SCIENCE MUSEUM GROUP

Building ONE | The Science Museum Group at Wroughton | December 2017

Drainage Strategy

Building ONE, The Science Museum Group at Wroughton

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Science Museum Group

5161116-ATK-ZZ-XX-RP-C-110

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Document history

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Table of contents

Tables

No table of figures entries found.

Figures

Executive summary

The former RAF Wroughton airfield in Wiltshire is owned and occupied by the Science Museum Group, which uses the former aircraft hangers for storing objects in their collection. It is proposed to construct a large portal framed unit of footprint of 27,000m^2, referred to as Building ONE. This report has been prepared to outline the engineering strategy to cater for the surface and foul water discharges that will be generated by this development.

The former airfield lacks engineering infrastructure to support the proposed development, however the site geology is suitable for soakaway drainage to be employed. It is proposed that infiltration drainage trenches are provided parallel to either side of the long elevation of the building. These would be located sufficiently away from the building to reduce the risk from solution features being created that would be a risk to the foundations.

Similarly there is no foul drainage provision in this part of the airfield. Despite its size, the building will have a relatively low population of the building, that would permit a septic tank or similar treatment plant to be used. Such a feature would also require a small soakaway drainage field for the treated water to be discharged.

1. Introduction

The former RAF Wroughton airfield in Wiltshire is owned and occupied by the Science Museum Group, which uses the former aircraft hangers for storing objects in their collection. This report has been prepared to outline the engineering strategy to cater for the surface and foul water discharges that will be generated by this development.

The SMGW occupies a former RAF airfield base in Wiltshire, which uses the former aircraft hangars for storing objects in their collection. SMG will construct a large portal framed unit of approximate size 27,000m^2 to accommodate the collection within a single building. The development footprint of Building ONE is located in the northern half of the SMGW's site and occupies a parcel of managed grassland located between the taxiways and runways.

Initially, the area of land to the west of Building ONE had been identified for the potential use as a surface water drainage field, however the general site topography has eliminated this from further consideration. The building shall be capable of being accessible by large delivery vehicles that shall reverse into the building. Level access is therefore essential between existing and proposed features.

The central airfield has a large solar farm array constructed to the south of the east/west runway. To the north of this runway, the airfield remains largely undeveloped save for three hangers that are located to the north of the perimeter distributor road.

2. Site Topography

A topographical survey of the site area to the north of runway B was prepared by SUMO Services Ltd in October 2017.

An area of land to the west of Runway A had been identified as a potential location for soakaway drainage – either in buried tanks or surface ponds. However, the level of the site to the west of Runway A increases to an approximate level of 197.80, some 2.3m higher than the proposed finish floor level of the One Collection building. Drainage in this location is approximately 280m away from the building.

3. Existing Service Provision

Enquiries with the statutory undertakers have been carried out. The returned information indicates that there is no drainage (surface or foul) provision near to Building ONE. The statutory undertakers have no information concerning private services that may be present across the site.

Site observation indicates that the runways are provided with a stone channel and gullies along their length. It is likely that these drain to catch pits or other soakaways.

4. Site Geology

Atkins have prepared a desktop geotechnical/geo-environmental assessment of the site. Report 5161116-ATK-ZZ-XX-RP-G-0102 refers.

An intrusive site investigation of the airfield has not yet been carried out for this project.

However, the geology is understood to comprise topsoil directly overlying chalk material that extends to depth. The chalk material is likely to be suitable for soakaway drainage.

5. Surface Water Drainage Strategy

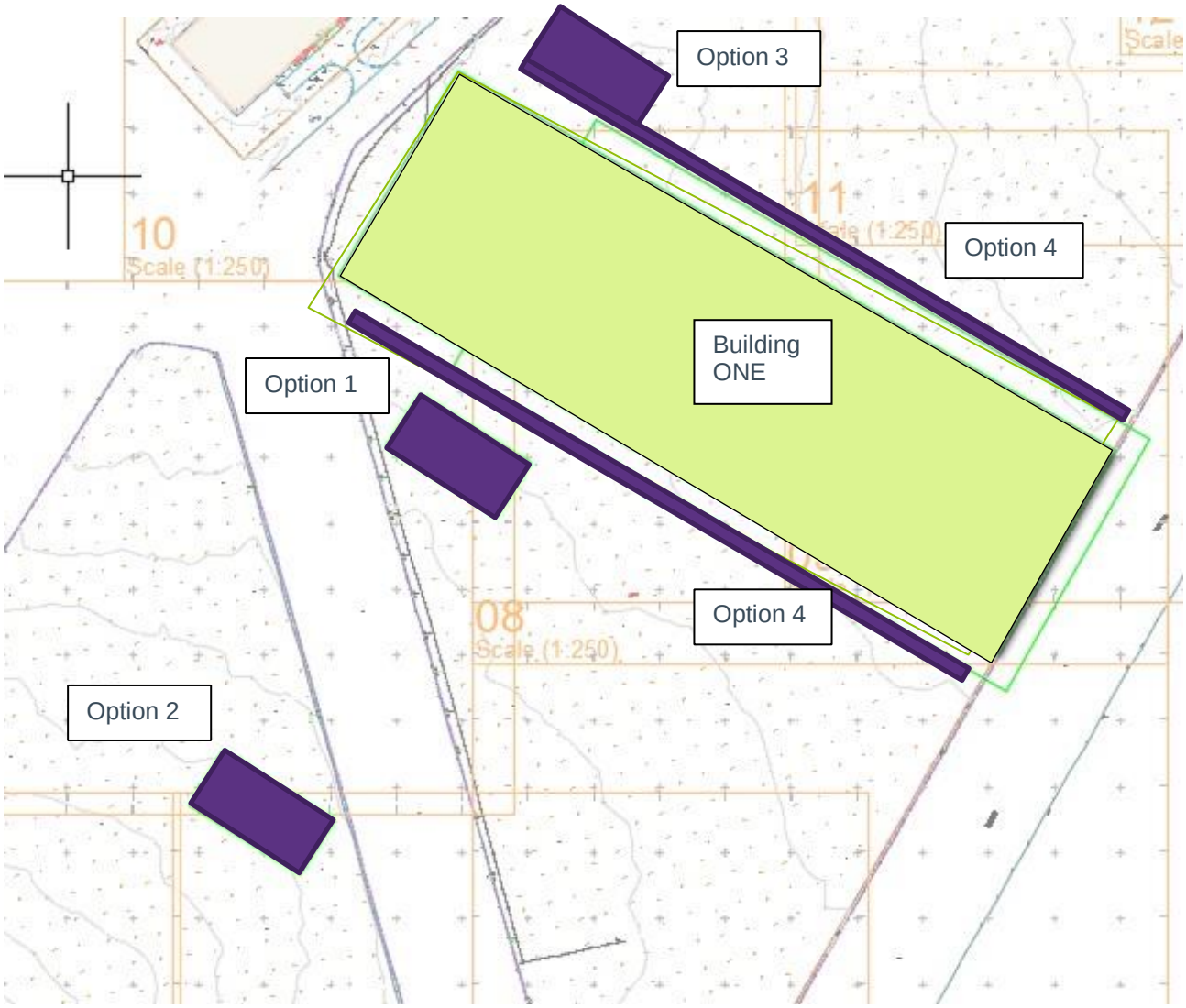
Due to the lack of surface water drains near to the site, combined with our understanding of the underlying geology, it is proposed to use soakaway drainage for the development. The intrusive site investigation has yet to be completed, however, once received this drainage strategy shall be reviewed to determine its true parameters.

Based on the area of the building and a conservative value for the permeability of the chalk material an initial attenuation volume of 2,635m^3 has been calculated. This volume could be achieved with an attenuation feature of size 50 x 35 x 1.5m. Consideration has been given to a variety of solutions, below, and also the use of a pond. However simple ponds are unlikely to store water in dry periods and are not a natural feature of the chalk downs.

There are several options available for the attenuation, shown below

Option	Pro	Con
1 & 3	• Close to building – short runs of drainage, minimising depth of excavation • Relative level difference is low	• Maintenance of buried tanks would be difficult
2	• Located further away from building that would not impinge on future development.	• Located approximately 250m away from building (furthest point). At 1 in 70 a pipe would fall 3.6m • Relative level difference is large • Deep excavations circa 7m deep. • Difficult to maintain
4	• Long linear features • Shallow excavation • Easy to maintain	• May restrict future access to the building.

Figure 5-1 Surface Drainage Options



There are alternatives to the single tank option, namely:

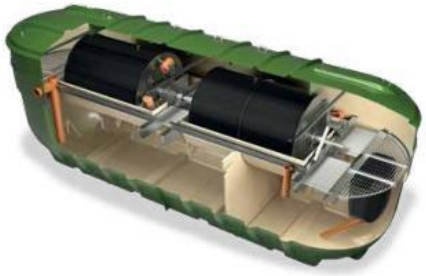
- Alternative 1: Splitting the tanks – providing one tank to each side of the building could be beneficial. This would reduce the requirement for deep excavations, but would potentially add maintenance difficulties.
- Alternative 2: a longer linear feature for the tank either side of the building. A tank 2.5x180x1.5m may be suitable. This is shown in the diagram above as Option 4.
- Alternative 3: similar to (2) above, but using swales instead of tanks. Key to this consideration will be the relative fall from the building to the swale.

Surface water drainage to the runways is not proposed to be modified with the exception of the area directly in front of the ONE Building, where local ground levels are likely to be modified for suitable pedestrian and vehicle access to tie in with the building's finished floor level.

6. Foul Water Drainage Strategy

There is no foul drainage provision in this part of the airfield. Due to the relatively low population of the building, a septic tank or similar treatment plant would be suitable. Based on a staff population of 20 plus a visiting group of 30, a septic tank of size 4.0x2.5x2.5m is likely to be suitable. This would also need an associated drainage field to offer soakaway drainage from the tank for the treated water.

The example shown below is a Kingspan Klargester BioDisc sewage treatment, that has been developed for



Klargester BioDisc Commercial Treatment Plant

commercial type developments. The tank comprises a rotating drum that separates solid from liquid waste and would require an electrical supply and connection back to the building management system. Alternatively non mechanical separator tanks (BioFicient) are available but are longer (up to 12m in length).

We propose **Biodisc tank** be used as it has a number of advantages over the non mechanical tank, namely:

1. It does not require the installation of air compressor (the air is provided by rotating the disc) – silent operation
2. The biofilm developed on the disc is a more robust biological structure than the suspended one (Bioficient) : the biology inside the tank is sustained using the waste provided by the users (exreta). The tank is selected based on a peak design population and therefore the system will be underloaded under normal daily conditions. The attached growth biology configuration is in general more resilient under these conditions than the suspended one.
3. Lower power supply requirements (115W vs 75W) – lower running costs
4. Smaller footprint (2450mmx2450mm vs 1920mmx4390mm – area ratio ~1:2)

The tank would require a drainage field within which to discharge the treated effluent water. This has been preliminary sized as comprising 3no stone filled manhole rings 1.5m in diameter and 1.5m deep.

7. Conclusion

Surface Water

Infiltration drainage systems will be located close to Building ONE and sized according to the footprint of the building and permeability of the geology.

Foul Water

Biodigester drainage system size appropriately for the users of the building will be located close to the building with clean effluent discharged to soakaway.

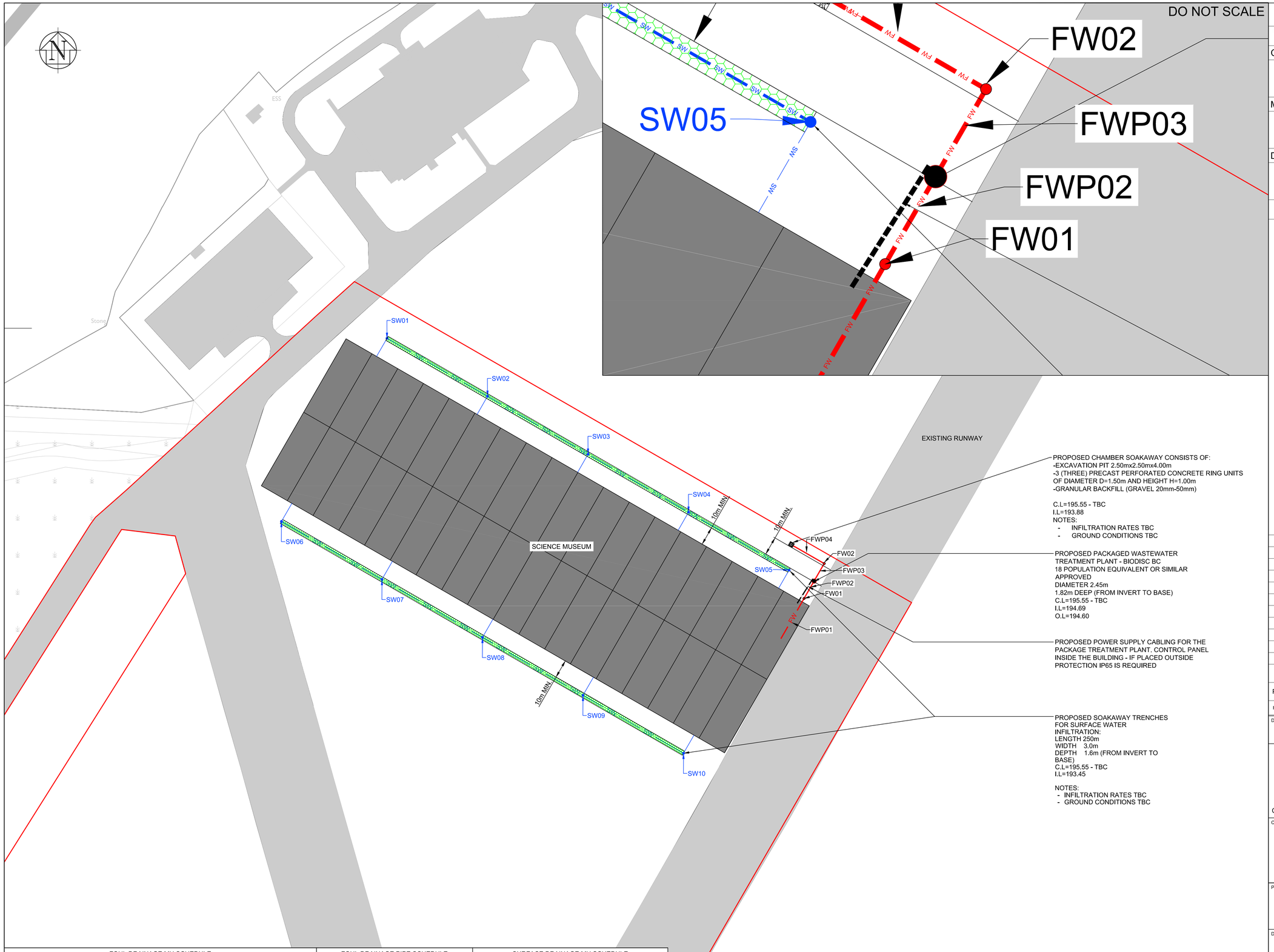
Appendices

Appendix A. Drainage Strategy Drawing

- 5161116-ATK-ZZ-ZZ-DR-C-0200

DO NOT SCALE

Millimetres 0 10 100



PROPOSED CHAMBER SOAKAWAY CONSISTS OF:
-EXCAVATION PIT 2.50mx2.50mx4.00m
-3 (THREE) PRECAST PERFORATED CONCRETE RING UNITS OF DIAMETER D=1.50m AND HEIGHT H=1.00m
-GRANULAR BACKFILL (GRAVEL 20mm-50mm)

C.L=195.55 - TBC
I.L=193.88
NOTES:
- INFILTRATION RATES TBC
- GROUND CONDITIONS TBC

PROPOSED PACKAGED WASTEWATER TREATMENT PLANT - BIODISC BC
18 POPULATION EQUIVALENT OR SIMILAR APPROVED
DIAMETER 2.45m
1.82m DEEP (FROM INVERT TO BASE)
C.L=195.55 - TBC
I.L=194.69
O.L=194.60

PROPOSED POWER SUPPLY CABLING FOR THE PACKAGE TREATMENT PLANT, CONTROL PANEL INSIDE THE BUILDING - IF PLACED OUTSIDE PROTECTION IP65 IS REQUIRED

PROPOSED SOAKAWAY TRENCHES FOR SURFACE WATER INFILTRATION:
LENGTH 250m
WIDTH 3.0m
DEPTH 1.6m (FROM INVERT TO BASE)
C.L=195.55 - TBC
I.L=193.45

NOTES:
- INFILTRATION RATES TBC
- GROUND CONDITIONS TBC

FOUL DRAINAGE MH SCHEDULE							
MH REF.	STRUCT TYPE	PROPOSED C.L. (mAOD)	MH DIAMETER	INCOMING PIPE I.L. (mAOD)	INCOMING PIPE I.L. (mAOD)	OUTGOING PIPE I.L. (mAOD)	OUTGOING PIPE DIAMETER (mm)
FW01	MH TYPE E	195.550	1000	194.940	150	194.940	150
BIO DISC BC	-	195.550	-	194.690	150/110*	194.600	110*/150
FW02	MH TYPE E	195.550	450	194.400	150	194.400	150
CHAMBER SOAKAWAY	IC	195.550	450	193.880	150	-	-

FOUL DRAINAGE PIPE SCHEDULE			
PIPE	DIAMETER (mm)	LENGTH (m)	GRADIENT
FW P01	100	24.240	2.50%
FW P02	100	9.050	2.50%
FW P03	100	9.050	2.50%
FW P04	100	19.620	2.50%

SURFACE DRAINAGE MH SCHEDULE				
MH REF.	STRUCT TYPE	MH DIAMETER (mm)	PROPOSED CL (mAOD)	EFFECTIVE I.L. (mAOD)
SW 01 - SW 10	SW CATCHPIT	1200.000	19.550	193.450
NOTE	MANHOLES AND TRENCHES HAVE THE SAME C.L. AND I.L. TO MAKE THE SYSTEM FLAT; THIS CONFIGURATION WILL PROVIDE EVEN AND HENCE MORE EFFECTIVE INFILTRATION THROUGHOUT THE LENGTH OF THE TRENCH			

KEY:
- SW — PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SW STRUCTURE
- FW — PROPOSED FOUL WATER DRAINAGE
- PROPOSED FW STRUCTURE
- PROPOSED POWER SUPPLY CABLING
- PROPOSED SURFACE WATER INFILTRATION TRENCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

MAINTENANCE/CLEANING

DECOMMISSIONING/DEMOLITION

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

NOTES:

1. UNLESS NOTED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES AOD.
2. THIS DRAWING IS TO BE READ WITH CONJUNCTION WITH THE SPECIFICATION AND ALL RELEVANT ARCHITECTURAL, ELECTRICAL, MECHANICAL AND STRUCTURAL DRAWINGS.
3. AN INTRUSIVE SITE INVESTIGATION, INCLUDING INFILTRATION TESTS USING TRIAL HOLES NEAR TO THE PROPOSED SOAKAWAYS, WILL BE REQUIRED TO VERIFY THEIR DESIGN
4. 150mm DIAMETER FOUL DRAINS TO BE EITHER VITRIFIED CLAY TO BS EN 295-1 OR U-PVC TO BS EN 1401-1 OR WIS 04-35-01
5. 150mm DIAMETER SURFACE WATER DRAINS TO BE EITHER VITRIFIED CLAY TO BS EN 295-1 OR U-PVC TO BS EN 1401-1 OR WIS 04-35-01
6. 225mm AND 300mm DIAMETER SURFACE WATER DRAINS TO BE EITHER CONCRETE TO BS EN 5911 OR U-PVC TO BS EN 1401-1 OR WIS 04-35-01
7. MANHOLE COVERS SUBJECT TO TRAFFIC LOADING TO BE CLASS D400 NON-ROCKING, ALL OTHERS TO BE CLASS B125 BS EN124. MANHOLES IN BLOCK PAVED AREAS TO BE RECESSED

Rev.	Date	Description	By	Chk'd	App'd
P01	13/12/17	FOR INFORMATION	AK& MC	TK	

Drawing Status: FOR COMMENT
Suitability:

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Client: SCIENCE MUSEUM GROUP

Project Title: SCIENCE MUSEUM GROUP
ONE COLLECTION FACILITY

Drawing Title: PROPOSED DRAINAGE LAYOUT

Scale	Designed	Drawn	Checked	Authorised
1:2000	AK & MC	AK		
Original Size: A1	Date 23/11/17	Date 23/11/17	Date	Date

Drawing Number: 5161116-ATK-ZZ-ZZ-DR-D-0200
Revision: P01

P:\GBBSB\PDG\NOVA PROJECTS\BRISTOL PROJECTS\5158023 One Collection Project\400 TECHNICAL INFORMATION\401 CAD BIM\01-WIP\C\M2\5161116-ATK-ZZ-ZZ-DR-D-0001 Proposed Drainage Layout.dwg

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