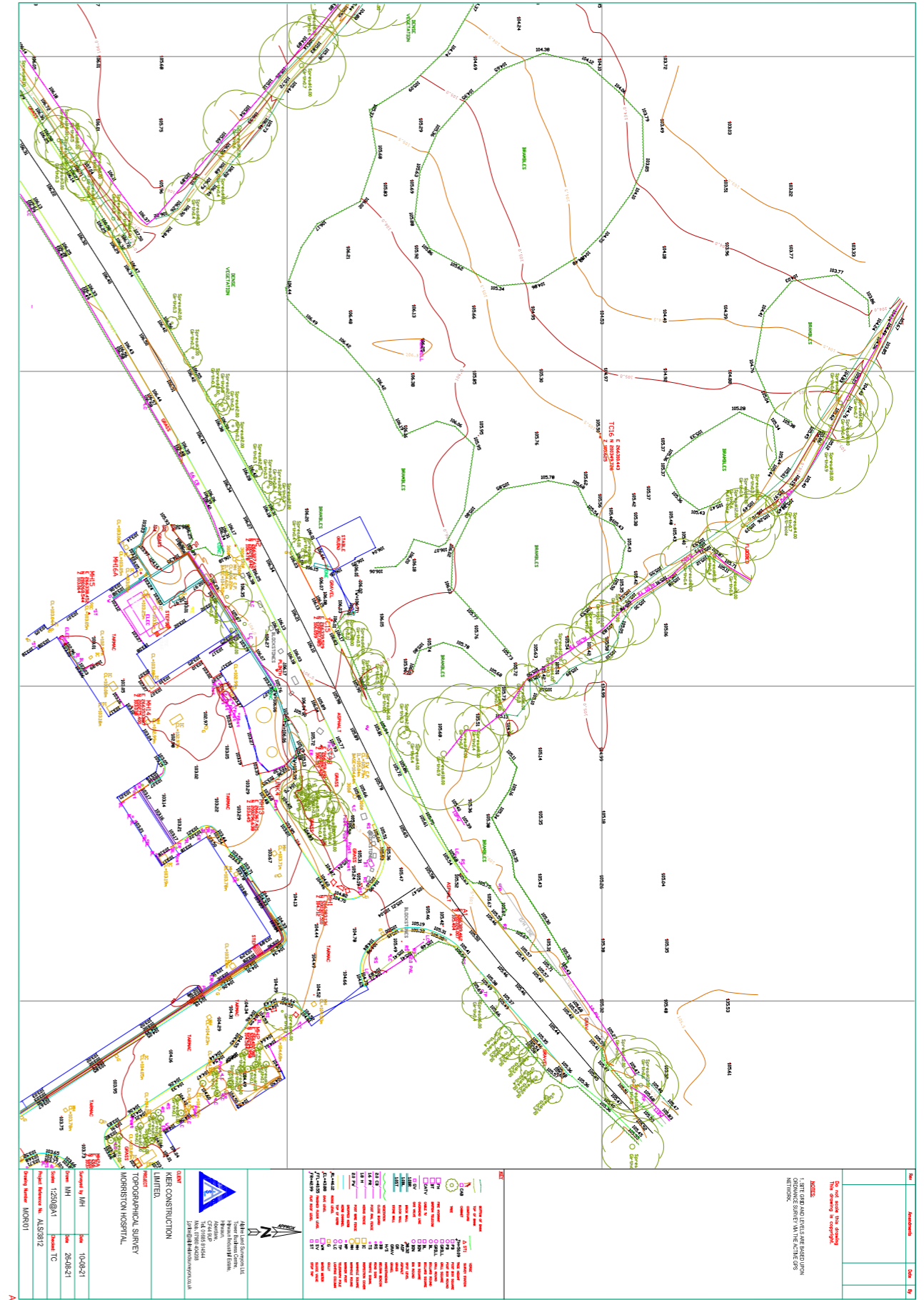
Chapter 33 of CIRIA Report C753 The SuDS Manual, provides further information on the correct procedures for management and disposal of sediment.

There are normally three types of waste arising from regular SuDS maintenance: Litter, green waste (vegetation) and sediment.

- Litter - should be disposed of as for any open space
- Green waste – A composting facility may be used, either on or off site. Alternatively disposed of by a suitably licenced contractor.
- Sediment - The sediment from the site is considered to be low /medium hazard and may be collected, dried and distributed /deposited over adjacent soft landscaped areas not linked to the SuDS components. Any sediment captured within the pre-treatment structures, SuDS components and gravity drainage system up to 5m³ per hectare per annum may be distributed this way in accordance with Natural Resources Wales guidance without a permit. Any volume above this rate will need to be disposed of offsite via a suitably licenced waste contractor.

Further guidance on waste disposal permitting can be found at; [Management of Silt From SuDS](#)

APPENDIX A
Topographic Survey Drawing



APPENDIX B
Site Investigation

EXECUTIVE SUMMARY

The Site	The site is located in the Morrison area of Swansea north of the existing Morrison Hospital complex off Mynydd Gelli Wastad Road. The site is covered in soft landscaping with semi-mature and mature vegetation in discrete areas. The post code for the site is SA6 6NL. The site is approximately 0.8 ha in area and is centred on National Grid Reference (NGR) 266336, 200310.
Proposed Development	The proposed development comprises the construction of a generator slab base and substation building with associated car parking and soakaways. Layouts for the site were provided by Kier prior to the works with exploratory hole locations being provided by RVW Consulting taking into accounts ecological constraints set out by Kiers client ecologist prior to the site works commencing.
Site History	The site has remained undeveloped and agricultural in nature since the earliest available mapping dated 1877. The surrounding area also has remained largely undeveloped with the exception of the construction of Morrison Hospital to the south of the site in 1948. The hospital complex is now approximately three times the size of the initial hospital footprint constructed in 1948.
Published Geology	BGS data does not indicate the presence of Made Ground on site. Superficial deposits of Hummocky Glacial Deposits underlain by Devensian Till (diamicton) of are recorded across the site. The Hummocky Glacial till consists of poorly sorted sand, gravel and silty clay. The Devensian Till, comprises sandy clay with pebble to boulder sized clasts. The bedrock geology for the site is shown on published mapping to comprise the Swansea Member Sandston, which consists of green-grey, lithic arenites ("Pennant sandstones") with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.
Hydrogeology and Hydrology	The superficial Devensian Till is designated as a Secondary Undifferentiated Aquifer. This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the aquifer. The Hummocky Glacial Deposits and Swansea Member Sandstones are designated as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The site approximately 600m south of the Llan River catchment, with a smaller tributary of the Llan located approximately 200m northeast of the site.
Radon	The site is located within an area where no radon protection measures are required for new developments; the site is in a low probability radon area as less than 1% of homes are above the action level.
Unexploded Ordnance	The site is located in a Low Risk Area with regards to Unexploded Ordnance (UXO). A site specific UXO Pre-Desk Study Assessment (PDSA) has been obtained from Zetica UXO in order to provide a preliminary assessment of the potential risks posed by unexploded ordnance at the site. The preliminary desk study recommended that whilst a detailed desk study is always prudent, it is not considered essential in this instance.

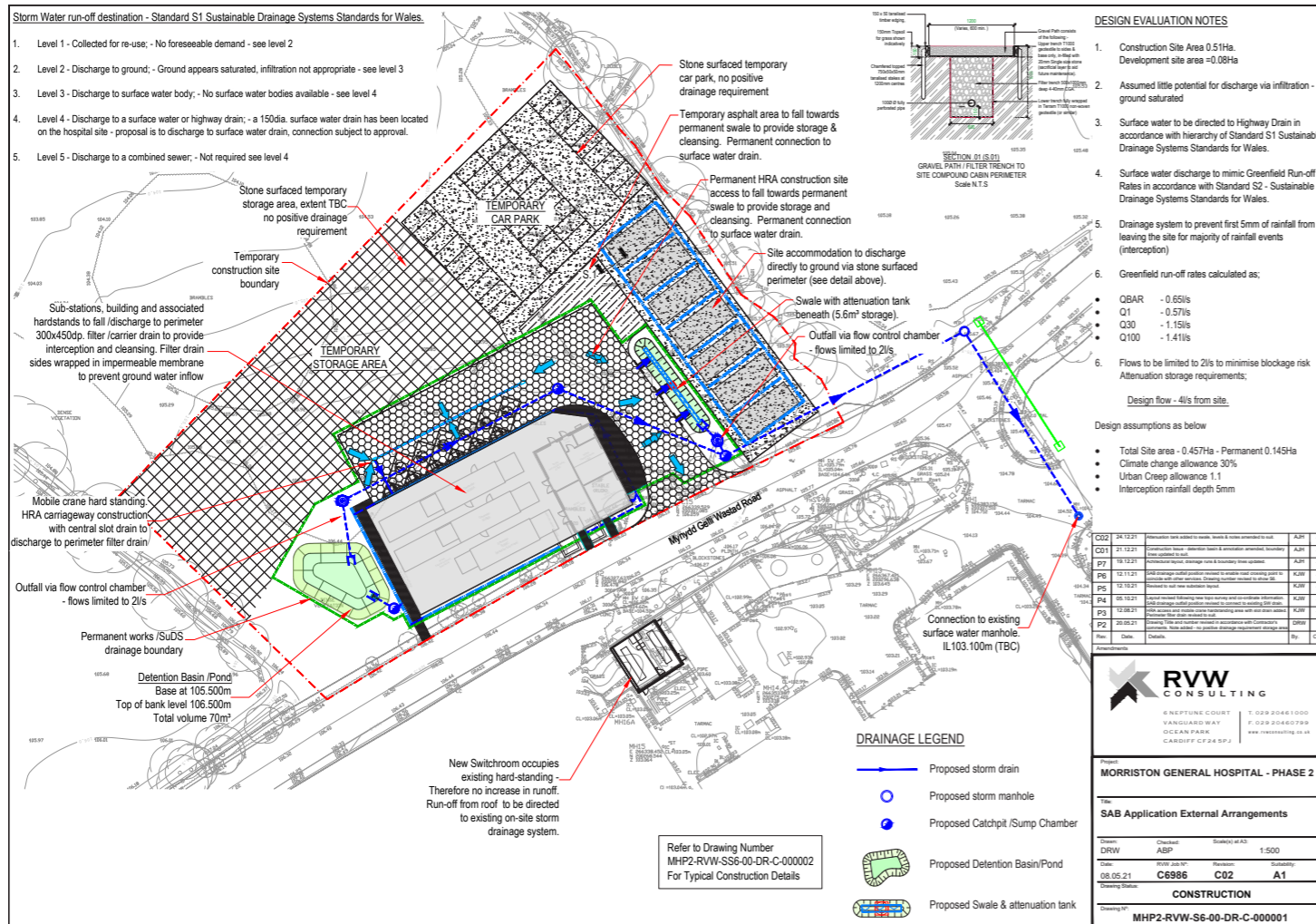
Site Investigation	<p>The site investigation was undertaken from 12th July to 16th July 2021. Three groundwater and ground gas monitoring visits were undertaken between 30th July to 10th August 2021 following the completion of the ground investigation.</p> <p>The scope of the site investigation included the following:</p> <ul style="list-style-type: none"> • Seven windowless sample boreholes to a maximum depth of 5.0m bgl including in-situ standard penetration testing (SPT's) with dynamic probes following a refusal. • Installation of four, 50mm internal diameter, ground gas and groundwater monitoring standpipes in WS03, WS04, WS06 and WS07; • Two trial pits to a maximum depth of 3.30m bgl; • Five TRL probes to provide CBR values adjacent to window sample locations; • One soakaway soil infiltration tests in s machine excavated pit at a minimum depth of 1.70m bgl; • On-site inspection and logging of recovered samples; • Representative soil samples taken and submitted for geotechnical classification testing; • Representative soil samples taken, submitted and tested for a suite of potential contaminants.
Ground Conditions	<p>The typical sequence of strata encountered beneath the site was:</p> <ul style="list-style-type: none"> • Topsoil; • Made Ground; • Hummocky Glacial Deposits <p>A thin veneer of topsoil was encountered in the soft landscaped areas of the site, typically described as dark brown slightly sandy gravelly clay with abundant roots.</p> <p>Made ground was encountered in the south east corner of the site near the entrance only and was recorded in four locations, TP01, TP02, WS03 and WS04 to a maximum depth of 2.30m bgl. This material was variable in composition but generally consisting of dark grey gravelly sandy clay with significant amounts of general waste and other anthropogenic material including but not limited to brick, sandstone, quartzite, glass and plastic. The made ground was noted to have a sulphur/rotten vegetable type odour in TP01.</p> <p>Hummocky Glacial Deposits were encountered within all locations. The Hummocky Glacial Deposits consist of both fine grained and coarse grained soils with lateral and vertical variation encountered across the site. This lateral variation is primarily due to the depositional environment of the Hummocky Glacial Deposits on the margins of a glacier and occur when material is deposited from the top of the glacier following their retreat resulting in very poorly sorted variable soils. Encountered soils thus comprised clay, sand and gravel dominated units with no consistent distributional pattern.</p>
Geotechnical Assessment	<p>Shallow spread foundations, strips or pads, placed within the shallow Hummocky Glacial Deposits, at a minimum depth of 1.2m bgl may be designed to an allowable net bearing pressure of 100kPa.</p> <p>If foundations cross from a fine to a coarse-grained soil, reinforcement of the foundation may be required to prevent differential settlement. Foundation excavations should be extended where deeper Made Ground is encountered. It should be noted that Made Ground was not encountered on the periphery of the generator base footprint however no exploratory holes could be</p>

	<p>undertaken within the footprint due to ecological constraints and the presence of thick vegetation preventing access at the time of the ground investigation.</p> <p>Since the upper natural strata consists of medium volume change potential soils then the use of ground-bearing floor slabs should not be considered.</p> <p>It is recommended that for foundations the Design Sulphate Class for the site, as defined in BRE Special Digest 1, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1</p> <p>For pavement design a CBR value of 5% is considered reasonable.</p> <p>Given the poor permeability of the natural soils as demonstrated by the soakaway undertaken in TP02 underlying the site entrance, it is anticipated that soakaway drainage or other infiltration features may not be feasible however again ecological constraints prevented further soakaways from being undertaken across the general site area and should be undertaken prior to further development of the site.</p>
Ground Contamination Assessment	<p>The site is currently used as a field for grazing and has been undeveloped since the earliest available mapping in 1877 therefore extensive contamination is not anticipated across the majority of the site. However, a significant thickness of unrecorded waste deposition at the entrance to the site and the eastern extremity of the site may need to be removed prior to development of the site.</p> <p>Laboratory analysis of the waste material and natural deposits present on site, based on a commercial/industrial end use, have not identified exceedances in excess of the screening limit for the proposed development. However, the nature of the made ground material may indicate that it is not suitable for retention on the site due to the noted content of general waste.</p> <p>Soil derived leachate samples have indicated elevated concentrations of a series of determinants, including heavy metals and PAH. However, the distance to the nearest surface water bodies and low permeability of the underlying strata indicate that these elevated concentrations are unlikely to migrate significantly.</p> <p>Asbestos was not identified within the laboratory testing of shallow soils and suspected asbestos containing materials were not recorded during the ground investigation. Given the made ground encountered during the site investigation, the potential presence of asbestos containing materials cannot be discounted.</p>
Ground Gas Assessment	<p>The site has been classified as Characteristic Situation 2 (Low Risk) based upon GSV derived from the worst-case recorded concentrations of carbon dioxide and methane and maximum flow rates. The characteristic situation provided has been provided due to a single carbon dioxide concentration greater than 5% and is therefore considered conservative. This was identified in the area of informal waste deposition. In the event that this material is removed during the development, consideration may be given to reducing the classification to CS1, in discussion with a specialist in Ground Gas Protection.</p> <p>A classification of CS2 indicates the need for ground gas protection measures to be installed within the new buildings in line with the requirements of BS8485:2015+A1:2019.</p>
Conclusions and Recommendations	<p>The following recommendations are presented in the context of the site and the proposed development:</p> <ul style="list-style-type: none"> • Any future development of the site will require land gas protection measures to be designed in line with the requirements of BS8485:2015+A1:2019 for a Characteristic Situation 2 (Low Risk) / Amber 1 site.

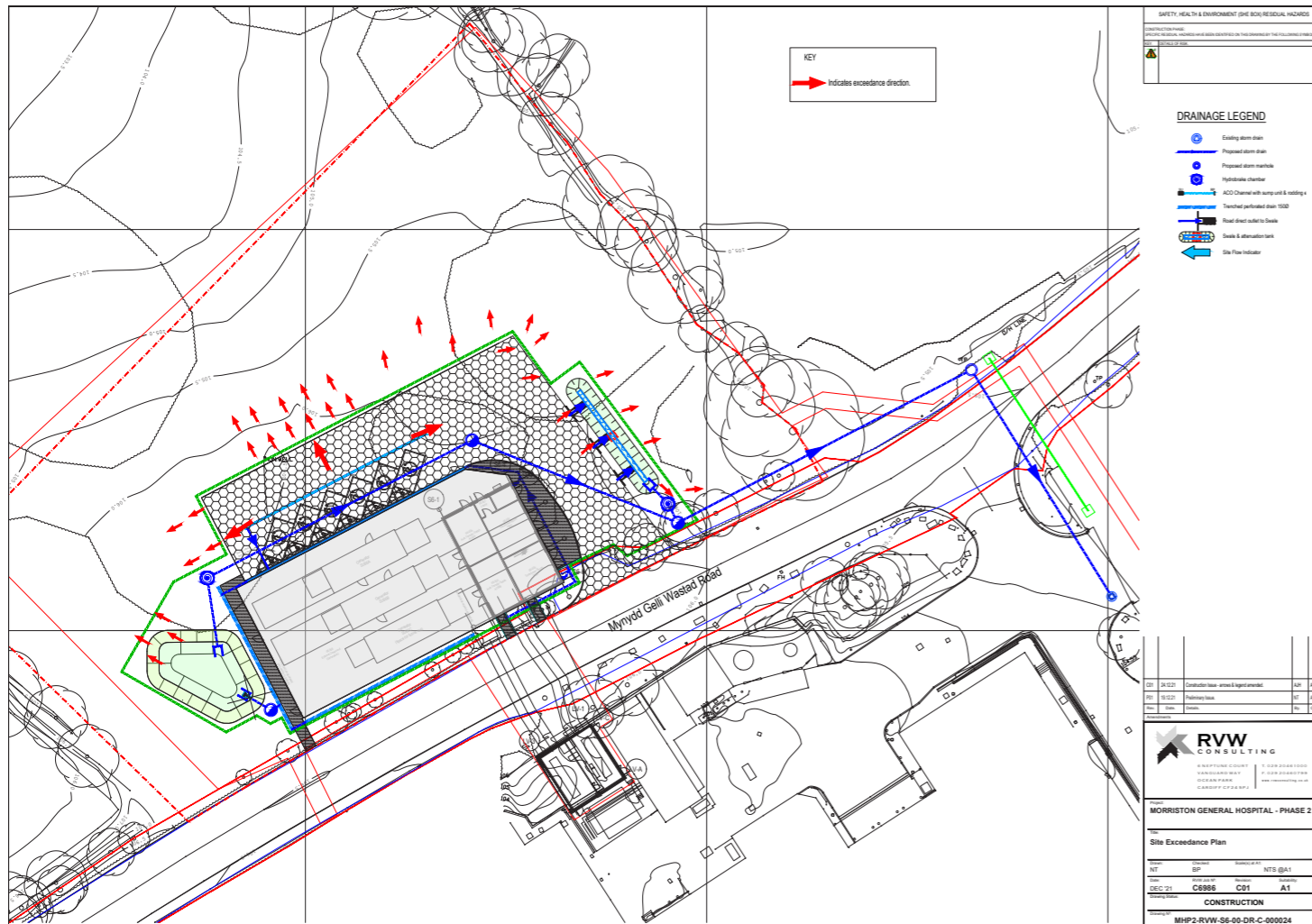
- During the ground investigation access to parts of the site were restricted by ecological constraints and heavy vegetation, primarily in the area on which the generator slab base and substation is proposed. It is recommended further ground investigation is conducted in these areas once clearance of vegetation is completed to obtain information on ground conditions beneath the proposed building footprint.
- Furthermore, due to the lateral variation of the Hummocky Glacial Deposits between coarse and fine grained soils across the site it is recommended that further window sampling is undertaken to build up a profile of these changes. This should be undertaken in conjunction with two cable percussive boreholes to obtain sufficient vertical penetration that was not always achieved with the windowless sampling equipment during this phase of works.
- Further soil infiltration testing is recommended across the wider site area due to the tests during this phase of works being limited to the site entrance.
- Further trial pitting across the general site area and beneath the proposed building footprint to further investigate general ground conditions, delineate the waste deposition areas and further investigate the lateral changes of the Hummocky Glacial Deposits.

APPENDIX C Site Layout Drawing

**APPENDIX D
 Flood Exceedance**



**APPENDIX E
 Drainage Calculations**



RVW Consulting		Page 1												
6 Neptune Court Ocean Park Cardiff CF24 5PJ														
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by													
Innovyze MDSuDS 2020.1.3														
Analysis Criteria														
<table border="0"> <tr><td>Output Interval (mins)</td><td>5</td></tr> <tr><td>Increase Rainfall (%)</td><td>30.000</td></tr> <tr><td>Analysis Interval Mode</td><td>Auto</td></tr> <tr><td>Reference Height Fraction</td><td>0.50</td></tr> <tr><td>Perform First Flush Analysis</td><td>ON</td></tr> <tr><td>Rainfall Depth (mm)</td><td>1.000</td></tr> </table>			Output Interval (mins)	5	Increase Rainfall (%)	30.000	Analysis Interval Mode	Auto	Reference Height Fraction	0.50	Perform First Flush Analysis	ON	Rainfall Depth (mm)	1.000
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Rainfall Depth (mm)	1.000													
Rainfall														
FEH														
<table border="0"> <tr><td>Return Period (years)</td><td>100.000</td></tr> <tr><td>Rainfall Version</td><td>2013</td></tr> <tr><td>Site</td><td>GB 266277 200319 SN 66277 00319</td></tr> <tr><td>Data Type</td><td>Point</td></tr> <tr><td>Profiles</td><td>Summer, Winter</td></tr> </table>			Return Period (years)	100.000	Rainfall Version	2013	Site	GB 266277 200319 SN 66277 00319	Data Type	Point	Profiles	Summer, Winter		
Return Period (years)	100.000													
Rainfall Version	2013													
Site	GB 266277 200319 SN 66277 00319													
Data Type	Point													
Profiles	Summer, Winter													
Storm Durations														
	Duration (mins)	Run Time (mins)												
	15	30												
	30	60												
	60	120												
	120	240												
	180	360												
	240	480												
	360	720												
	480	960												
	600	1200												
	720	1440												
	960	1920												
	1440	2880												
	2160	4320												
	2880	5760												
	4320	8640												
	5760	11520												
	7200	14400												
	8640	17280												
	10080	20160												
Designed in MDSuDS														

RVW Consulting		Page 2																		
6 Neptune Court Ocean Park Cardiff CF24 5PJ																				
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by																			
Innovyze MDSuDS 2020.1.3																				
Inflows																				
Area																				
<table border="0"> <tr><td>Runoff Method</td><td>Time of Concentration</td></tr> <tr><td>Area (ha)</td><td>0.116</td></tr> <tr><td>Volumetric Runoff Coefficient</td><td>0.750</td></tr> <tr><td>Time of Concentration (secs)</td><td>10</td></tr> </table>			Runoff Method	Time of Concentration	Area (ha)	0.116	Volumetric Runoff Coefficient	0.750	Time of Concentration (secs)	10										
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Area (ha)	0.116																			
Volumetric Runoff Coefficient	0.750																			
Time of Concentration (secs)	10																			
Area (2)																				
<table border="0"> <tr><td>Runoff Method</td><td>Time of Concentration</td></tr> <tr><td>Area (ha)</td><td>0.029</td></tr> <tr><td>Volumetric Runoff Coefficient</td><td>0.750</td></tr> <tr><td>Time of Concentration (secs)</td><td>10</td></tr> </table>			Runoff Method	Time of Concentration	Area (ha)	0.029	Volumetric Runoff Coefficient	0.750	Time of Concentration (secs)	10										
Runoff Method	Time of Concentration																			
Area (ha)	0.029																			
Volumetric Runoff Coefficient	0.750																			
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Inlets																				
<table border="0"> <thead> <tr> <th>Name</th> <th>Inlet Type</th> <th>High Bypass Rate (L/s)</th> <th>Low Bypass Rate (L/s)</th> <th>Percentage Bypass (%)</th> <th>Connect to</th> </tr> </thead> <tbody> <tr> <td>Lateral Inflow</td> <td>Lateral Inflow</td> <td></td> <td></td> <td>0.000</td> <td>Underdrain</td> </tr> <tr> <td>Lateral Inflow (2)</td> <td>Lateral Inflow</td> <td></td> <td></td> <td>0.000</td> <td>Not allowed</td> </tr> </tbody> </table>			Name	Inlet Type	High Bypass Rate (L/s)	Low Bypass Rate (L/s)	Percentage Bypass (%)	Connect to	Lateral Inflow	Lateral Inflow			0.000	Underdrain	Lateral Inflow (2)	Lateral Inflow			0.000	Not allowed
Name	Inlet Type	High Bypass Rate (L/s)	Low Bypass Rate (L/s)	Percentage Bypass (%)	Connect to															
Lateral Inflow	Lateral Inflow			0.000	Underdrain															
Lateral Inflow (2)	Lateral Inflow			0.000	Not allowed															
Designed in MDSuDS																				

RVW Consulting		Page 3
6 Neptune Court Ocean Park Cardiff CF24 5PJ		
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by	
Innovyze		MDSuDS 2020.1.3
Outlets		
Siphon (2)		
Invert Level (m)		-1.200
Cut In Height (m)		0.250
Cut Out Height (m)		0.250
	Depth (m)	Outflow (L/s)
	0.500	2.0
	1.000	2.0
Siphon		
Invert Level (m)		-1.500
Cut In Height (m)		0.500
Cut Out Height (m)		0.500
	Depth (m)	Outflow (L/s)
	0.500	2.0
	1.000	2.0
	2.000	2.0
Designed in MDSuDS		

RVW Consulting		Page 4	
6 Neptune Court Ocean Park Cardiff CF24 5PJ			
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by		
Innovyze		MDSuDS 2020.1.3	
Drainage Systems			
Swale			
Exceedence Level (m)		0.000	
Freeboard (mm)		0	
Length (m)		14.000	
Slope (1:x)		40.000	
Base Width (m)		0.600	
Swale			
Base Level (m)		-0.600	
Side Slope (1:x)		3.000	
Porosity (%)		1.000	
Filtration Rate (m/hr)		0.00000	
Side Infiltration Rate (m/hr)		0.00000	
Interception Volume (m³)		5.500	
Evapotranspiration (mm/day)		2.00	
Delay Time (secs)		10	
Retention Coefficient		0.339	
Trench			
Trench Depth (m)		0.600	
Trench Porosity (%)		1.000	
Base Infiltration Rate (m/hr)		0.00000	
Side Infiltration Rate (m/hr)		0.00000	
Interception Volume (m³)		5.500	
Delay Time (secs)		10	
Retention Coefficient		0.442	
Underdrain			
Depth Above Base (m)		0.000	
Diameter (mm)		150	
No of Barrels		1	
Manning's n		0.500	
Tank			
Exceedence Level (m)		0.000	
Base Level (m)		-1.000000	
Freeboard (mm)		0	
Initial Depth (m)		0.010	
Interception Volume (m³)		70.000	
Routing Method		No Delay	
	Depth (m)	Area (m²)	Perimeter (m)
	0.000	70.000000	29.659
	0.500	70.000000	29.659
	1.000	70.000000	29.659
Designed in MDSuDS			

RVW Consulting		Page 5			
6 Neptune Court Ocean Park Cardiff CF24 5PJ					
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by				
Innovyze		MDSuDS 2020.1.3			
Connections					
Label	From	To	Connection Type	Time Of Travel (secs)	Reten. Coeff.
Pipe	Swale	Siphon (2)			
No Delay	Area (2)	Lateral Inflow	No Delay		
No Delay (2)	Lateral Inflow	Swale			
No Delay (3)	Area	Lateral Inflow (2)	Attenuated Flow	1159	0.100
Lagged Flow	Lateral Inflow (2)	Tank			
Lagged Flow (2)	Tank	Siphon			
Design Report					
	Volume in Drainage Systems (m³)			70.396	
	Volume in Pipes (m³)			0.000	
	Total Volume (m³)			70.396	
Designed in MDSuDS					

RVW Consulting		Page 6								
6 Neptune Court Ocean Park Cardiff CF24 5PJ										
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by									
Innovyze		MDSuDS 2020.1.3								
Phase Summary - All Drainage Systems										
Phase										
FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000										
Drainage System Ctrl	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
Swale	-1.200	0.000	8.5	0.000	0.000	5.554	0.0	0.000	100.000	OK
Tank	-0.725	0.275	30.7	19.262	0.000	0.000	2.0	5.684	72.483	OK
Designed in MDSuDS										

RVW Consulting		Page 9								
6 Neptune Court Ocean Park Cardiff CF24 5PJ										
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by									
Innovyze		MDSuDS 2020.1.3								
<u>Phase Summary - All Storms</u>										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 2160 mins: Winter : +30.000 %	-0.941	0.259	0.6	0.137	0.000	5.527	0.6	24.806	0.000	OK
100.000 years: 2880 mins: Summer : +30.000 %	-0.938	0.262	0.8	0.139	0.000	5.537	0.8	27.532	0.000	OK
100.000 years: 2880 mins: Winter : +30.000 %	-0.946	0.254	0.5	0.133	0.000	5.537	0.5	27.532	0.000	OK
100.000 years: 4320 mins: Summer : +30.000 %	-0.944	0.256	0.6	0.135	0.000	5.552	0.6	32.213	0.000	OK
100.000 years: 4320 mins: Winter : +30.000 %	-0.950	0.250	0.4	0.130	0.000	5.555	0.4	32.201	0.000	OK
100.000 years: 5760 mins: Summer : +30.000 %	-0.950	0.250	0.5	0.130	0.000	5.571	0.5	36.406	0.000	OK
100.000 years: 5760 mins: Winter : +30.000 %	-0.952	0.248	0.3	0.129	0.000	5.571	0.4	36.404	0.000	OK
100.000 years: 7200 mins: Summer : +30.000 %	-0.949	0.251	0.4	0.130	0.000	5.591	0.5	40.542	0.000	OK
100.000 years: 7200 mins: Winter : +30.000 %	-0.951	0.249	0.3	0.129	0.000	5.587	0.3	40.558	0.000	OK
100.000 years: 8640 mins: Summer : +30.000 %	-0.949	0.251	0.4	0.131	0.000	5.605	0.4	44.648	0.000	OK
100.000 years: 8640 mins: Winter : +30.000 %	-0.950	0.250	0.2	0.130	0.000	5.606	0.3	44.646	0.000	OK
Designed in MDSuDS										

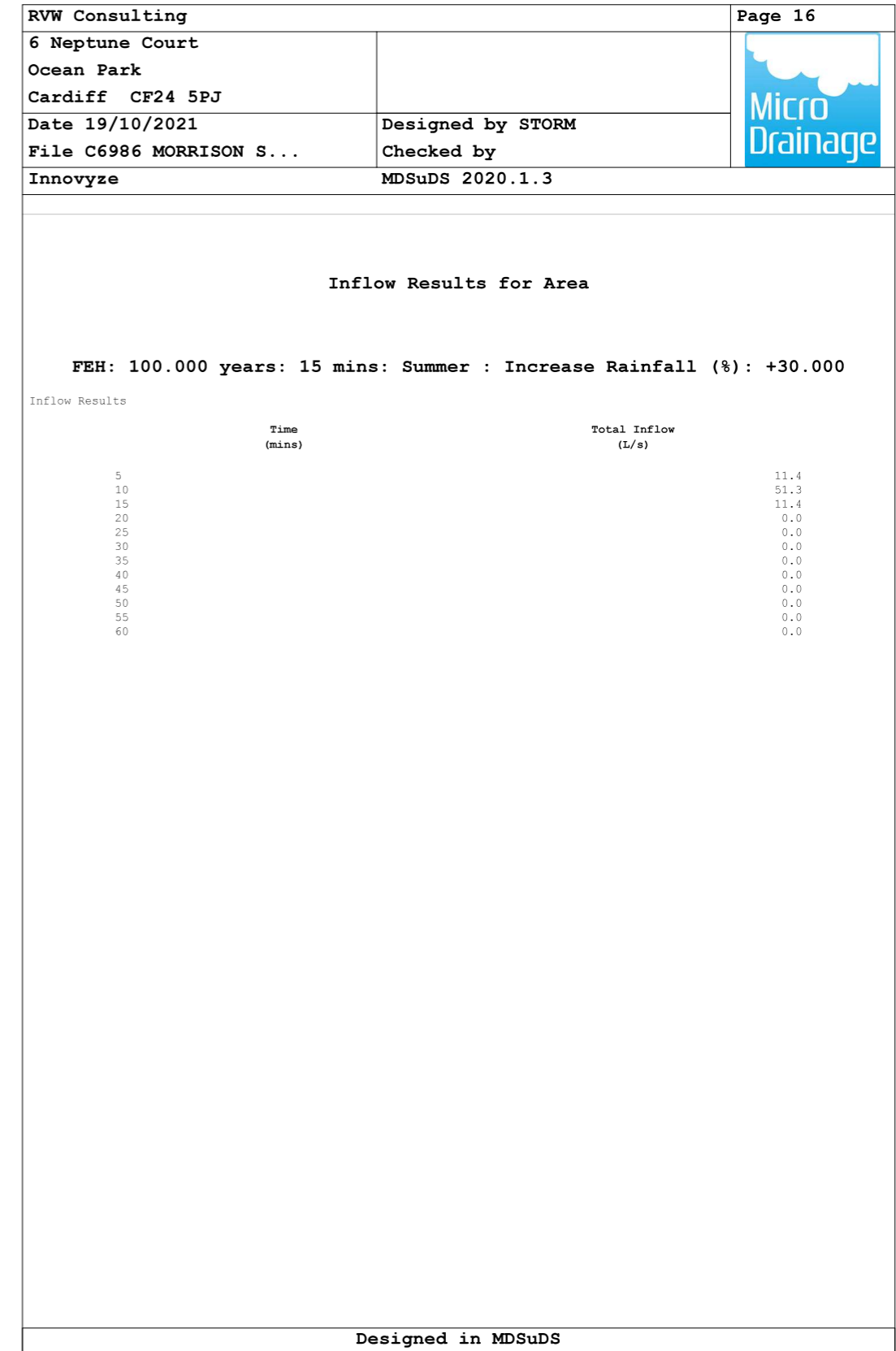
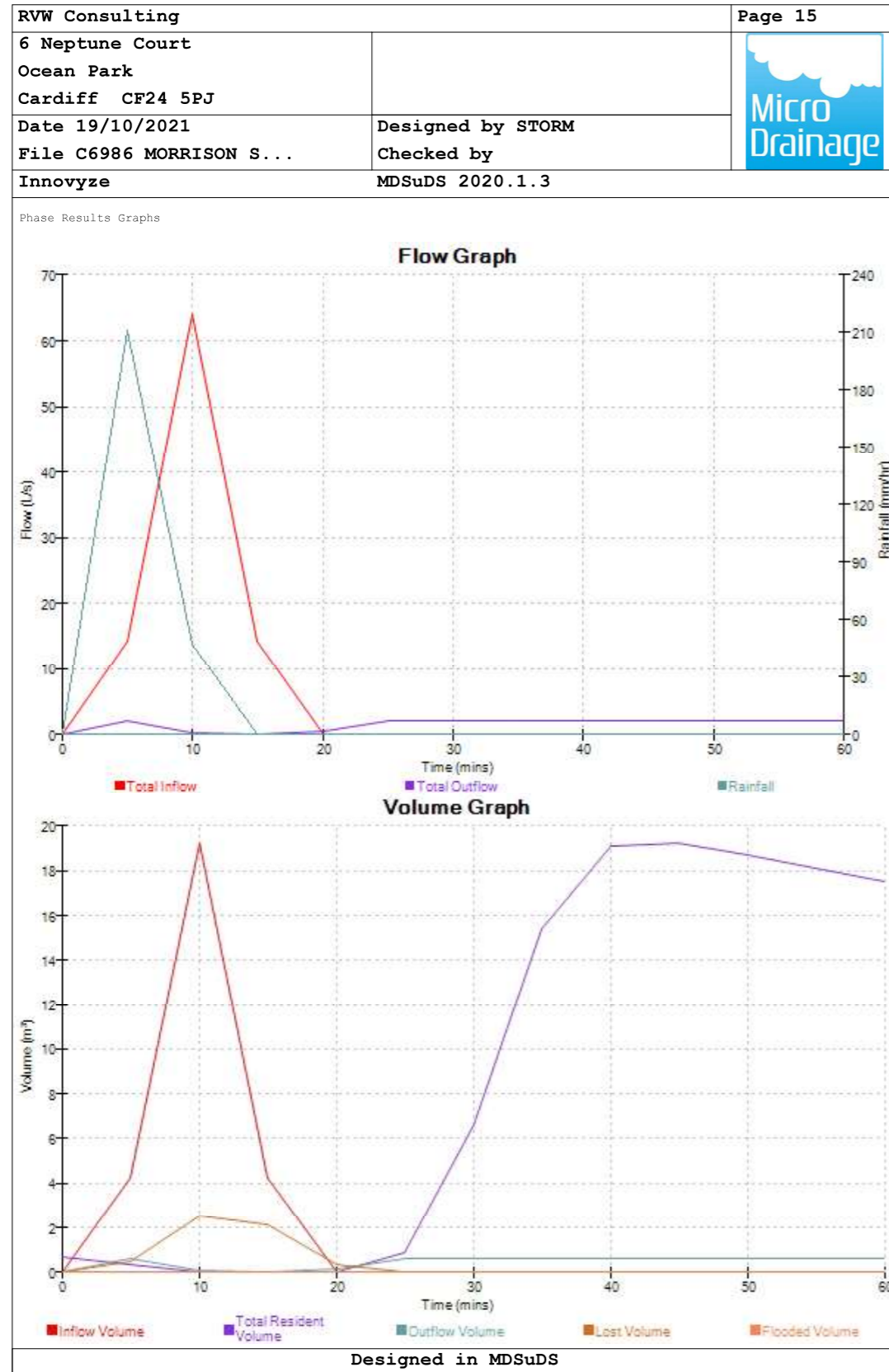
RVW Consulting		Page 10								
6 Neptune Court Ocean Park Cardiff CF24 5PJ										
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by									
Innovyze		MDSuDS 2020.1.3								
<u>Phase Summary - All Storms</u>										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 10080 mins: Summer : +30.000 %	-0.950	0.250	0.4	0.130	0.000	5.619	0.4	48.758	0.000	OK
100.000 years: 10080 mins: Winter : +30.000 %	-0.951	0.249	0.2	0.129	0.000	5.620	0.3	48.755	0.000	OK
First Flush - Rainfall Depth (mm): 1	-1.200	0.000	0.4	0.000	0.000	0.218	0.0	0.000	0.000	OK
Tank										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 15 mins: Summer : +30.000 %	-0.725	0.275	30.7	19.262	0.000	0.000	2.0	5.684	0.000	OK
100.000 years: 15 mins: Winter : +30.000 %	-0.725	0.275	29.9	19.238	0.000	0.000	2.0	5.704	0.000	OK
100.000 years: 30 mins: Summer : +30.000 %	-0.610	0.390	33.4	27.328	0.000	0.000	2.0	5.577	0.000	OK
100.000 years: 30 mins: Winter : +30.000 %	-0.610	0.390	31.7	27.328	0.000	0.000	2.0	5.575	0.000	OK
100.000 years: 60 mins: Summer : +30.000 %	-0.490	0.510	32.4	35.674	0.000	0.000	2.0	12.678	0.000	OK
100.000 years: 60 mins: Winter : +30.000 %	-0.489	0.511	26.9	35.771	0.000	0.000	2.0	12.622	0.000	OK
100.000 years: 120 mins: Summer : +30.000 %	-0.453	0.547	24.1	38.262	0.000	0.000	2.0	26.912	0.000	OK
100.000 years: 120 mins: Winter : +30.000 %	-0.447	0.553	17.8	38.732	0.000	0.000	2.0	26.677	0.000	OK
Designed in MDSuDS										

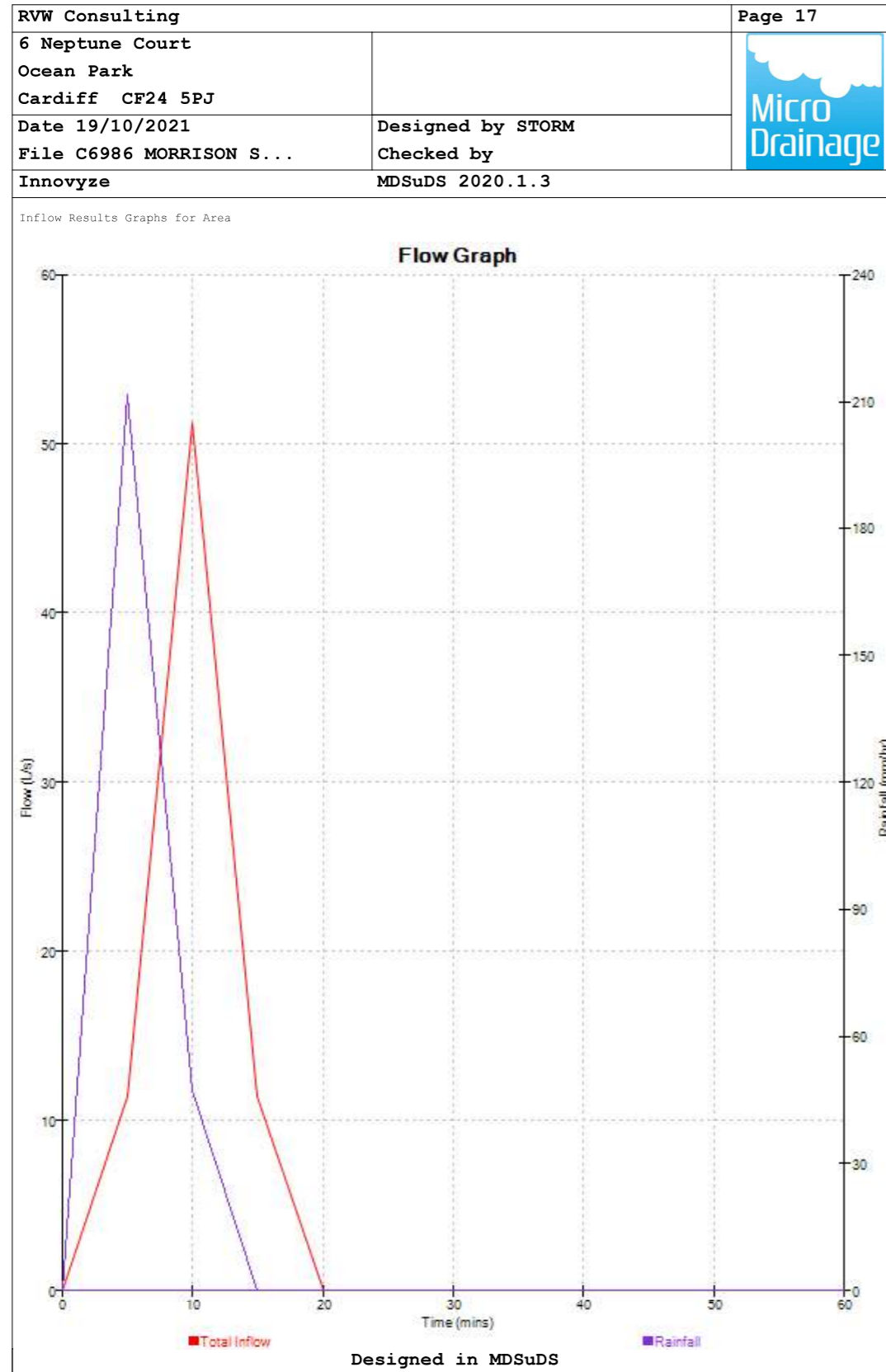
RVW Consulting		Page 11								
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Innovyze		MDSuDS 2020.1.3								
Phase Summary - All Storms										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 180 mins: Summer : +30.000 %	-0.454	0.546	19.4	38.234	0.000	0.000	2.0	41.097	0.000	OK
100.000 years: 180 mins: Winter : +30.000 %	-0.444	0.556	13.7	38.953	0.000	0.000	2.0	40.731	0.000	OK
100.000 years: 240 mins: Summer : +30.000 %	-0.458	0.542	16.5	37.925	0.000	0.000	2.0	54.725	0.000	OK
100.000 years: 240 mins: Winter : +30.000 %	-0.457	0.543	11.3	38.039	0.000	0.000	2.0	54.669	0.000	OK
100.000 years: 360 mins: Summer : +30.000 %	-0.469	0.531	12.8	37.171	0.000	0.000	2.0	73.916	0.000	OK
100.000 years: 360 mins: Winter : +30.000 %	-0.475	0.525	8.5	36.717	0.000	0.000	2.0	73.916	0.000	OK
100.000 years: 480 mins: Summer : +30.000 %	-0.484	0.516	10.7	36.109	0.000	0.000	2.0	80.289	0.000	OK
100.000 years: 480 mins: Winter : +30.000 %	-0.504	0.496	7.0	34.738	0.000	0.000	2.0	80.289	0.000	OK
100.000 years: 600 mins: Summer : +30.000 %	-0.503	0.497	9.2	34.801	0.000	0.000	2.0	85.538	0.000	OK
100.000 years: 600 mins: Winter : +30.000 %	-0.538	0.462	6.0	32.370	0.000	0.000	2.0	85.538	0.000	OK
100.000 years: 720 mins: Summer : +30.000 %	-0.523	0.477	8.1	33.360	0.000	0.000	2.0	90.041	0.000	OK
100.000 years: 720 mins: Winter : +30.000 %	-0.574	0.426	5.2	29.824	0.000	0.000	2.0	90.041	0.000	OK
100.000 years: 960 mins: Summer : +30.000 %	-0.568	0.432	6.6	30.270	0.000	0.000	2.0	97.572	0.000	OK
Designed in MDSuDS										

RVW Consulting		Page 12								
6 Neptune Court Ocean Park Cardiff CF24 5PJ										
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by									
Innovyze		MDSuDS 2020.1.3								
Phase Summary - All Storms										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 960 mins: Winter : +30.000 %	-0.648	0.352	4.3	24.618	0.000	0.000	2.0	97.572	0.000	OK
100.000 years: 1440 mins: Summer : +30.000 %	-0.658	0.342	4.9	23.959	0.000	0.000	2.0	109.187	0.000	OK
100.000 years: 1440 mins: Winter : +30.000 %	-0.787	0.213	3.2	14.902	0.000	0.000	2.0	109.187	0.000	OK
100.000 years: 2160 mins: Summer : +30.000 %	-0.777	0.223	3.7	15.597	0.000	0.000	2.0	122.423	0.000	OK
100.000 years: 2160 mins: Winter : +30.000 %	-0.941	0.059	2.4	4.117	0.000	0.000	2.0	122.423	0.000	OK
100.000 years: 2880 mins: Summer : +30.000 %	-0.867	0.133	3.0	9.307	0.000	0.000	2.0	133.384	0.000	OK
100.000 years: 2880 mins: Winter : +30.000 %	-0.990	0.010	1.9	0.700	0.000	0.000	2.0	133.384	0.000	OK
100.000 years: 4320 mins: Summer : +30.000 %	-0.971	0.029	2.3	1.999	0.000	0.000	2.0	152.081	0.000	OK
100.000 years: 4320 mins: Winter : +30.000 %	-0.990	0.010	1.5	0.700	0.000	0.000	2.0	152.081	0.000	OK
100.000 years: 5760 mins: Summer : +30.000 %	-0.990	0.010	1.9	0.700	0.000	0.000	2.0	168.904	0.000	OK
100.000 years: 5760 mins: Winter : +30.000 %	-0.990	0.010	1.2	0.700	0.000	0.000	2.0	168.904	0.000	OK
Designed in MDSuDS										

RVW Consulting		Page 13								
6 Neptune Court Ocean Park Cardiff CF24 5PJ										
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by									
Innovyze		MDSuDS 2020.1.3								
Phase Summary - All Storms										
Storm Event	Max Level (m)	Max Depth (m)	Max Inflow (L/s)	Max Res. Vol. (m³)	Max Flooded Volume (m³)	Tot. Lost Vol. (m³)	Max Outflow (L/s)	Tot. Disch. Vol. (m³)	Perc. Avail. (%)	Status
100.000 years: 7200 mins: Summer : +30.000 %	-0.990	0.010	1.7	0.700	0.000	0.000	2.0	185.529	0.000	OK
100.000 years: 7200 mins: Winter : +30.000 %	-0.990	0.010	1.1	0.700	0.000	0.000	2.0	185.529	0.000	OK
100.000 years: 8640 mins: Summer : +30.000 %	-0.990	0.010	1.5	0.700	0.000	0.000	2.0	201.951	0.000	OK
100.000 years: 8640 mins: Winter : +30.000 %	-0.990	0.010	1.0	0.700	0.000	0.000	2.0	201.951	0.000	OK
100.000 years: 10080 mins: Summer : +30.000 %	-0.990	0.010	1.4	0.700	0.000	0.000	2.0	218.397	0.000	OK
100.000 years: 10080 mins: Winter : +30.000 %	-0.990	0.010	0.9	0.700	0.000	0.000	2.0	218.397	0.000	OK
First Flush - Rainfall Depth (mm): 1	-0.990	0.010	1.4	0.700	0.000	0.000	2.0	1.573	0.000	OK
Designed in MDSuDS										

RVW Consulting		Page 14
6 Neptune Court Ocean Park Cardiff CF24 5PJ		
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by	
Innovyze		MDSuDS 2020.1.3
Phase Management		
Phase		
FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000		
Phase Results		
Volume In (m³)	Volume Out (m³)	Max Inflow (L/s)
27.769	5.684	64.1
		Max Outflow (L/s)
		2.0
Designed in MDSuDS		





RVW Consulting		Page 18
6 Neptune Court		
Ocean Park		
Cardiff CF24 5PJ		
Date 19/10/2021	Designed by STORM	
File C6986 MORRISON S...	Checked by	
Innovyze	MDSuDS 2020.1.3	

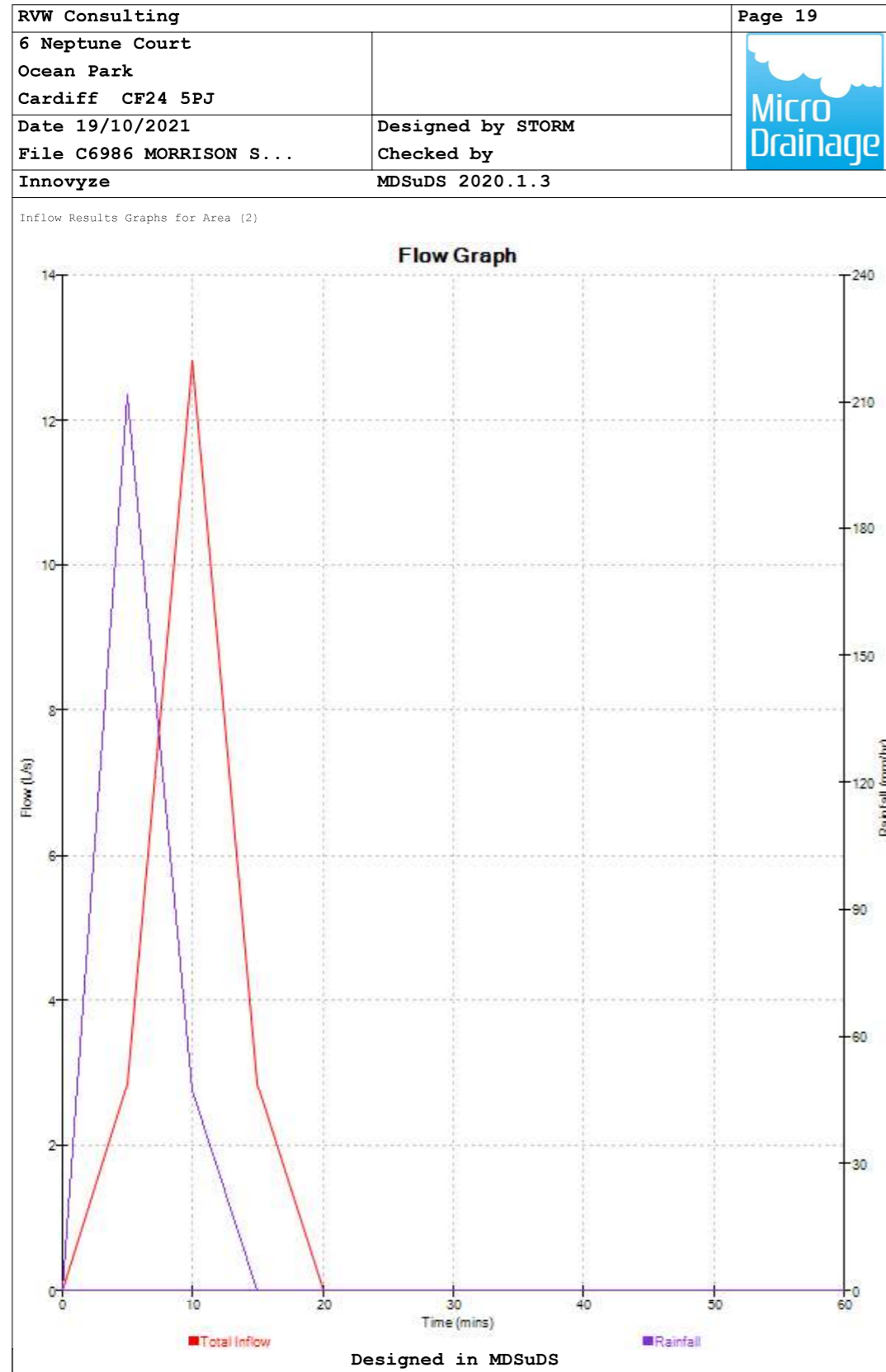
Inflow Results for Area (2)

FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000

Inflow Results

Time (mins)	Total Inflow (L/s)
5	2.8
10	12.8
15	2.8
20	0.0
25	0.0
30	0.0
35	0.0
40	0.0
45	0.0
50	0.0
55	0.0
60	0.0

Designed in MDSuDS



RVW Consulting		Page 20
6 Neptune Court		
Ocean Park		
Cardiff CF24 5PJ		
Date 19/10/2021	Designed by STORM	
File C6986 MORRISON S...	Checked by	
Innovyze	MDSuDS 2020.1.3	

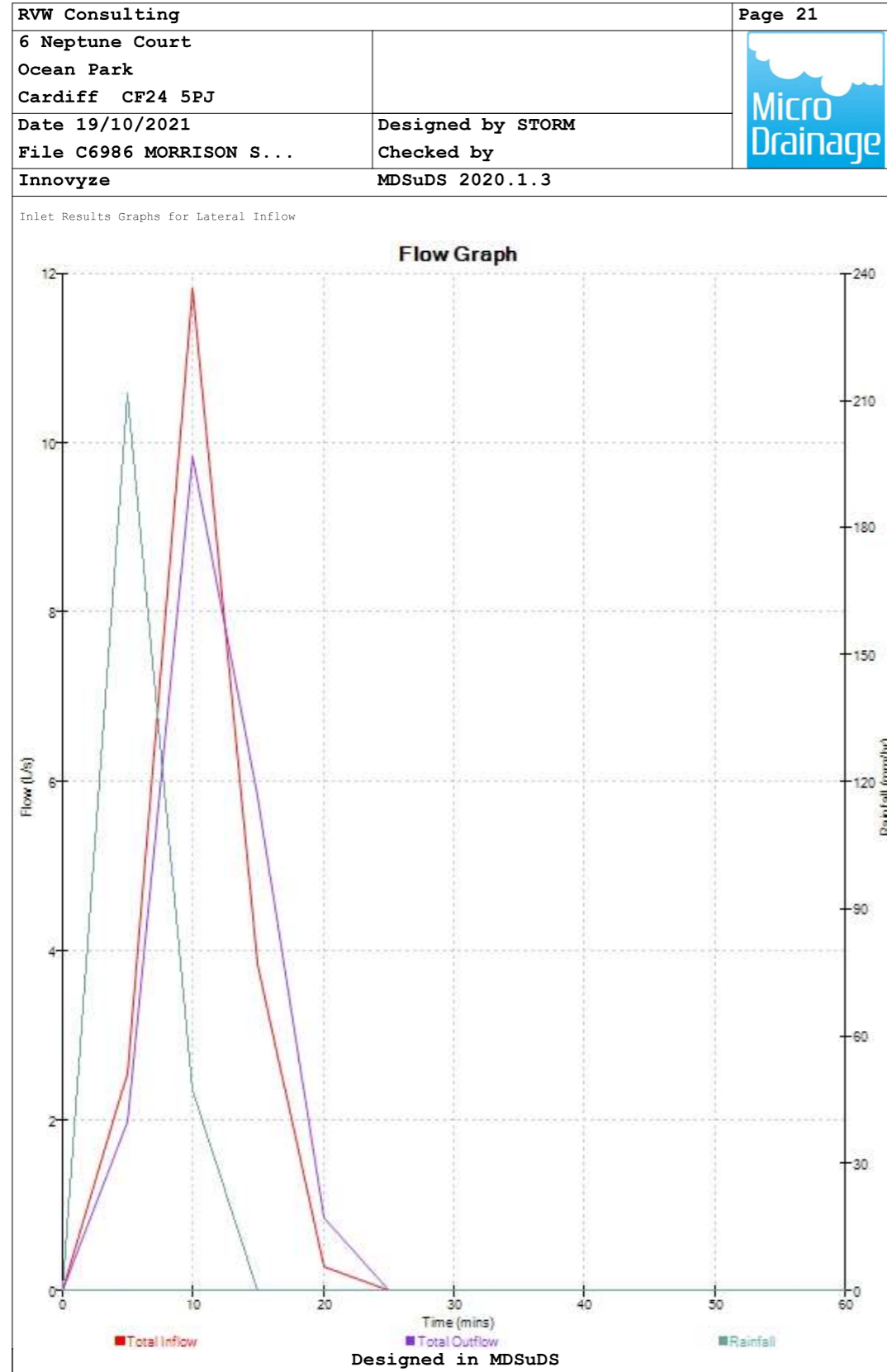
Inlet Results for Lateral Inflow

FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000

Inlet Results

Time (mins)	No Delay (L/s)	Total Inflow (L/s)	No Delay (2) (L/s)	Total Outflow (L/s)
5	2.6	2.6	2.0	2.0
10	11.8	11.8	9.8	9.8
15	3.8	3.8	5.8	5.8
20	0.3	0.3	0.9	0.9
25	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0

Designed in MDSuDS



RVW Consulting		Page 22
6 Neptune Court Ocean Park Cardiff CF24 5PJ		
Date 19/10/2021 File C6986 MORRISON S...	Designed by STORM Checked by	
Innovyze		MDSuDS 2020.1.3

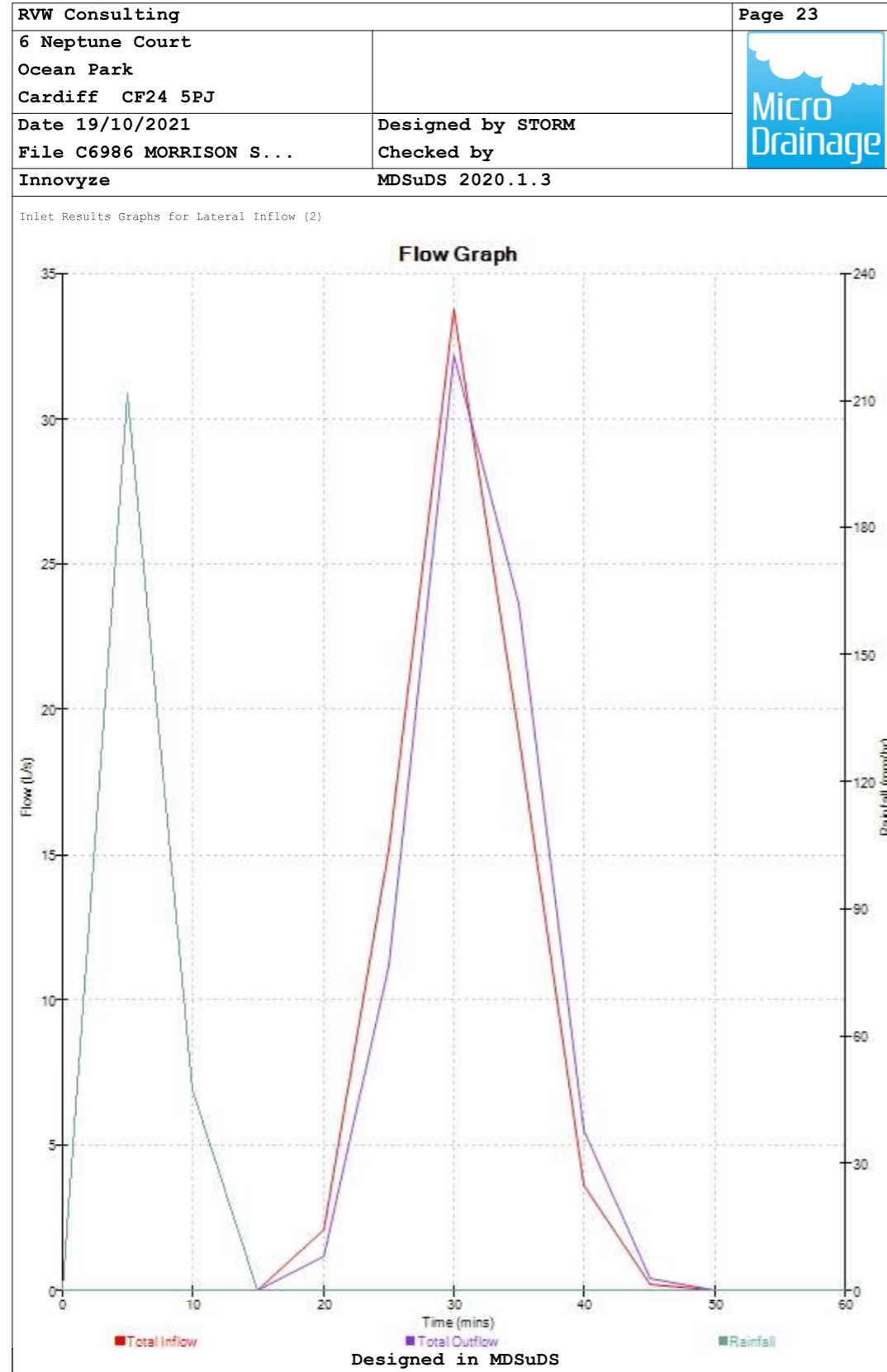
Inlet Results for Lateral Inflow (2)

FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000

Inlet Results

Time (mins)	No Delay (3) (L/s)	Total Inflow (L/s)	Lagged Flow (L/s)	Total Outflow (L/s)
5	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
20	2.1	2.1	1.2	1.2
25	15.2	15.2	11.2	11.2
30	33.8	33.8	32.2	32.2
35	19.1	19.1	23.6	23.6
40	3.6	3.6	5.5	5.5
45	0.2	0.2	0.4	0.4
50	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0

Designed in MDSuDS



RVW Consulting		Page 24
6 Neptune Court		
Ocean Park		
Cardiff CF24 5PJ		
Date 19/10/2021	Designed by STORM	
File C6986 MORRISON S...	Checked by	
Innovyze	MDSuDS 2020.1.3	

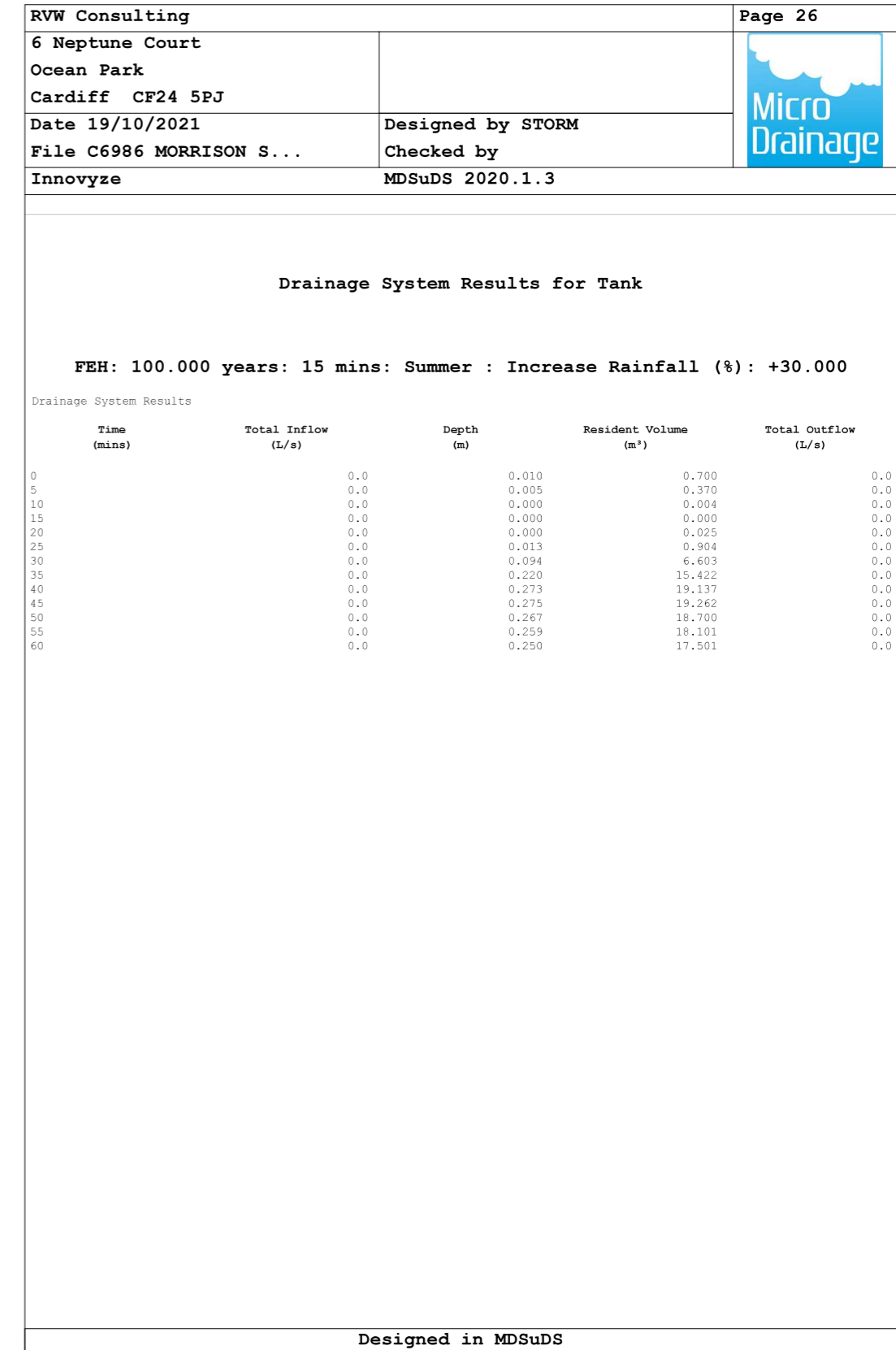
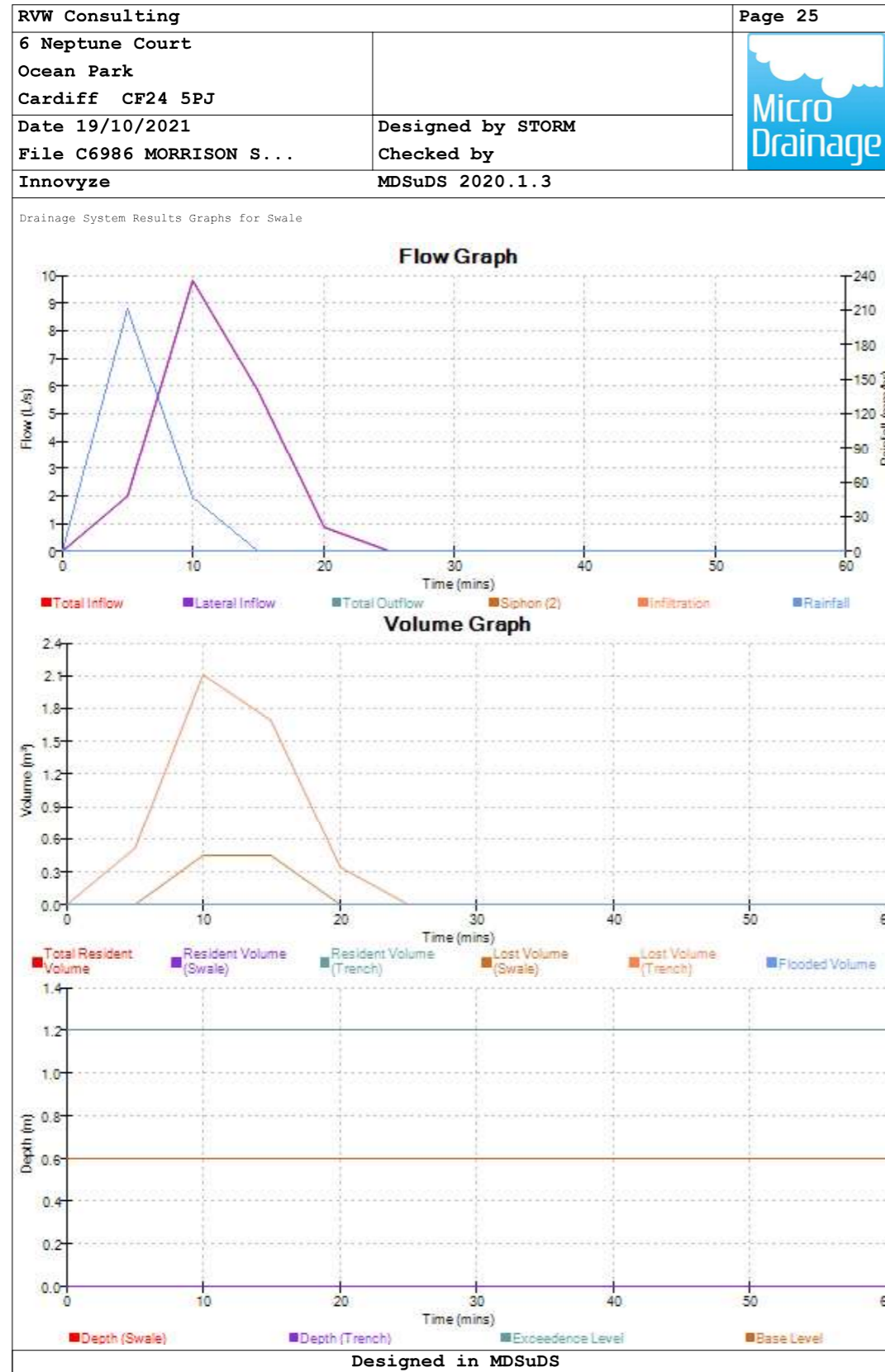
Drainage System Results for Swale

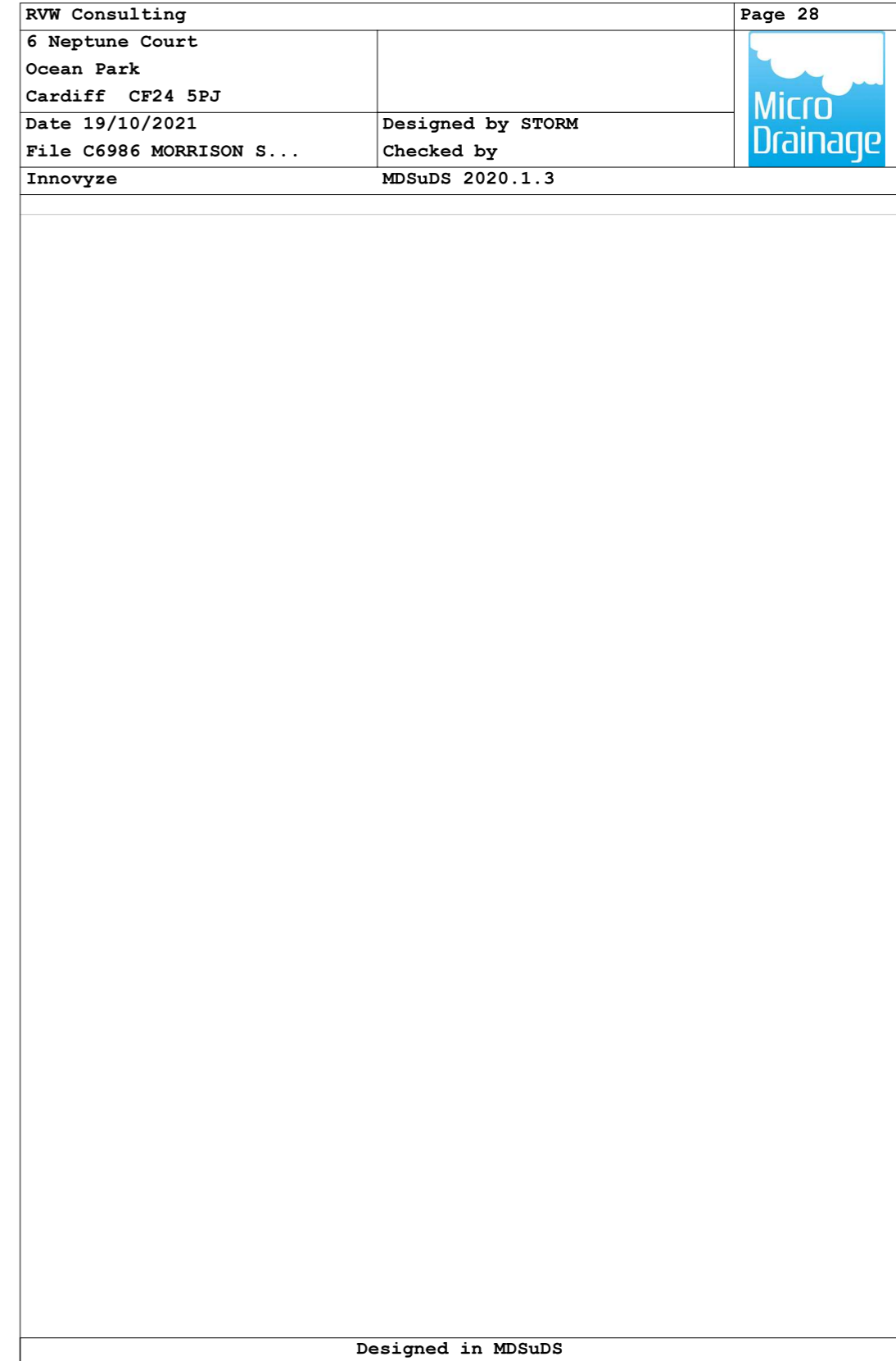
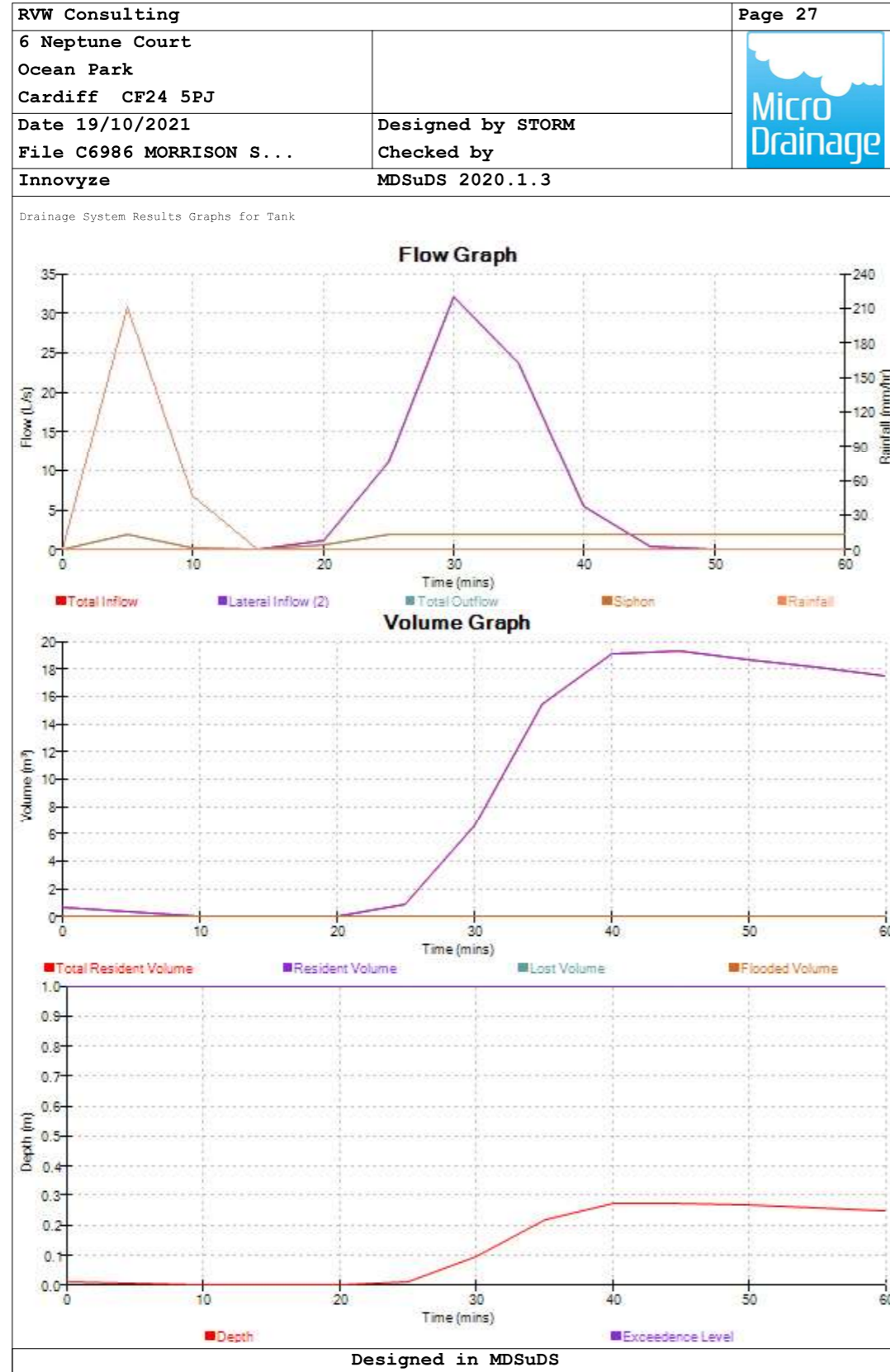
FEH: 100.000 years: 15 mins: Summer : Increase Rainfall (%): +30.000

Drainage System Results

Time (mins)	Total Inflow (L/s)	Depth (m)	Resident Volume (m ³)	Total Outflow (L/s)
0	0.0	0.600	0.000	0.0
5	0.0	0.600	0.000	0.0
10	0.0	0.600	0.000	0.0
15	0.0	0.600	0.000	0.0
20	0.0	0.600	0.000	0.0
25	0.0	0.600	0.000	0.0
30	0.0	0.600	0.000	0.0
35	0.0	0.600	0.000	0.0
40	0.0	0.600	0.000	0.0
45	0.0	0.600	0.000	0.0
50	0.0	0.600	0.000	0.0
55	0.0	0.600	0.000	0.0
60	0.0	0.600	0.000	0.0

Designed in MDSuDS





 RVW Consulting 6 Neptune Court Ocean Way Splott	Project Moriston Hospital – Site Accommodation Drainage				Job Ref. C6986	
	Section Storm Drainage, Roof Infiltration				Sheet no./rev. 1	
	Calc. by BP	Date 17/12/2021	Chk'd by OP	Date 24/12/21	App'd by BP	Date 20/12/21

Purpose
This is temporary site compound to facilitate the construction of the new Substation at Morriston Hospital. The site accommodation will provide welfare facilities and offices.

Drainage Methodology
The infiltration is poor however we have adopted a very slow infiltration of 1.0×10^{-6} and notwithstanding this the infiltration trench has the capacity to store up to storms with a 10 year return.

The compound generally will have a permeable/ porous finish of porous asphalt (access roads) and graded stone for general compound and footpath areas, so as to emulate the current natural greenfield conditions.

The Site accommodation will discharge the roof drainage to a filter strip around the perimeter of the accommodation.

The filter strip for the site accommodation has been designed with infiltration allowance at a very low rate of 1×10^{-6} . However, if the ground does not infiltrate then there is enough storage within the filter strip to accommodate two storm events with a ten-year return period. See calculations below for the filter strip.

Results review
This calculation shows the infiltration trench discharging over a period of 22hr 26min 21s. this is less than 24 hours and therefore acceptable. However, we expect the infiltration to be significantly better than this. Notwithstanding this the trench has the capacity to accommodate two design storm events.

Therefore, the Infiltration Trench design is acceptable.

 RVW Consulting 6 Neptune Court Ocean Way Splott	Project Moriston Hospital – Site Accommodation Drainage				Job Ref. C6986	
	Section Storm Drainage, Roof Infiltration				Sheet no./rev. 2	
	Calc. by BP	Date 17/12/2021	Chk'd by OP	Date 24/12/21	App'd by BP	Date 20/12/21

PLANE INFILTRATION SYSTEM DESIGN
In accordance with CIRIA C753 SUDS

Tedds calculation version 2.0.04

Design rainfall intensity
 Location of catchment area Swansea
 Impermeable area drained to the system $A = 115.0 \text{ m}^2$
 Return period Period = 10 yr
 Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.290$
 5-year return period rainfall of 60 minutes duration $M5_{60\text{min}} = 19.0 \text{ mm}$
 Increase of rainfall intensity due to global warming $p_{\text{climate}} = 0 \%$

Infiltration blanket details
 Base area of blanket $A_b = 30.0 \text{ m}^2$
 Porosity $n = 0.3$
 Drainage ratio $R = A / A_b = 3.8$
 Soil infiltration rate $f = 1.00 \times 10^{-6} \text{ m/s}$

Table equations
 Rainfall intensity $i = M10 / D$
 Minimum depth required (Eq. 25.1) $H = D / n \times (R \times i - f)$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Intensity, i (mm/hr)	Depth (mm)
5	0.34;	6.4;	1.20;	7.7;	91.99;	97;
10	0.49;	9.2;	1.22;	11.2;	67.43;	142;
15	0.59;	11.1;	1.22;	13.7;	54.60;	171;
30	0.77;	14.6;	1.24;	18.0;	36.07;	224;
60	1.00;	19.0;	1.24;	23.6;	23.56;	289;
120	1.26;	23.9;	1.24;	29.6;	14.80;	354;
240	1.59;	30.3;	1.22;	36.9;	9.23;	424;
360	1.81;	34.5;	1.21;	41.6;	6.93;	459;
600	2.16;	41.0;	1.19;	48.8;	4.88;	503;
1440	2.93;	55.6;	1.16;	64.7;	2.70;	539;

Min depth of blanket req'd $H_{\text{max}} = 539 \text{ mm}$
 Time to empty blanket to half volume - Eq.25.6(1) $t_{s50} = n \times H_{\text{max}} / (2 \times f) = 22\text{hr } 26\text{min } 21\text{s}$

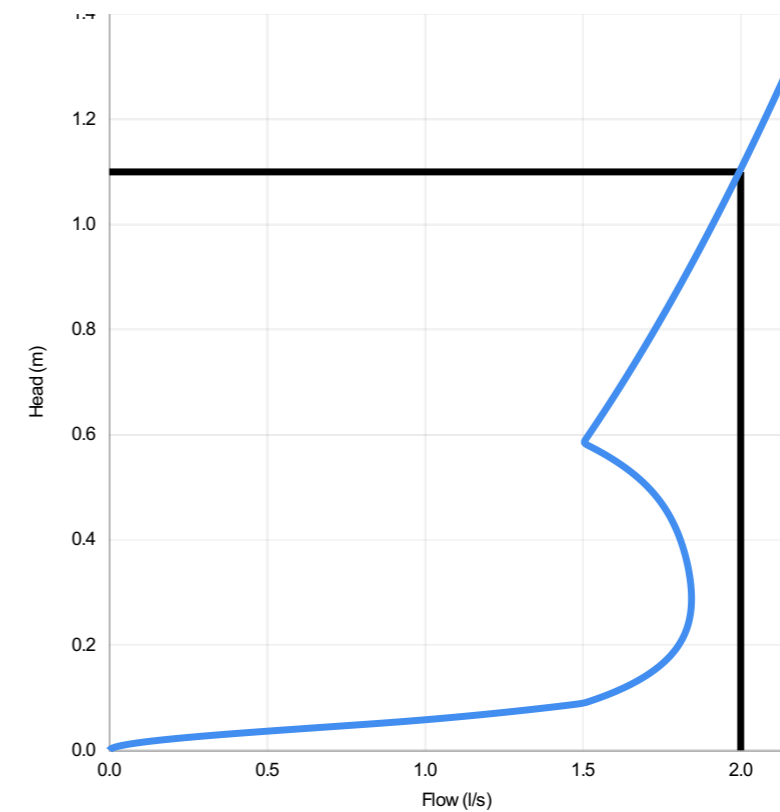
PASS - Infiltration system discharge time less than or equal to 24 hours

APPENDIX F
Data Sheets
Flow control
Attenuation Tank

Technical Specification		
Control Point	Head (m)	Flow (l/s)
Primary Design	1.100	2.000
Flush-Flo	0.289	1.844
Kick-Flo®	0.584	1.500
Mean Flow		1.672



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Head (m)	Flow (l/s)
0.000	0.000
0.038	0.533
0.076	1.308
0.114	1.611
0.152	1.724
0.190	1.791
0.228	1.827
0.266	1.842
0.303	1.843
0.341	1.835
0.379	1.820
0.417	1.798
0.455	1.765
0.493	1.718
0.531	1.649
0.569	1.551
0.607	1.526
0.645	1.568
0.683	1.609
0.721	1.648
0.759	1.687
0.797	1.724
0.834	1.761
0.872	1.797
0.910	1.831
0.948	1.866
0.986	1.899
1.024	1.932
1.062	1.964
1.100	1.995

DESIGN ADVICE The head/flow characteristics of this SHE-0066-2000-1100-2000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.



DATE	16/05/2020 10:04
Site	THWBC
DESIGNER	David Williams
Ref	6838 - SHB32 / 20_21_2439

SHE-0066-2000-1100-2000
 Hydro-Brake Optimum®

Polystorm-R Modular Cell

Data Sheet

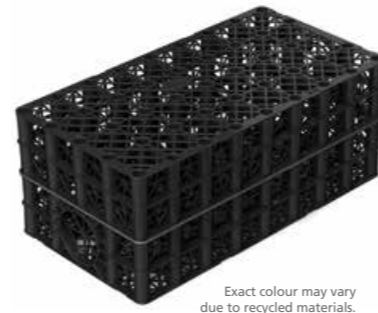
PRODUCT INFORMATION

P1 ISSUE 4 - SEPT 2017

Product code: PSM1A

The Polystorm-R modular cell is ideally suited for loaded applications at greater depths, such as housing, commercial and infrastructure projects and has a compressive strength of up to 61 tonnes/m². It offers all the proven performance of the Polystorm cell, with the added benefits of being manufactured from over 90% recycled material content.

Wherever performance criteria and standards allow, we will always maximise the sustainability of our products by using post consumer plastics in their manufacture. By sourcing and carefully controlling the quality of the recycled material we use our precision injection moulding. Therefore we are able to guarantee consistent quality in our recycled plastic, giving you the confidence and the performance levels you expect from the market leader.



Exact colour may vary due to recycled materials.

Key Benefits

- Made from specially selected and controlled recycled materials
- Environmentally friendly, sustainable solution
- Has undergone stringent testing to ensure product performance
- Compressive strength of 61 tonnes/m²
- Ideal for retention, attenuation and infiltration applications with a suitable geomembrane or geotextile
- BBA approved
- Allow flexibility of shape - ideal for shallow excavation systems, narrow strips or use in restricted areas
- Can be used as part of a value engineered hybrid system with Polystorm, Polystorm Lite and Polystorm Xtra
- Integrated inlet and outlet
- 3D flow throughout the structure
- 95% void ratio
- Light weight yet robust - excellent Health and Safety and installation benefits
- 60 years creep limited life expectancy

Technical Support

Detailed guidance and assistance is available. For further information, please contact our Technical Team on **+44 (0) 1509 615100** or email **civils@polypipe.com**



ELEMENT	VALUE
PHYSICAL PROPERTIES	
Length	1m
Width	0.5m
Depth	0.4m
Total volume	0.2m ³
Unit weight	9kg (approx)
Unit storage volume	0.19m ³ (190 litres)
Void ratio	95%
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	610 kN/m ² **
Lateral	63 kN/m ² **
SHORT TERM DEFLECTION	
Short-term vertical deflection	60 kN/m ² per mm
LONG TERM DEFLECTION	
Estimated long term vertical deflection (creep)	0.2798 Ln (design life in hrs) +0.485 [Based on an applied test load = 162 kN/m ²] Creep data limit 60 years
Estimated long term lateral deflection (creep)	1.0192 Ln (design life in hrs) -3.864 [Based on an applied test load = 30.8 kN/m ²] Creep data limit 60 years

Note: Polystorm-R is ideal for use in trafficked and pedestrian applications subject to a structural design check and suitable installation conditions

* Each unit includes 4 Clips and 2 Shear Connectors.

** Compressive strength at yield, maximum recommended value for design purposes.

Polystorm-R Modular Cell

Data Sheet

PRODUCT INFORMATION

P2 ISSUE 4 - SEPT 2017

RECOMMENDED MAXIMUM DEPTH OF INSTALLATION (to cell invert) [m]

TYPICAL SOIL TYPE	TYPICAL ANGLE OF SHEAR RESISTANCE	SOIL WEIGHT kN/m ³	WITHOUT GROUNDWATER (below base of cells) NORMAL CASE		WITH GROUNDWATER AT 1M BELOW GROUND LEVEL AND UNITS WRAPPED IN GEOMEMBRANE	
			Pedestrian	Trafficked (cars) <3000kg GVW	Pedestrian	Trafficked (cars) <3000kg GVW
Stiff over consolidated clay e.g. London clay	24	20.0	2.2	1.9	1.8	1.6
Normally consolidated silty sandy clay e.g. alluvium, made ground	26	19.0	2.4	2.2	1.9	1.7
Loose sand and gravel	30	18.0	3.0	2.7	2.0	1.9
Medium dense sand and gravel	33	19.0	3.2	2.9	2.0	1.9
Dense sand and gravel	38	20.0	3.7	3.5	2.1	2.0

Note:

1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)

2) Assuming water density = 10.0kN/m³

3) Assumed ultimate limit state (ULS) partial factor of safety applied to: Material = 2.75 Lateral pressure = 1.35

Durability

The polymer material used in the manufacture of the Polystorm-R unit has an adequate resistance to attack from the type and quantities of chemicals that may be expected to naturally occur in uncontaminated soils and rainwater runoff. When installed in accordance with our recommendations, it is expected that the Polystorm-R unit will have a design life in excess of 60 years*. The installer of a proposed geocellular structure should ensure that an appropriate design check has been undertaken, in accordance with the recommended methodology and factors of safety given in CIRIA C680 (2008), Structural Design of Modular Geocellular Drainage Tanks, prior to the commencement of construction activities.

* Derived from long term extrapolated creep testing

Notes

- Unless stated, all values are nominal and may vary within normal production tolerances.
- The characteristic unit parameters stated have been based on Polypipe BBA certificate N° 06/4297, sheet 3.
- Polypipe reserve the right to change product specifications without prior notice.
- This document is uncontrolled and updates will not be issued automatically.

RECOMMENDED MINIMUM COVER LEVELS [m]

LIVE LOAD CONDITIONS	PEDESTRIAN	LIGHT TRAFFICKED	
		Car park with vehicle mass <GVW	
Minimum cover depth required (m)	0.50	<3000kg 0.50	<9000kg 0.65

Note



- Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)
- Assumed serviceability limit state (SLS) partial factor of safety applied to: Material = 1.5 Live load = 1.0 Dead load = 1.0
- Shallower minimum burial depths may be applicable subject to an assessment of the specific site conditions. For further details please consult our Technical Team on 01509 615100.

All descriptions and illustrations in this publication are intended for guidance only and shall not constitute a 'sale by description'. All dimensions given are nominal and Polypipe may modify and change the information, products and specifications from time to time for a variety of reasons, without prior notice. The information in this publication is provided 'as is' on September 2017. Updates will not be issued automatically. This information is not intended to have any legal effect, whether by way of advice, representation or warranty (express or implied). We accept no liability whatsoever (to the extent permitted by law) if you place any reliance on this publication you must do so at your own risk. All rights reserved. Copyright in this publication belongs to Polypipe and all such copyright may not be used, sold, copied or reproduced in whole or part in any manner in any media to any person without prior consent. Polypipe is a registered trademark of Polypipe. All Polypipe products are protected by Design Right under CDDA 1988. Copyright © 2016 Polypipe. All rights reserved.

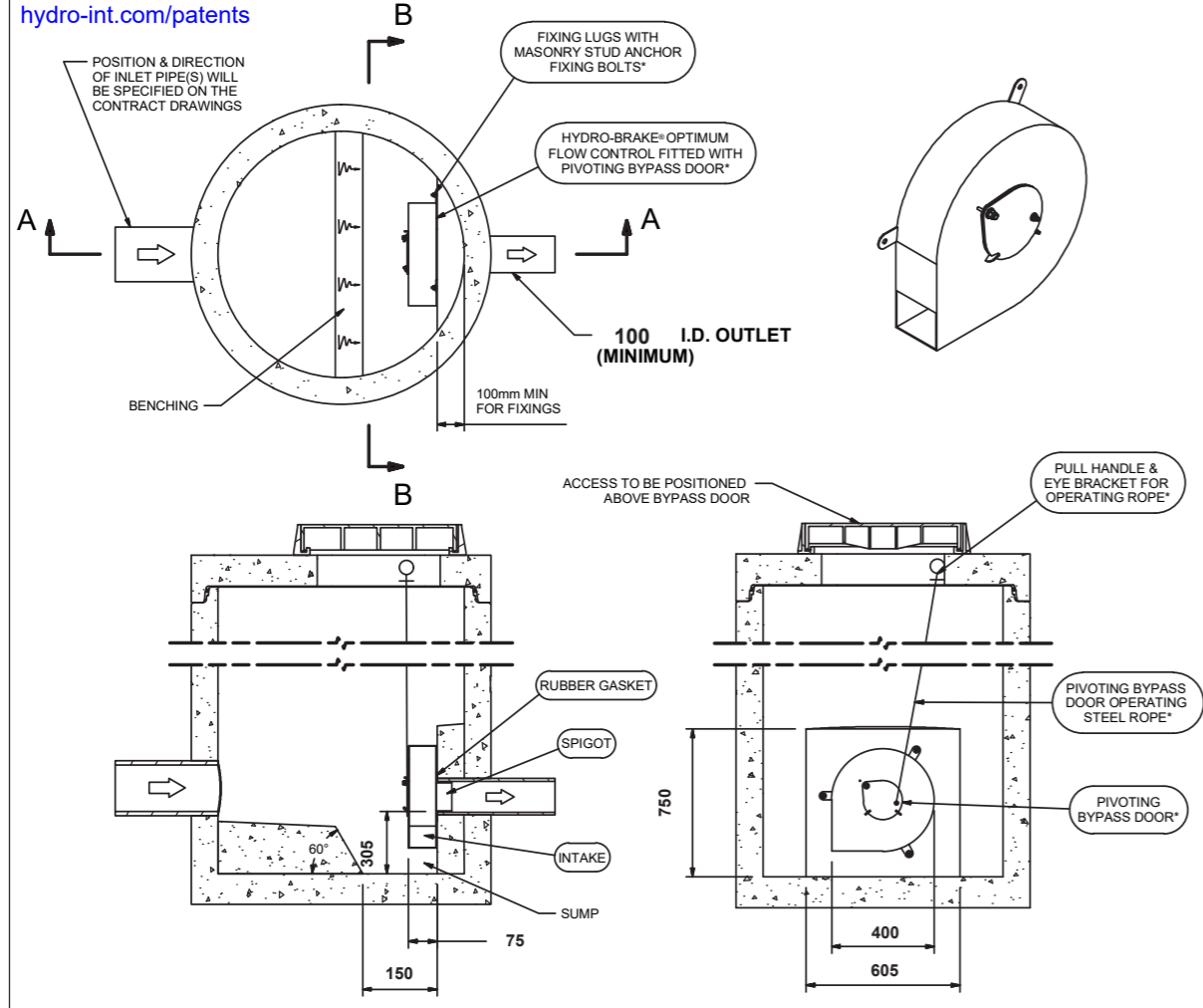
Technical Specification		
Control Point	Head (m)	Flow (l/s)
Primary Design	1.100	2.000
Flush-Flo™	0.289	1.844
Kick-Flo®	0.584	1.500
Mean Flow		1.672

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet





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IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE	The head/flow characteristics of this SHE-0066-2000-1100-2000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.	 SHE-0066-2000-1100-2000 Hydro-Brake® Optimum
DATE	5/16/2020 10:04 AM	
SITE	THWBC	
DESIGNER	David Williams	
REF	6838 - SHB32 / 20_21_2439	

APPENDIX G
Maintenance and inspection checklist

SuDS & Drainage Maintenance Inspection Checklist - 01

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements			
Site ID:	Morrison Hospital - Sub Station	Infiltration Trench /Reference:	
Site Location:	Morrison Hospital - Sub Station		
SuDS /Drainage Element:	Infiltration Trench	Approved Drawing Reference(s):	
Inspection Frequency:	Refer to Maintenance Schedule 01	Approved Specification Reference:	
Nature of Development:	Sub-station	Specific Purpose of Inspected Element:	To allow surface water to infiltrate to ground

Inspection date:				
	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of infiltration trench?				
Is there evidence of silt /debris accumulation at surface level?				
If yes, state nature and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Is there any evidence of physical damage? If so is remedial action required?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

SuDS & Drainage Maintenance Inspection Checklist - 02

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements			
Site ID:	Morrison Hospital - Sub Station	Access Point Location /Reference:	
Site Location:	Morrison Hospital - Sub Station		
SuDS /Drainage Element:	Access Structures /MH's and Inspections chambers	Approved Drawing Reference(s):	
Inspection Frequency:	Refer to Maintenance Schedule 02	Approved Specification Reference:	
Nature of Development:	Sub-station	Specific Purpose of Inspected Element:	To provide access to drainage system

Inspection date:				
	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of access systems?				
Is there evidence of silt /debris accumulation within Manholes or Inspection Chambers?				
If yes, state nature and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Is there any evidence of physical damage? If so is remedial action required?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

SuDS & Drainage Maintenance Inspection Checklist - 03

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements				
Site ID:	Morrison Hospital - Sub Station	Inlet Structure Location /Reference:		
Site Location:	Morrison Hospital - Sub Station			
SuDS /Drainage Element:	Inlet Structure(s)	Approved Drawing Reference(s):		
Inspection Frequency:	Refer to Maintenance Schedule 03	Approved Specification Reference:		
Nature of Development:	Sub-station	Specific Purpose of Inspected Element:	To direct surface water to drainage system	
Inspection date:				
	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of inlet structures?				
Is there evidence of silt /debris accumulation within inlets?				
If yes, state nature and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Is there any evidence of physical damage? If so is remedial action required?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

SuDS & Drainage Maintenance Inspection Checklist - 04

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements				
Site ID:	Morrison Hospital - Sub Station	Cellular tank /Reference:		
Site Location:	Morrison Hospital - Sub Station			
SuDS /Drainage Element:	Cellular Soakaways	Approved Drawing Reference(s):		
Inspection Frequency:	Refer to Maintenance Schedule 04	Approved Specification Reference:		
Nature of Development:	Leisure & Retail	Specific Purpose of Inspected Element:	Storage and infiltration of rainwater	
Inspection date:				
	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of soakaway system?				
Is there evidence of silt /debris accumulation within Catchpit /chambers?				
If yes, state depth (mm) and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of physical damage? If so is remedial action required?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

SuDS & Drainage Maintenance Inspection Checklist - 04

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements			
Site ID:	Morrison Hospital - Sub Station	Detention Basin /Reference:	
Site Location:	Morrison Hospital - Sub Station	Approved Drawing Reference(s):	
SuDS /Drainage Element:	Detention Basin	Approved Specification Reference:	
Inspection Frequency:	Refer to Maintenance Schedule 05	Specific Purpose of Inspected Element:	Control of surface water & pollutant removal
Nature of Development:	Leisure & Retail		

Inspection date:	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of basin?				
Is there evidence of silt /debris accumulation within surface structure?				
If yes, state nature and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Is there any evidence of physical damage? Is there evidence of invasive species? If so is remedial action required?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

SuDS & Drainage Maintenance Inspection Checklist - 06

Refer to Document - 6986-RVW-XX-ZZ-RP-C-00001 - Drainage Management & Maintenance Plan in O&M Manual for Inspection & Maintenance frequency and requirements			
Site ID:	Morrison Hospital - Sub Station	Silt Trap Location /Reference:	
Site Location:	Morrison Hospital - Sub Station	Approved Drawing Reference(s):	
SuDS /Drainage Element:	Silt Traps Catchpits /Sump Units	Approved Specification Reference:	
Inspection Frequency:	Refer to Maintenance Schedule 06	Specific Purpose of Inspected Element:	Sediment /Silt & debris capture/control
Nature of Development:	Leisure & Retail		

Inspection date:	Yes or No?	Details	Action required /Undertaken?	Date Action completed
General inspection items				
Is there evidence of poor performance of Silt traps /Catchpits?				
Is there evidence of silt /debris accumulation within Catchpit chambers?				
If yes, state depth (mm) and extent. Is removal required?				
If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Natural Resources Wales or SEPA)				
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?				
Is there any evidence of any other clogging or blockage of outlets or drainage paths?				
Have any health and safety risks been identified to either the public or maintenance operatives?				
Is there any evidence of physical damage? If so is remedial action required?				
Any other observations? Documents or Photographs appended?				
Suitability of Current Maintenance Regime				
Continue as current? Increase maintenance? Decrease maintenance?				
Proposed Date of next Inspection				

APPENDIX H

SAB Additional Supporting Documentation & Drawings Table
to be included within SAB Submission

Document Reference	Rev.	Description
REPORTS, SPECIFICATIONS & SUPPORTING INFORMATION		
B030182_MORRISTONINFRASTRUCTURE		Tetra Tech, Site Investigation
6986-RVW-XX-ZZ-RP-C-00001		Drainage Strategy and O & M
C6986-RVW-XX-XX-RP-C-FCA01		FCA Report
CALCULATIONS		
C6986 MDSUDS results ka		SUDS Drainage Calculations
C6986 Compound Storm Drainage		Compound infiltration design

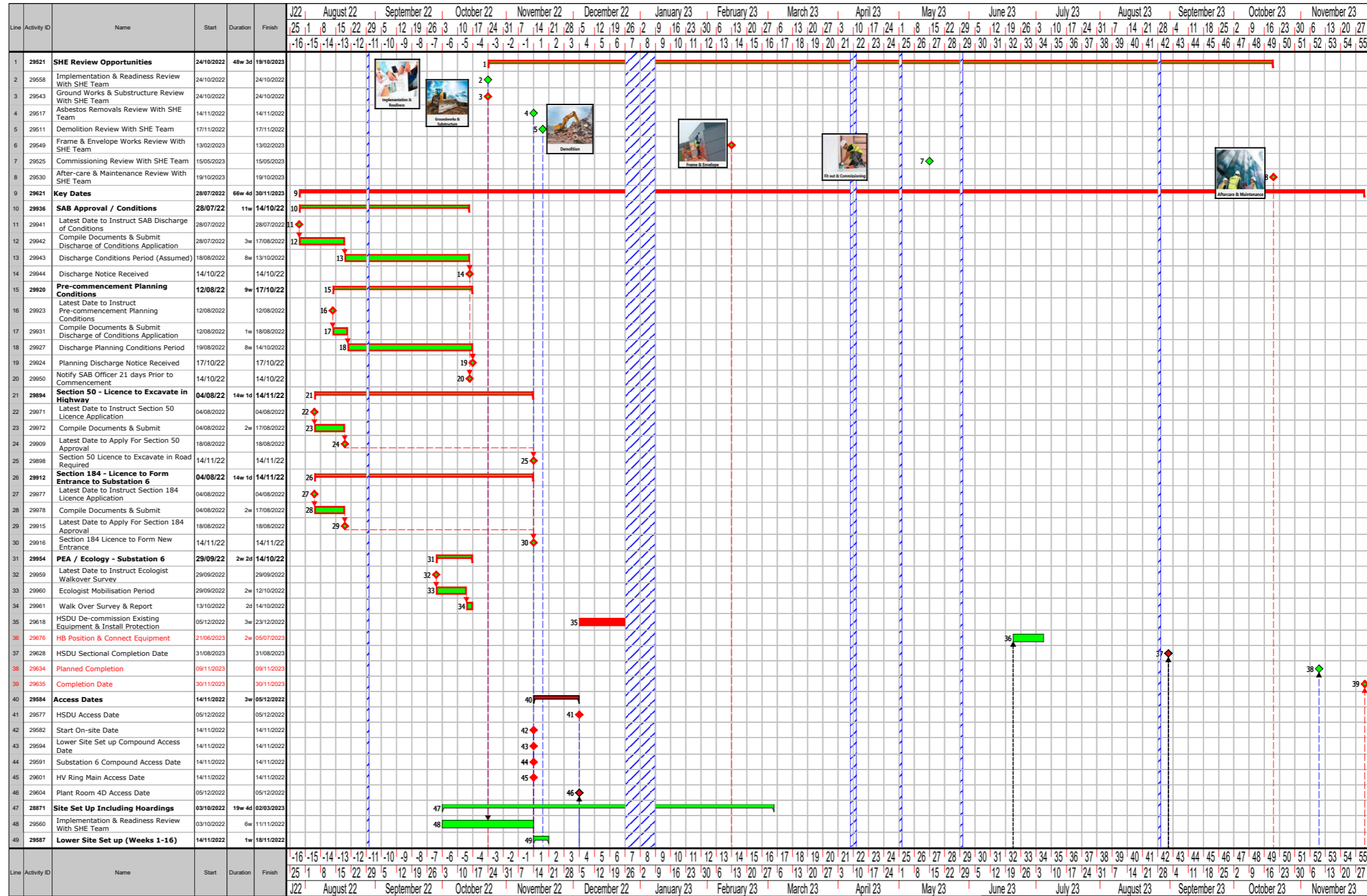
Drawing Reference	Rev.	Description
RVW DRAWINGS		
MHP2-RVW-S6-00-DR-C-000001	C01	Application External Arrangements
MHP2-RVW-S6-00-DR-C-000003	C01	Contractors Compound
MHP2-RVW-S6-00-DR-C-000010	C01	Contractors Compound - Exceedance Plan
MHP2-RVW-S6-00-DR-C-000020	C01	Details Sheet
MHP2-RVW-S6-00-DR-C-000021	C01	Drainage Detail Sections - Sheet 1 of 3
MHP2-RVW-S6-00-DR-C-000022	C01	Drainage Detail Sections - Sheet 2 of 3
MHP2-RVW-S6-00-DR-C-000023	C01	Drainage Detail Sections - Sheet 3 of 3
MHP2-RVW-S6-00-DR-C-000024	C01	Site Exceedance Plan
MHP2-RVW-S6-00-DR-C-000025	C01	Drainage Areas
MHP2-RVW-S6-00-DR-C-000030	C01	Longitudinal Sections
MHP2-RVW-S6-00-DR-C-000101	C01	External Works Layout and Details
MHP2-RVW-S6-00-DR-C-000200	C01	Drainage & SuDS Asset Management and Maintenance Plan

MORRISTON HOSPITAL - INFRASTRUCTURE WORKS

7A: PROGRAMME

SBUHB - MORRISTON HOSPITAL

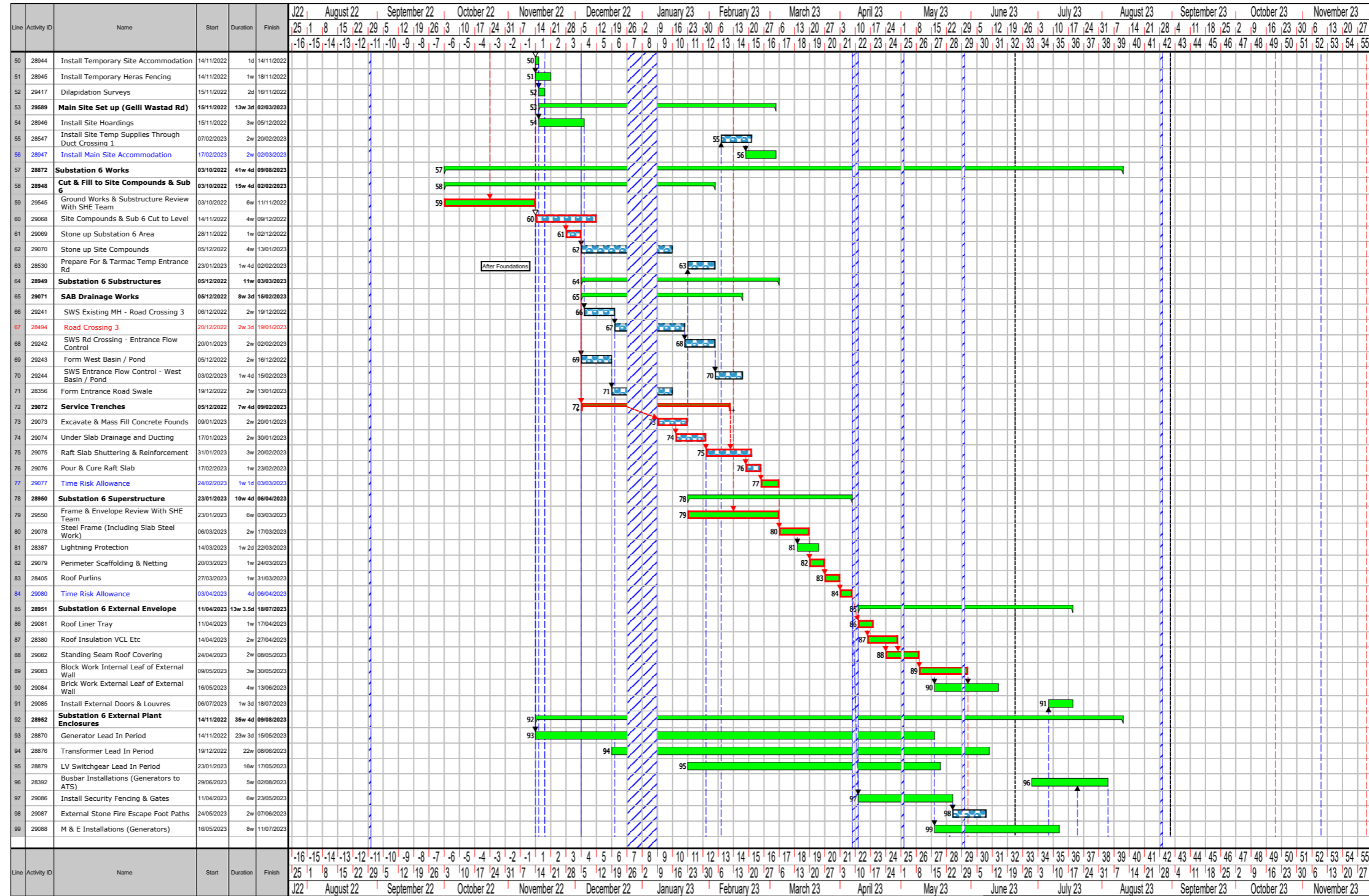
Conway House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY



Programme Issue Date:	04/11/2020	Stage 4 Draft Construction Programme	Programme Revision & Date:	Rev: K 29/06/2022
Drawn by:	CH		Page Number:	1 of 5
			Programme Reference:	N2104/FBC

SBUHB - MORRISTON HOSPITAL

Conway House
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St Mellons
Cardiff
CF3 0EY

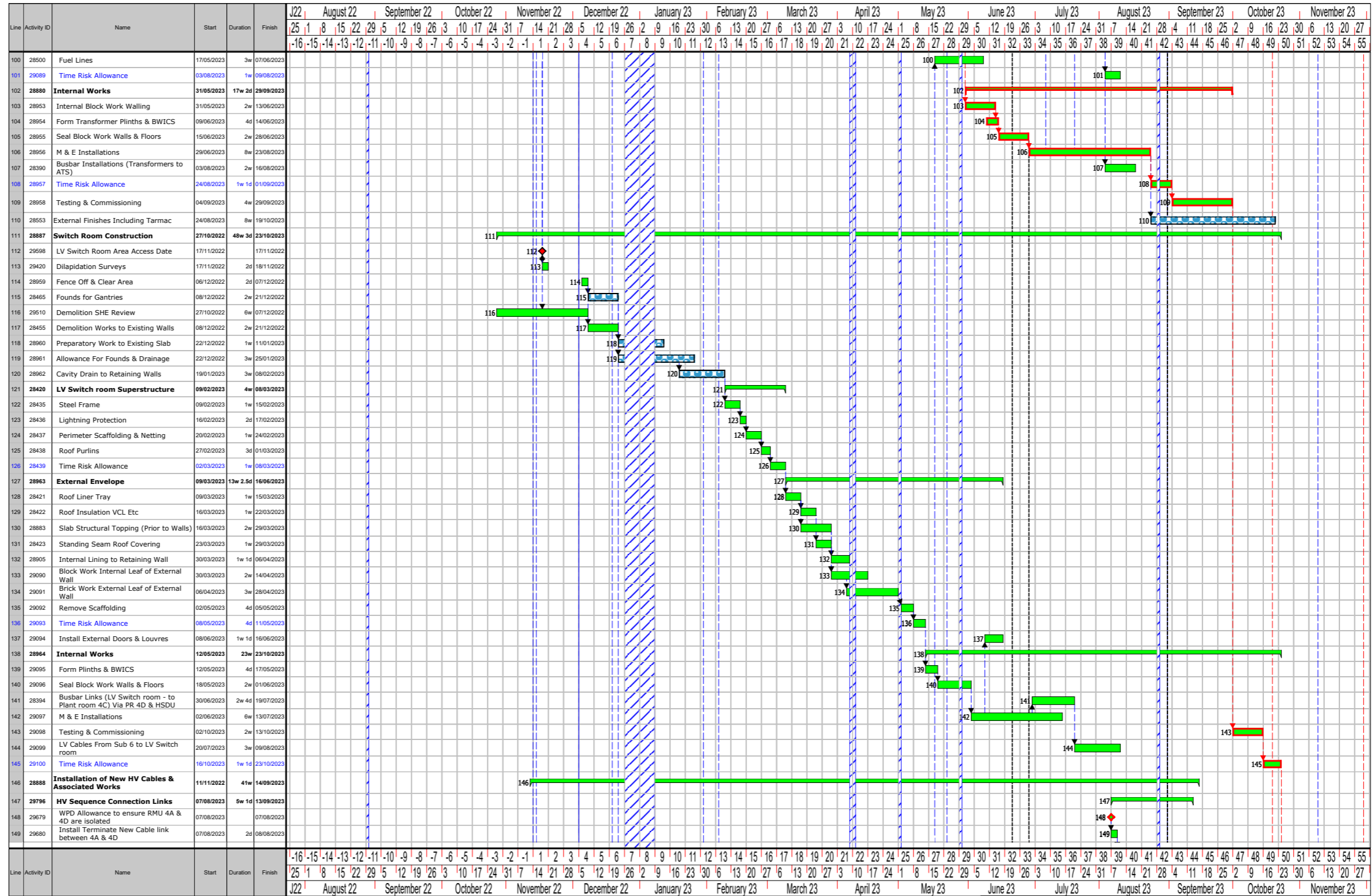


Programme Issue Date:	04/11/2020	Programme Revision & Date:	Rev: K 29/06/2022
Drawn by:	CH	Page Number:	2 of 5
		Programme Reference:	N2104/FBC

Stage 4 Draft Construction Programme

SBUHB - MORRISTON HOSPITAL

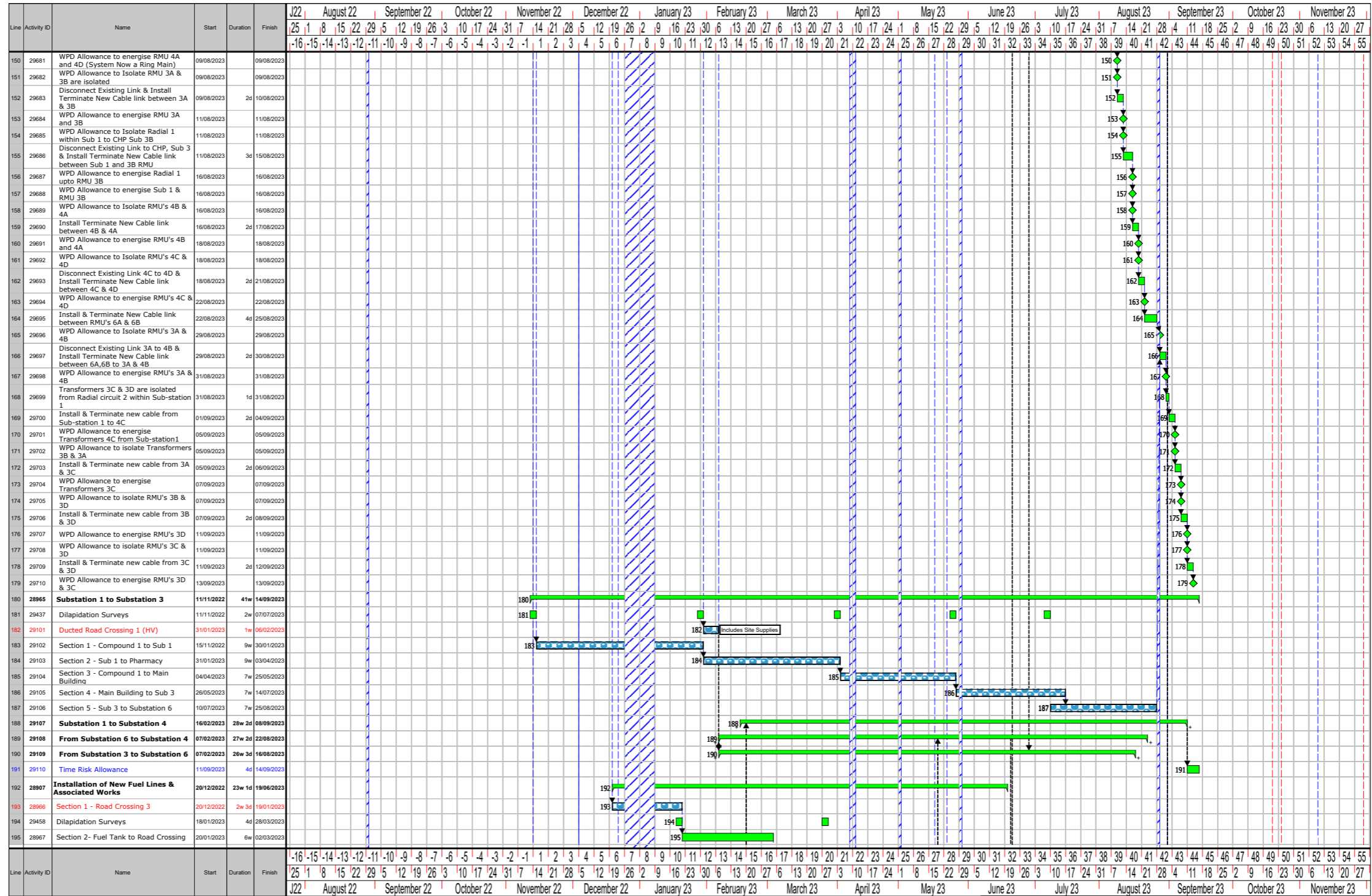
Conway House
St Mellons Business Park
St Mellons
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Programme Issue Date:	04/11/2020	Stage 4 Draft Construction Programme	Programme Revision & Date:	Rev: K 29/06/2022
Drawn by:	CH		Page Number:	3 of 5
			Programme Reference:	N2104/FBC

SBUHB - MORRISTON HOSPITAL

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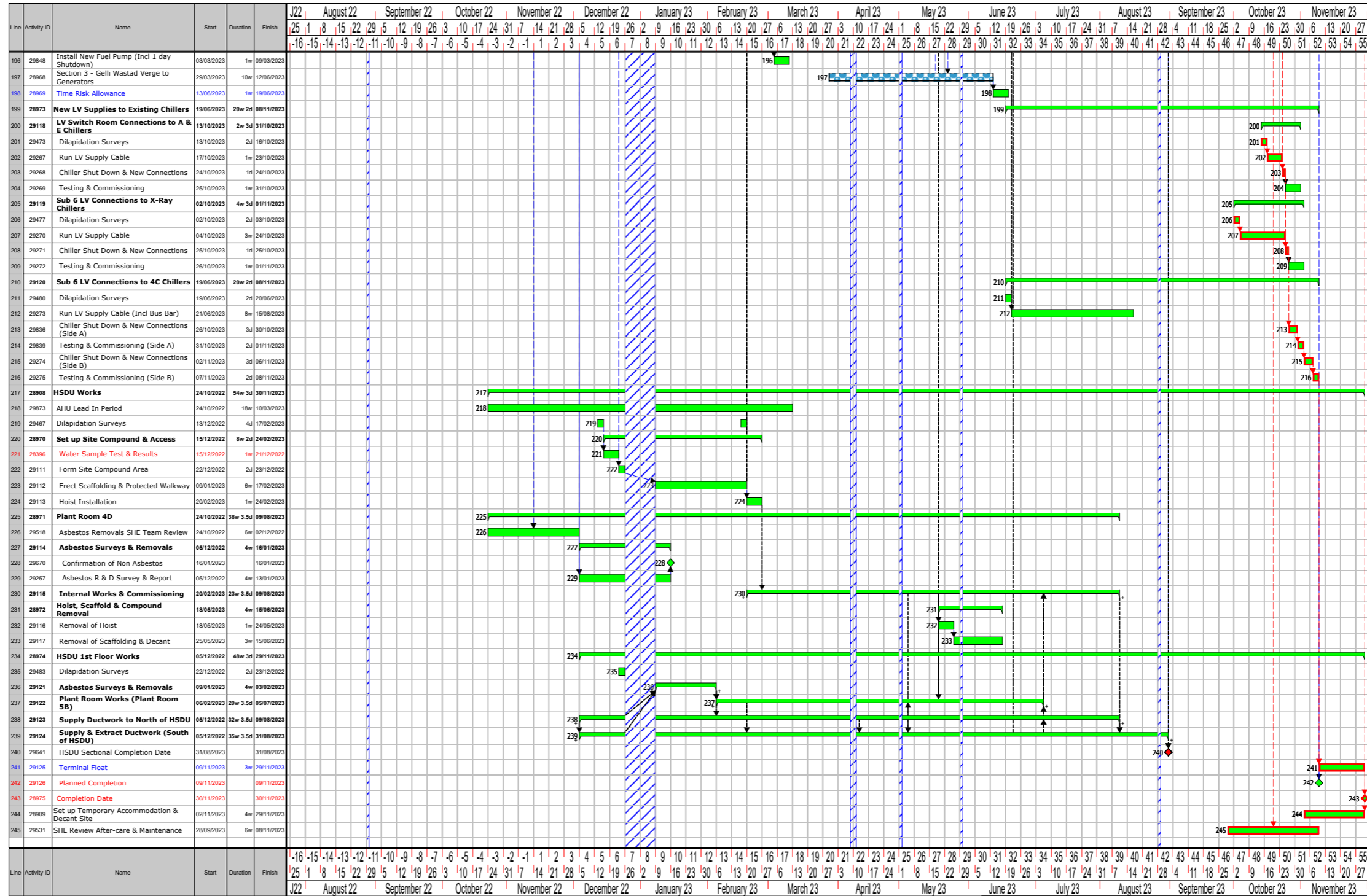
Programme Issue Date:	04/11/2020	Stage 4 Draft Construction Programme	Programme Revision & Date:	Rev: K 29/06/2022
Drawn by:	CH		Page Number:	4 of 5
			Programme Reference:	N2104/FBC



Kier Construction

SBUHB - MORRISTON HOSPITAL

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St Mellons Business Park
St Mellons
Cardiff
CF3 0EY



Programme Issue Date:	04/11/2020	Stage 4 Draft Construction Programme	Programme Revision & Date:	Rev: K 29/06/2022
Drawn by:	CH		Page Number:	5 of 5
			Programme Reference:	N2104/FBC

Morrison Hospital

Shutdown Schedule

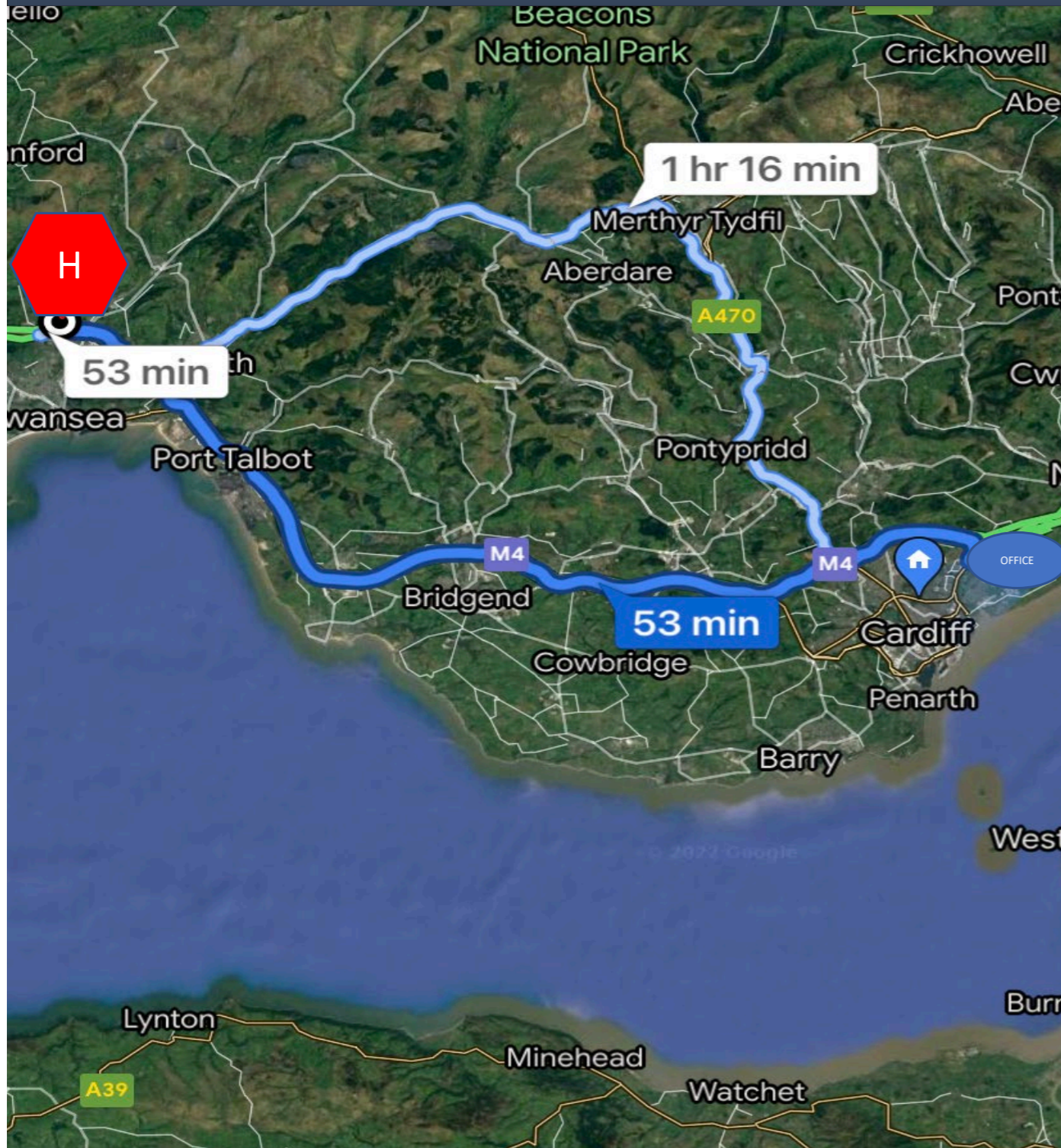


Activity	Estimated Number of Days Required	Programme Requirements	Impact	Estates Comments
Transformer Change over	26 days to complete full change once cables installed (1day per connection to minimise impact)	Included & Detailed on Programme as WPD Requirements	WPD to assist in shutting RMU to allow safe connection	
Busbar Connections to 4C Panel (Chiller Side A)	3 days for connection to 4C panel from SS6 6A (2 Days Testing)	Included in Programme	One panel to be shut down at any one time.	
Busbar Connections to 4C Panel (Chiller Side B)	3 days for connection to 4C panel from SS6 6B (2 Days Testing)	Included in programme	One panel to be shut down at any one time.	
Existing AHU within Plantroom 5B	Possibly 2-4 week as services will need to be isolated and re-routed to allow new installation of HSDU AHU to avoid trap door	Included in Programme	Areas served by AHU will be affected	
Compressor pipework within Plant room 5B	2-3days to be relocated around new external louvre installation	included in Programme	Areas served by compressed air will be affected	
New Oil Pump	Electrical connection 1 day	included in programme	Shutdown required to connect into existing Distribution Board within STEAM plantroom	
LTHW (Pumpset)	Remodification to existing pipework (3days)	Included in programme	Areas served by LTHW will be affected	
CHW (Pumpset)	Remodification to existing pipework (3days)	Included in Programme	Areas served by CHW will be affected	
Steam	Connection onto Valve	included in programme	Connection onto existing valve might not be suitable	
Medical Gases to HSDU (Potential requirement)	Unkown until ceilings are removed within sterilization equipment	Not included on Programme	Cannot be detrmind until ceiling have been removed.	
Fire Smoke Damper removal to HSDU	From survey dampers are within HSDU area	No programme requirements	Existing panel might supply outside of HSDU area (Risk)	
BMS Panel 4D	Modification works for new AHU (unknown if feeding outside HSDU)	included in programme	Areas served by BMS panel will be affected	
Commissioning AHU 4D (Pressure Relief Dampers)	Ventilation System is commissioned week 1 / 2 and then we need 1 week to carry out the positive pressure dampers to the rooms	included in programme	Limited access weeks 1 and 2. No access to the rooms in week 3 of commissioning programme	
Commissioning AHU 5B (Pressure Relief Dampers)	Ventilation System is commissioned week 1 / 2 and then we need 1 week to carry out the positive pressure dampers to the rooms	included in programme	Limited access weeks 1 and 2. No access to the rooms in week 3 of commissioning programme	
Chiller Shutdown to Mechanical Panel Board (X-Ray Chillers)	1 day to isolate connect and re-energise (Ensure cable is terminate	included in programme	X-Ray Chillers	
Chiller Shutdown to Mechanical Panel Board (A&E Chillers)	1 day to isolate connect and re-energise (Ensure cable is terminate in new board first)	included in programme	A& E Chillers	

MORRISTON HOSPITAL - INFRASTRUCTURE WORKS

8A: LOGISTICS

Morrison Hospital Swansea Bay UHB



KEY



Kier Cardiff, Conway House, St Mellons Office, CF3 0EY



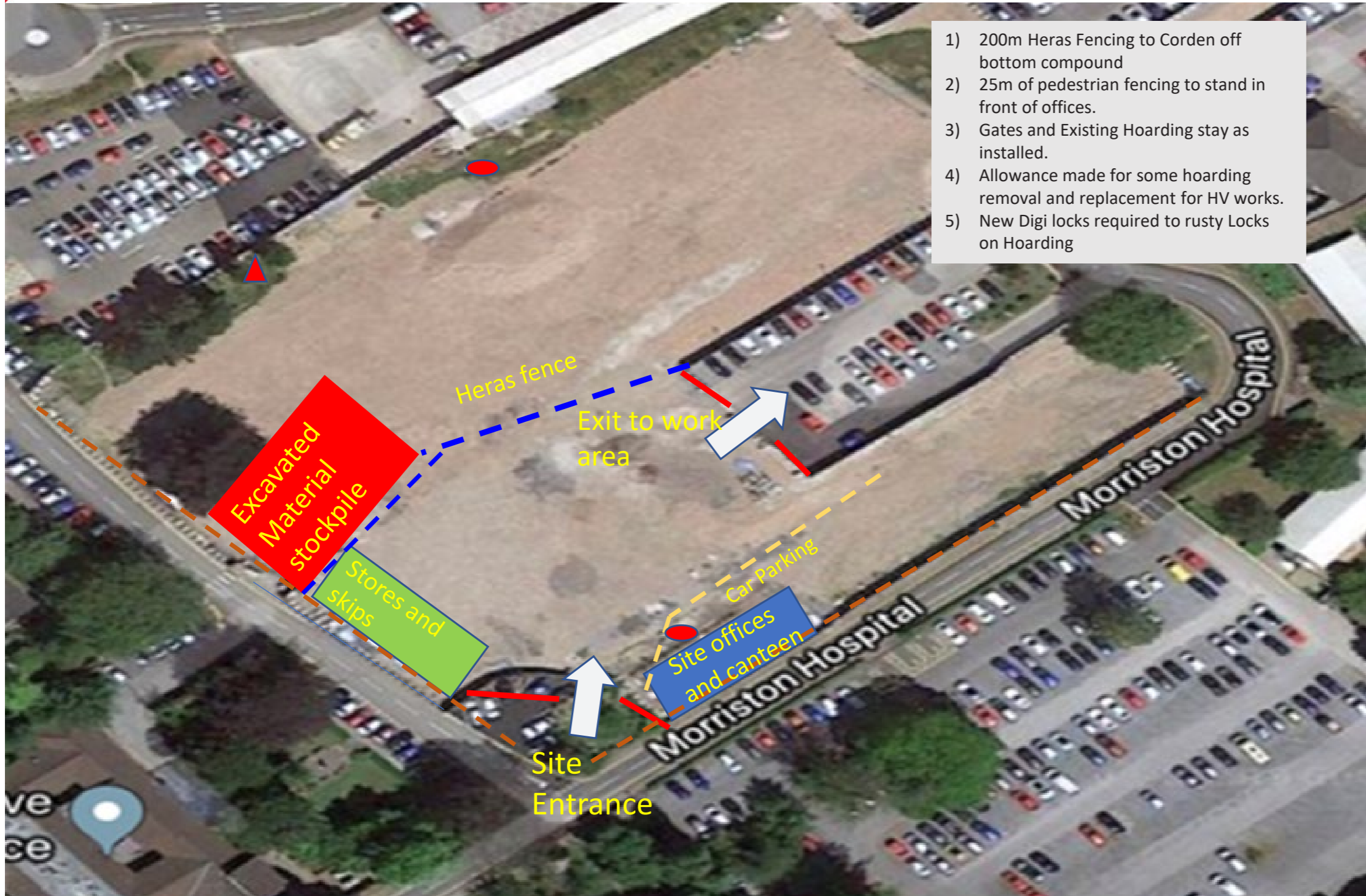
Morrison Hospital Heol Maes Eglwys, Morrison SA66NL

By Car 53 min (48 miles)

Cycle 5 Hour



Initial Temporary site set up weeks 1-16

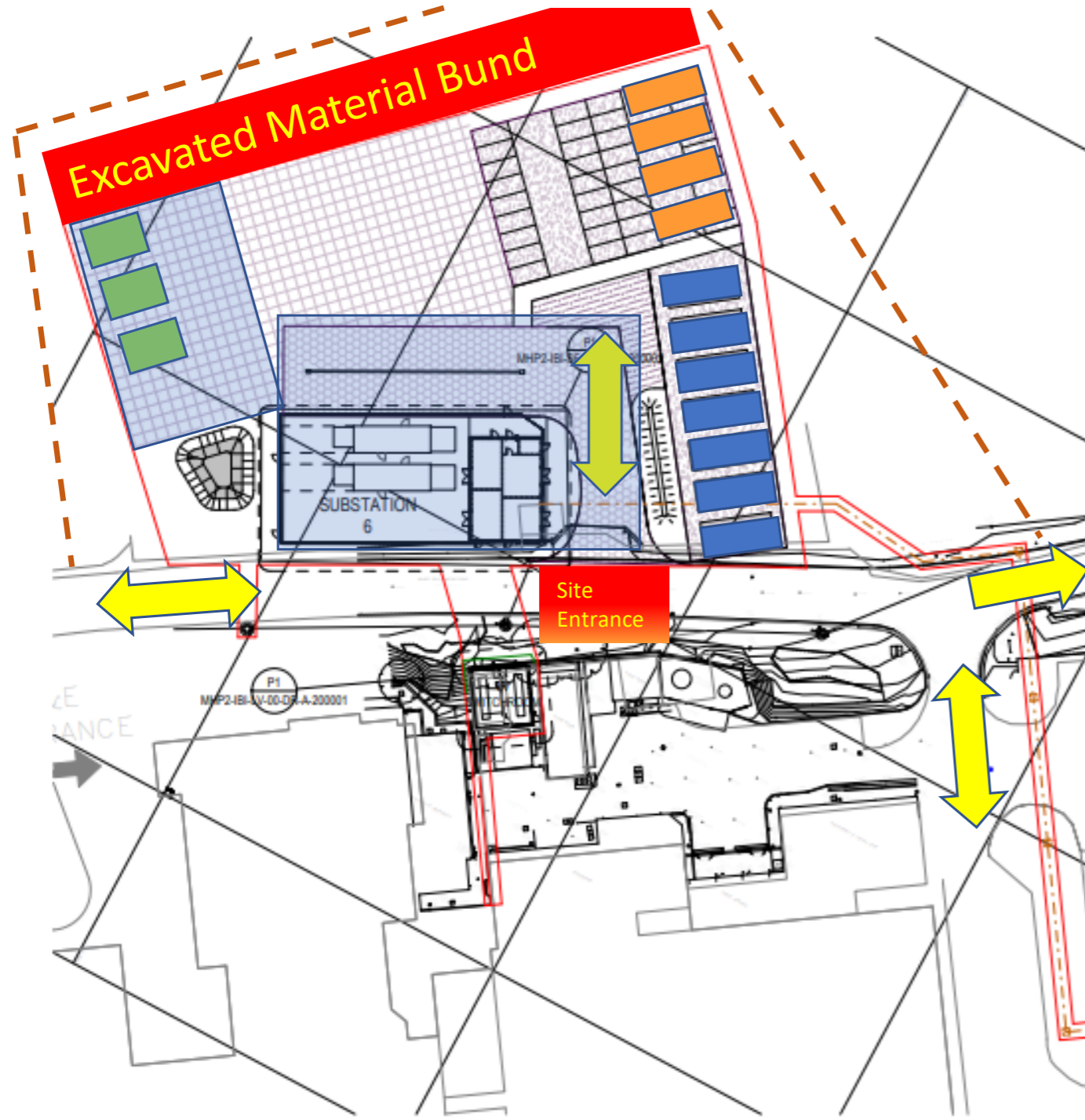


- 1) 200m Heras Fencing to Corden off bottom compound
- 2) 25m of pedestrian fencing to stand in front of offices.
- 3) Gates and Existing Hoarding stay as installed.
- 4) Allowance made for some hoarding removal and replacement for HV works.
- 5) New Digi locks required to rusty Locks on Hoarding

Previous Services connections all in place and in working order. Steve Williams and Richard Bunn checked on 02/11/2021.

- Electrical connection made to top of bank.
 - Water and foul connections in immediate location to the existing building location.
 - Existing Hoarding Line
 - Temporary Heras Fence line
- Set up to be installed as previous Kier Compound Arrangements.
- 1x office
 - 1x meeting room
 - 1x toilet shower drying room facility
 - 1x Canteen
 - 1x stores

Main site set up weeks 15-56



Prelim Allowance

- 1) Cattle Fence installed as part of Ecology works 101m
- 2) Heras Fencing/ v beam to 3 sides 220m required
- 3) Solid plastic hoarding to be installed to front elevation and gate returns 90+14m once Ecology works are complete.
- 4) New big steel gates 6m ETS or similar
- 5) Pedestrian Barrier 60m Electrical trenching on slab and building cordoning
- 6) Red Hoops x6 No. Restricted access to trenches.
- 7) Saw Tooth Hoarding in front of Cabins 30m Timber hoarding
- 8) 40M Heras to cordon off Car parking and Skips.
- 9) Electrical LV Switch room works
- 10) 40m Heras
- 11) 10m MASS Barrier in front of scaffolding
- 12) Hoard it system 12m in front of scaffolding including pedestrian and vehicle gate.
- 13) 35m Of protection Hoarding for Staff access around loading scaffold (Green) Both Sides and above. (Lighting)
- 14) Plyboard Loading bay area for protection and pallet truck above.
- 15) Pharmacy Hoist Area
- 16) 25M of Heras and Heras gate.
- 17) HV Trenching 250m Hits
- 18) 250m of mass barrier and 250m of heras per length.
- 19) 8 jointing bays 64 Mass panels
- 20) Fork lift
- 21) Red Hoops

Services connections



Electrical connection made once road crossings have been installed



Water connections made once road crossings have been installed.

Foul connection to Tank ??

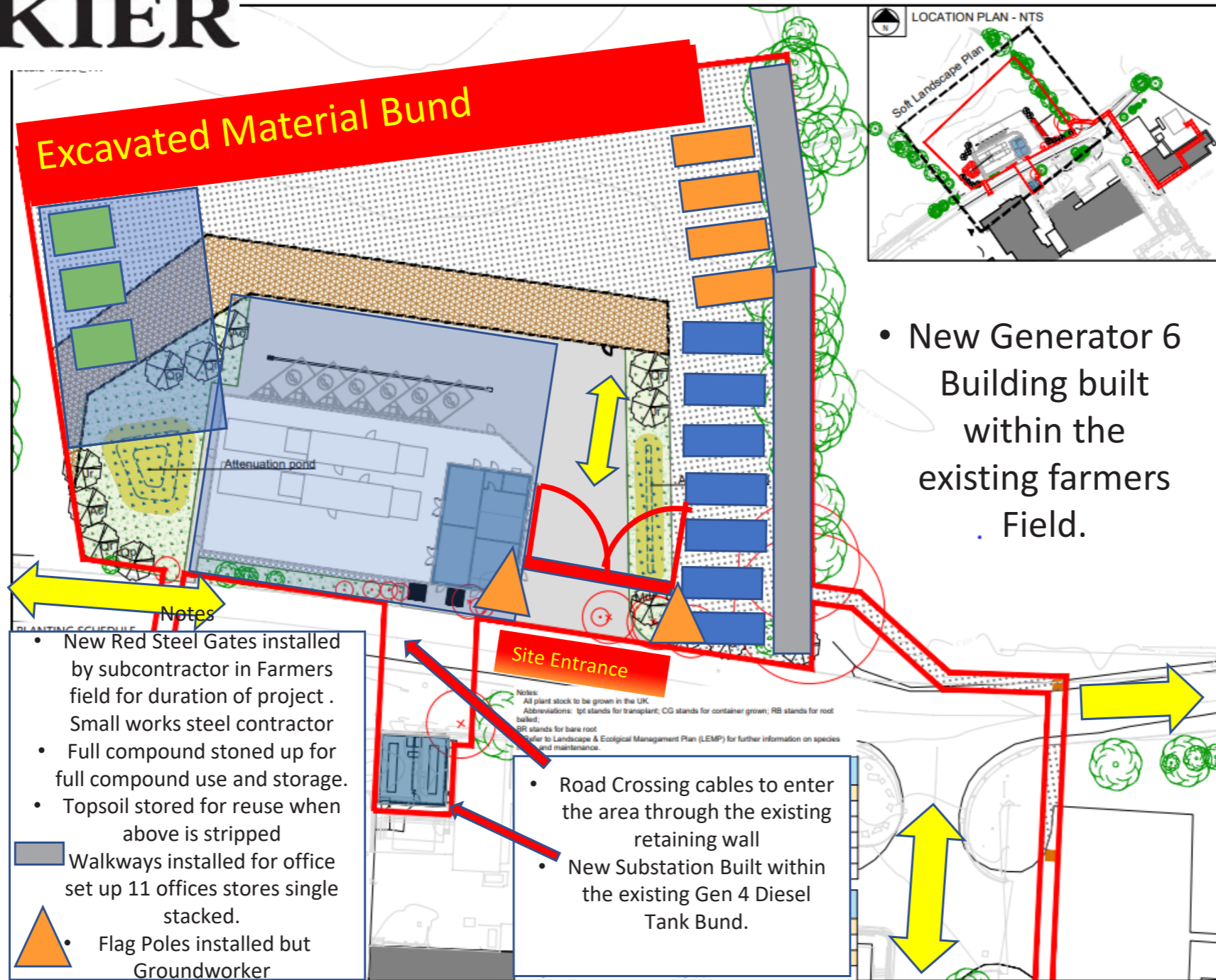
— New Hoarding / Fence Line
 — Temporary / permanent V Mesh
 — TBC

--- Temporary Heras Fence line

- Subcontractor store and Office.
- Recycling Zone and Refuelling area
- Kier Compound Arrangements.
 2x office
 1x meeting room
 2x Canteen
 1x toilet shower
 1x drying room facility
 1x stores



Main site set up Prelim provision weeks 15-56



Services connections



Electrical connection made once road crossings have been installed



Water connections made once road crossings have been installed.
 Foul connection to Tank ??



New Hoarding / Fence Line
 Temporary / permanent V Mesh
 TBC



Temporary Heras Fence line



Subcontractor store and Office.



Recycling Zone and Refuelling area



Kier Compound Arrangements.

2x office

1x meeting room

2x Canteen

1x toilet shower

1x drying room facility

1x stores

Main site set up weeks 15-56



Morrison Infrastructure Project Early infrastructure works February 2022



Proposed Tree
Removal to Crossing 1

Proposed shrub
Removal

Proposed Tree
Removal