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QA HOSPITAL MSCP PORTSMOUTH, COSHAM, PORTSMOUTH, PO6 3LY

DRAINAGE STRATEGY REPORT

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Appendices

1.0 Introduction

1.1.1 Noviniti is planning a proposed development on the site at QA Hospital MSCP Portsmouth, Cosham, Portsmouth, PO6 3LY.

1.1.2 Stripe Consulting has been instructed to produce a Drainage Strategy to support the Planning Application.

1.1.3 This report aims to demonstrate that a reduction in surface water run-off from the site can be achieved.

1.1.4 The general limitations of this assessment are that:

- Several data sources have been used in compiling this report. Whilst Stripe Consulting believe them to be trustworthy; it is unable to guarantee the accuracy of the information that has been provided by others.
- This report is based on information available at the time of preparation. There is potential for further information to become available, which may create a need to modify conclusions drawn in this report.

2.0 Location of Site

2.1.1 The site is off Harvey Road in Portsmouth. A location plan is enclosed in **Appendix A**.

2.1.2 The Local Authority is Portsmouth City Council.

3.0 Site Description

3.1 Existing Site

3.1.1 The existing site is the car park serving Queen Alexandra Hospital. A topographical survey has been commissioned for the site and can be found in **Appendix B**.

3.2 Existing Drainage System

3.2.1 Detailed surveys of the existing infrastructure have been undertaken and drawings have been included at **Appendix C**. Existing sewers have been included on the proposed drainage plan where relevant.

3.3 Existing Geology

3.3.1 The geology of the site has been ascertained by reference to the 1:50,000 British Geological Survey website. The data provided on the website indicates the bedrock and superficial drift geology for the site.

3.3.2 The strata of the site (bedrock geology) comprises chalk formation, described as follows:

"Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) - Chalk. Sedimentary Bedrock formed approximately 72 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas. These sedimentary rocks are shallow-marine in origin. They are biogenic and detrital, generally comprising carbonate material (coccoliths), forming distinctive beds of chalk."

3.3.3 The strata of the site (superficial drift) head, described as follows:

"Head - Clay, Silt, Sand and Gravel. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by subaerial slopes (U). These sedimentary deposits are subaerial in origin. They are detrital, comprising coarse- to fine- grained materials, forming down-slope layers and fans of accumulated material."

3.4 Geological Assessment

3.4.1 Boreholes in the local area indicate head over chalk. A site-specific investigation has been undertaken by Tweedie Evans Consulting in 2019, and borehole logs can be found at **Appendix D**.

3.4.2 Soakage testing was undertaken in two locations on site (TP1 and TP3), in general accordance with BRE 365, within the underlying chalk. Both locations, TP1 and TP3, drained fully during the 3 No. tests undertaken with indicative infiltration rates of between 6.54×10^{-5} m/s and 1.82×10^{-4} m/s.

3.4.3 Based on the soakage test data collected in 2019, it is considered that the encountered chalk may provide a suitable drainage medium, should suitable and sufficient attenuation be available.

3.4.4 It should be noted that CIRIA C574 guidance 'Engineering in Chalk' (2002) recommends that soakaways within medium (or higher) density chalk should be located at least 5m from any foundations, with additional distance considered in low density chalk or potential solution features.

3.4.5 It should be noted that CIRIA Report 156 (1996) "*Infiltration drainage – Manual of good practice*" suggests that infiltration systems should normally be built at least 6m away from the nearest foundation of any buildings, although the SuDS manual (CIRIA C753) suggests 5m is acceptable.

3.4.6 In addition, CIRIA C753 indicates that, on sloping sites, an assessment should also be made to ensure that infiltrating water will not cause raised groundwater levels and/or waterlogging of downhill areas, and that slopes are not made unstable.

3.4.7 In addition, the requirements of Building Regulations and the Environment Agency would need to be incorporated into any design which drains into an aquifer, such as on this site.

3.5 Further Investigations

3.5.1 Further site investigations were undertaken by Crossfield Consulting in March 2020.

3.5.2 A falling head permeability test undertaken in one windowless sample hole indicated very low permeability strata with an estimated equivalent soil infiltration rate of less than 1×10^{-7} m/s. Therefore, soakaway drainage is precluded for this site and an alternative drainage solution should be identified.

3.5.3 Further investigations were undertaken by Structural Soils Limited in December 2020 and January 2021 to support the scheme.

3.5.4 The reports do not provide any further relevant information to determine the viability of soakaways on site.

3.6 Geotechnical Summary

3.6.1 The viability of infiltration on site is not governed by the suitability of the underlying strata, but rather the site constraints.

3.6.2 There is minimal space on the site to install a new soakaway system to serve the car park. There is also a potential for contamination due to the current use of the site.

3.6.3 In addition, it should be noted that the existing overall drainage network for the QA Hospital has been designed to accommodate the surface water run-off from the car park area and so a discharge into this system would mimic the existing situation.

3.6.4 Based on the information above, infiltration has been discounted for the development site and a positive connection will be considered to the existing surface water network.

3.7 Hydrogeology Setting

3.7.1 The Environment Agency (EA) mapping service, as provided by Magic Map, indicates the aquifer designation for the bedrock and superficial drift geology and the groundwater vulnerability in the area. The mapping, as included at **Appendix E**, provide the following information for the site:

Geology Map	Site Description
Aquifer Designation (Bedrock)	Principal
Aquifer Designation (Superficial Drift)	Secondary (undifferentiated)
Groundwater Vulnerability	Medium / High
Groundwater Source Protection Zone	None

3.8 Hydrology

3.8.1 The nearest strategic watercourse is Portsmouth Harbour, located 1.5km to the south of the site.

4.0 Site Run-Off

4.1 Existing Surface Water Runoff

4.1.1 The site has been previously developed, but an analysis of the Greenfield run-off rate is appropriate and will be made for the developable site area (redline) of 0.453 hectares.

4.1.2 The Greenfield run-off rates have been calculated for the existing site. The existing site run-off rates have been calculated based on the Interim Code of Practice for Sustainable Drainage Systems, Chapter 6 using the Micro Drainage design software. The output from the software analysis can be found at **Appendix F**.

4.1.3 The Qbar (rural) value for the site is 1.8 litres per second. A conservative value of 70% hardstanding has been used to calculate the urban run-off from site. The Qbar (urban) value for the site is 4.6 litres per second.

4.1.4 A technical assessment has been made for the site of the most appropriate flow rate suiting the site constraints as follows:

Flow Rate (Standard)	Flow Rate (l/s)	Method of control	Constraints
Qbar Rural	1.8	-	Too low for a flow control
Qbar Urban	4.6	Hydro-Brake	1. Low flow rate indicates high level of silt removal required. 2. Hydrobrake chamber must be constructible.
3 x Qbar	5.4	Orifice	Minimum flow rate of 5.0 l/s to prevent blockages (or 50mm diameter orifice)
-	2.0	Hydro-Brake	1. Low flow rate indicates high level of silt removal required. 2. Hydrobrake chamber must be constructible.
-	5.0	Orifice	Minimum flow rate of 5.0 l/s to prevent blockages (or 50mm diameter orifice)
Infiltration	0	None	Site must be suitable for infiltration

4.2 Hardstanding Assessment

4.2.1 An assessment of the existing and proposed hardstanding areas for the site has been undertaken to provide guidance as to the most appropriate flow rate on site.

4.2.2 Brownfield run-off has been calculated using the Modified Rational Method for a 1 in 1 year storm event. The information is as follows:

	Hardstanding / Roof (m^3)	Porous Hard Surfaces (m^3)	Green Space / Landscaping (m^3)	Brownfield Flow Rate (l/s)
Existing	4530	-	-	72.91

4.3 Greenfield Run-Off Assessment

4.3.1 An assessment of the most appropriate flow restriction on site can be made with an engineering judgement made on the following parameters:

- Proposed depth of surface water system. Shallow systems will not be able to construct certain flow controls.
- Risk of blockages, open drainage systems and conventional piped systems will have a significantly higher chance of blockage.
- Potential for soakage or a hybrid solution with some infiltration and some positive discharge.
- The existing use of the site (green/brown field) and the most appropriate reduction in surface water flows from the proposed development.
- Potential development costs and the viability of achieving very low flow rates on sites.
- Manufacturer limits, with Hydro-International stating they can achieve between 0.7 and 550 l/s on their product range.

4.3.2 Infiltration has not been selected, based on the geotechnical information provided within this report.

4.3.3 The approved strategy for the QAH Ward building (as referenced in drawing 13772/2000 Rev B) was to reduce the flows by 30% on existing, as the catchment lies within the larger drainage network serving the entire hospital.

4.3.4 This approved approach has been taken forward for the MSCP design, with a 30% reduction on the existing 1 in 1 year flow rate proposed.

4.3.5 The 1 in 1 year flow rate for the site, as shown in this report, is 72.91 l/s. Based on this, a flow control of 51 litres per second has been selected for the scheme.

4.4 Further Assessment

4.4.1 The existing surface water sewer to which the system is discharging is 150mm diameter at an approximate fall of 1 in 30. This indicates a full bore velocity of 32 litres per second.

4.4.2 It is not good practice to discharge at full bore, so it is suggested that the surface water system be throttled with a 150mm diameter pipe laid at 1 in 80 falls. This equates to a flow control of approximately 19 litres per second.

4.4.3 This represents a significant betterment to the design rate of 51 litres per second and has minimal impact on the attenuation requirements on site.

5.0 Proposed Development

5.1.1 The proposal is for a new multi-storey car park (MSCP) on the site. A site layout can be found at **Appendix G**.

5.2 Infiltration Potential

5.2.1 The geotechnical information provided in this report indicates that standard infiltration methods will not be suitable on site.

5.2.2 The table below summarises the potential for infiltration.

Low infiltration potential: There is a low potential for infiltration SuDS in parts of the Site. **Comments:** It is likely that the underlying geology at the Site, or in areas of the site, is relatively impermeable which would limit the effectiveness of a proposed infiltration SuDS scheme. **Recommendations:** Infiltration SuDS should be focused in more suitable parts of the site. If a site investigation confirms that infiltration SuDS are not possible at the site, then attenuation SuDS with a controlled discharge into a nearby surface water feature or existing surface water drainage is recommended.	**YES**
Moderate infiltration potential: There is a moderate potential for infiltration SuDS in parts of the Site. **Comments:** It is likely that the permeability of the underlying material at the site would be suitable for infiltration drainage. However, there may be constraints on the use of infiltration SuDS because of any of the following: a high water-table, the limited thickness of the receiving formation, the potential for a significant range in permeability in the underlying geology and confirmation of the infiltration capacity is recommended. **Recommendations:** A site investigation is recommended to investigate groundwater levels and formation thickness and to confirm that infiltration rates at the site are sufficient to accommodate an infiltration SuDS feature. If a site investigation confirms that infiltration SuDS are possible at the Site then assorted options can be considered for infiltration SuDS and these include infiltration trenches, soakaways, swales, permeable pavements and infiltration basins without outlets.	**NO**
High infiltration potential: There is a high potential for infiltration SuDS in parts of the Site. **Comments:** It is likely that the underlying geology at the Site is highly permeable and an infiltration SuDS scheme should be possible at the Site. Groundwater levels are expected to be sufficiently deep at the site. **Recommendations:** A site investigation is recommended to confirm the high infiltration capacity and the depth of the winter water table. Assorted options can be considered for infiltration SuDS and these include infiltration trenches, soakaways, swales, permeable pavements and infiltration basins without outlets.	**NO**

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6.0 Sustainable Drainage Assessment

6.1 SuDS Hierarchy

6.1.1 Options for the destination for the run-off generated on site have been assessed in line with the prioritisation set out in the Building Regulations Part H document and DEFRA's Draft National Standards for SuDS as follows:

Discharge to Ground	**Not viable based on exploratory study**
Discharge to Watercourse	**No watercourses in area**
Discharge to Surface Water Sewer	**Selected Option**
Discharge to Other Sewer	**N/A**

6.1.2 The indicative potential for different SuDS devices has been assessed and can be seen in the table below:

SuDS Feature	Environmental benefits	Water quality improvement	Suitability for low permeability soils ($k<10^{-6}$)	Ground-water recharge	Suitable for small / confined sites?	Site specific restrictions	Appropriate for subject site?
Wetlands	✓	✓	✓	X	X	Site Constraints	No
Retention ponds	✓	✓	✓	X	X	Site Constraints	No
Detention basins	✓	✓	✓	X	X	Site Constraints	No
Infiltration basins	✓	✓	X	✓	X	Site Constraints	No
Soakaways	X	✓	X	✓	✓	Site Constraints	No
Underground storage	X	X	✓	X	✓	None	Yes
Swales	✓	✓	✓	✓	X	Site Constraints	No
Filter strips	✓	✓	✓	✓	X	Site Constraints	No
Rainwater harvesting	X	✓	✓	✓	✓	No demand	No
Permeable paving	X	✓	✓	✓	✓	Site Constraints	No
Green roofs	✓	✓	✓	X	✓	Site Constraints	No
Rain Garden (external)	✓	✓	✓	X	X	Site Constraints	No
Rain Garden (planter)	✓	✓	✓	X	X	Site Constraints	No

6.2 Detailed SuDS Assessment

6.2.1 To maximize the potential use of SuDS at the site, a review has been undertaken in accordance with the SuDS Hierarchy (refer to SuDS: A Practical Guide prepared by the Environment Agency).

6.2.2 The following table indicates the potential setting for SuDS elements:

	Description	Setting	Required Area
Green Roof	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated
Rainwater Harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an overground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (underground or above ground)
Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open Space	Dependant on Run-off volumes and soils
Filter Strip	Filter strips are grassed or planted areas that runoff can run across to promote infiltration and cleansing.	Open Space	Maximum length 5 metres
Permeable Paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / Open Space	Can typically drain double its area
Bioretention Area	A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street / Open Space	Typically, surface area is 5-10% of drained area with storage below.
Swale	Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / Open Space	Account for width to allow safe maintenance typically 2-3 metres wide.
Hardscape Storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Open Space	Could be above or below ground and sized to storage need.
Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open Space	Dependant on runoff volumes and soils.
Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open Space	Typically, 5-15% of drainage area to provide good treatment.
Underground Storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open Space	Dependant on runoff volumes and soils.

6.2.3 This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Component	Recommendation / Opinion	
Green (living) roofs or Blue/Green roof systems	There is no scope for blue or green roofs on the scheme.	↓
Basins and Ponds	There is no potential for basins and ponds on the site.	↓
Filter Strips and Swales	There is no scope for use of surface mounted SuDS on the scheme to convey water.	↓
Infiltration Devices	Infiltration devices will not be viable on site.	↓
Permeable Surfaces and Filter Drains	Porous surfaces cannot be used on site.	↓
Tanked Systems	It is unlikely that these will be required.	↓

6.2.4 The proposed drainage system incorporates sustainable drainage features in accordance with the SuDS hierarchy, current legislation and best practice as much as practicable on site.

7.0 Drainage Proposal

7.1 Surface Water Drainage

7.1.1 Surface water drainage at the site will follow the Sustainable Drainage Systems (SuDS) management train. The surface water from the site will discharge into the existing sewer at a restricted rate. A Drainage Plan can be found at **Appendix H**.

7.1.2 New climate change allowances have been in force since February 19th 2016. The new allowances take into consideration the design life of the development, flood zone, development type and geographical location.

7.1.3 Based on these parameters, the Central value for rainfall intensity should be used. Based on Table 2 (shown below), this is a range between 20% and 40% for the central and upper end values. Therefore, it is appropriate to use 40% on this development for design.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

7.1.4 Any water up to a 1 in 100 year storm event including 40% climate change will be attenuated within the curtilage of the site in the proposed drainage system.

7.1.5 National SuDS standards, the Design and Construction Guidance 2020 and Sewers for Adoption recommend that the 1 in 30 year storm event is managed below ground with exceedance flows managed above ground.

7.1.6 As the rainfall will land on the top deck level, the below ground drainage system will be designed to manage the 1 in 30 year event.

7.1.7 The surface water for the 1 in 100 year storm event including 40% climate change will be managed within the site via the top deck, the proposed system and the existing drainage systems around the site.

7.1.8 MicroDrainage calculations have been undertaken, which can be found at **Appendix J**.

7.2 Designing for Exceedance Events

7.2.1 Current best practice guidance on flood risk requires an evaluation of how rainfall events beyond the design capacity of the proposed drainage system would be managed and what effects they are likely to have on flood risk at the site or surrounding areas.

7.2.2 Should a rainfall event exceeding the 1.0% AEP (1 in 100 year) event plus climate change event occur, the proposed storage and flow paths of surface water should be considered.

7.2.3 The surface water SuDS features included for the 1 in 100 year storm will be designed with sufficient resilience to manage and convey exceedance flows away from any properties to minimise risk.

7.2.4 Indicative exceedance pathways have been shown on the drainage layout, with further information to be defined once the detailed levels of the scheme have been developed.

7.3 Designing for System Failure

7.3.1 Current best practice on sustainable drainage design should consider failure of the surface water system and potential blockages from multiple sources.

7.3.2 The potential risks to the surface water system have been indicated below:

Risk	Description	Comments / Recommendations
Blockage	Potential blockage of outfall from surface water system	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report.
Failure	Potential blockage of outfall from flow control failure or build-up of debris	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report.
Surcharge	Potential back-up of system due to surcharging or poorly maintained public surface water infrastructure or watercourse	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report.
Blockage	Potential risk of flooding due to build-up of sediment within system	Catchpit manholes have been provided to remove solids and sediment. Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report.
Failure	Potential risk of surface water flows from poor maintenance of surface mounted SuDS features (such as porous paving or swales)	Regular inspection and maintenance of the surface mounted SuDS should be undertaken in line with the findings of this report.
Surcharge	Potential risk of additional surface water flows or overland flows from extreme (exceedance storm) events in adjacent sites causing the surface water system to be overloaded.	Exceedance flow routes have been assessed and shown on the drainage layout.
Failure	Potential risk from failure of third-party specialist equipment such as pump stations or interceptors	Any pump stations or interceptors installed on site should be maintained in line with the specialist manufacturer's recommendations.
Blockage	Potential risk from poor maintenance of gullies	Regular inspection and maintenance of the underground drainage system should be undertaken in line with the findings of this report.
Blockage	Potential reduction in infiltration on site from compaction of soils during the construction phase	Ground consolidation should not have a major impact.
Failure	Poor planting and maintenance of green areas could reduce the hydraulic properties of SuDS devices (and amenity/biodiversity benefits)	Not applicable

7.4 Urban Creep

7.4.1 Urban Creep is the conversion of permeable surfaces to impermeable over time. e.g. impermeable surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. The consideration of urban creep (is best) assessed on a site by site basis but is limited to residential development only.

7.4.2 It is important that the appropriate allowance for urban creep is included in the design of the drainage system over the lifetime of the proposed development. The allowances set out below are applied to the impermeable area within the property curtilage:

Residential development density Dwellings per hectar	Change allowance % of impermeable area
≤ 25	10
30	8
35	6
45	4
≥ 50	2
Flats & apartments	0

7.4.3 Note where the inclusion of the appropriate allowance would increase the total impermeable area to greater than 100%, 100% should be used as the maximum.

7.4.4 The proposed development has limited scope for expansion. Based on this, zero allowance for urban creep is required for the development.

7.5 Construction Phase Drainage

7.5.1 It is an offence to cause or knowingly permit the entry of poisonous, noxious or polluting material into the water environment. Prosecution may ensue if the pollution is serious enough to lower the ecological status of the water body in terms set by the Water Framework Directive (2000/60/EC).

7.5.2 The polluter does not have to be prosecuted first for remediation of damage to be required. If water pollution is serious enough to be classed as environmental damage the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.

7.5.3 An offence may also be committed if environmental damage or the threat of environmental damage is not reported by the polluter or if no action is taken by the polluter to prevent further damage. Third parties (e.g. private water supply users, landowners, recreational users and the public) who may be affected by possible damage may also report 'risk' of environmental damage to the enforcing authority; in this instance an offence may be committed if action is not taken to prevent the potential environmental damage occurring.

7.5.4 The principles of Sustainable Drainage Systems (SuDS) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or water quality shall:

- Soakaway where soils allow
- Consider and manage erosion
- Retain any silts on site and prevent silts from discharging into watercourses or drains
- Remove pollutants in surface water
- Keep runoff rates at existing greenfield runoff
- Prevent accidental spillages reaching watercourses.

7.5.5 As infiltration is not expected to be viable on site, the temporary drainage for the development will be in the form of land drainage with discharge into the existing sewer, with the appropriate levels of treatment.

7.5.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.

7.5.7 Any potentially hazardous substances (i.e. form plant / deliveries) will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

8.0 Water Quality

8.1 Water Quality Overview

8.1.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate "train" or sequence of SuDS components that are connected in series.

8.1.2 The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

8.1.3 The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015).

8.1.4 The proposed development is medium hazard (runoff from large car parking areas), as indicated on the table below:

Hazard	Source of Hazard	Present
Very Low	Residential Roof drainage.	**NO**
Low	Residential amenity uses including low usage car parking spaces and roads, other roof drainage	**NO**
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage road, trunk roads and motorways)	**YES**
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste	**NO**

8.1.5 The site does lie within a source protection zone and therefore additional treatment stages are required.

8.1.6 The treatment processes provided by different SuDS components will have varying capabilities for removal of different types of contaminants as per the table below:

Hazard	Requirements for discharge to surface water and groundwater	Present
Very Low	Removal of gross solids and sediments only.	**NO**
Low	Simple index approach	**NO**
Medium	Surface water: Simple index approach Ground water: Simple index approach and risk screening	**YES**
High	Guidance and risk assessment process in HA (2009). Discharge may require environmental permit or licence. Obtain pre-permitting advice from environmental regulator. Risk assessment likely to be required.	**NO**

8.2 Simple Index Approach

8.2.1 The index approach as defined by CIRIA C753 (the SuDS Manual) defines the index approach to water quality in three steps as defined in Box 26.2 below:

BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:

1 Designated as those protected for the supply of drinking water (Table 4.3).

8.3 Step 1- Allocate Potential Hazards

8.3.1 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):

Total SuDS mitigation index ≥ pollution hazard index

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

8.3.2 Where the only destination of the runoff is to a surface water – that is there is no infiltration from the SuDS to groundwater – the surface water indices should be used.

8.3.3 In England and Wales, where the principal destination of the runoff is to a surface water, but small amounts of infiltration may occur from unlined components (Interception), then the groundwater indices should be used for the discharge to groundwater, and the surface water indices should be used for the main surface water discharge (as suggested in Table 26.3).

8.3.4 Where the principal destination of the runoff is to groundwater, but discharges to surface waters may occur once the infiltration capacity is exceeded, the groundwater indices should be used, as suggested in Table 26.4. The risk to surface waters will be low, as dilution will be high for large events, so treatment is not required.

8.3.5 The pollution indices for this site have been selected using the guidance in CIRIA C753 and are as per Table 26.2 below:

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

8.3.6 The identified hazard levels are as follows:

- Total Suspended Solids (TSS) 0.70
- Metals 0.60
- Hydrocarbons 0.70

8.4 Treatment with Discharge to Surface Water

8.4.1 As the site is discharging to a watercourse or sewer, Table 26.3 of the CIRIA C753 manual is used to evaluate the water quality mitigation measures offered by the proposed drainage system. The identified hazard remediation levels are as follows:

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

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

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yuj7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

		Hazard	Treatment	Result
–	Total Suspended Solids (TSS)	0.70	0.7	0
–	Metals	0.60	0.6	0
–	Hydrocarbons	0.70	0.7	0

8.4.2 There are existing treatment devices and interceptors on site. The existing car park (and therefore the proposed MSCP) drains to an interceptor upstream of chamber MACP04.

8.4.3 The interceptor is a Klargester NSB72 (as identified on the Buro Happold plans) and should be inspected prior to commencement of works and deemed suitable for the development.

9.0 Summary and Conclusions

9.1.1 Noviniti is planning a proposed development on the site at QA Hospital MSCP Portsmouth, Cosham, Portsmouth, PO6 3LY.

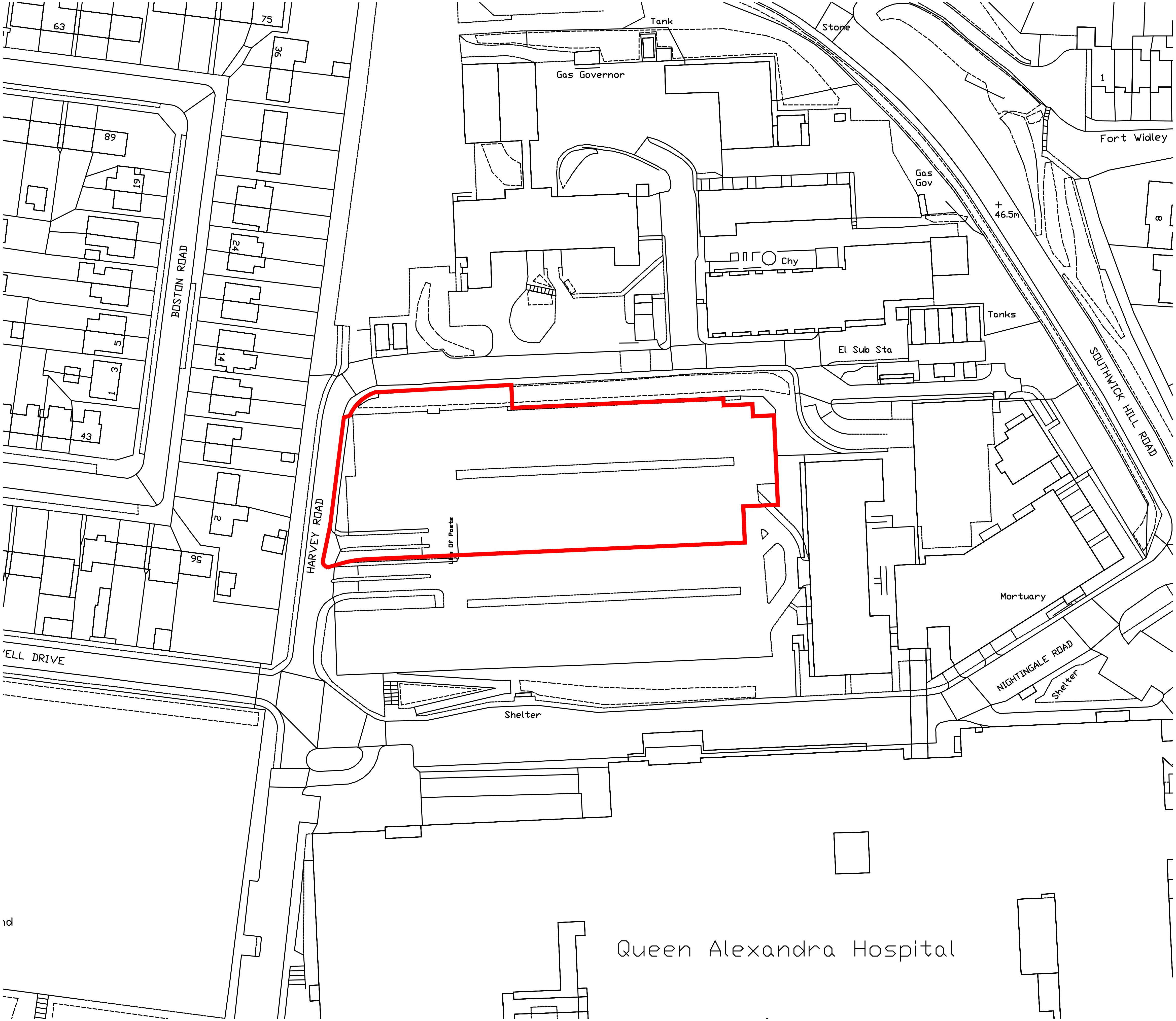
9.1.2 Stripe Consulting has been instructed to produce a Drainage Strategy to support the Planning Application.

9.1.3 The surface water system will discharge into the surface water sewer at a restricted rate.

9.1.4 The report has demonstrated that the proposed drainage measures ensure that no property will be at risk of flooding if the development proceeds and that suitable means of surface water drainage can be achieved for the proposed development.

Appendix A

Location Plan



Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimeters unless noted otherwise.
3. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings.

Rev	Rev Date	Revision Description	Drawn	Check'd	Apprv'd
P01	25.01.21	Initial Issue	AJ	DB	RH

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Bridge Farm
Meath Green Lane
Horley
Surrey
RH6 8JA

Web: www.stripeuk.com
Tel: 01293 850 794
Email: office@stripeuk.com

Client

QA HOSPITAL TRUST

Project

QA HOSPITAL MSCP
PORTSMOUTH

Title

LOCATION PLAN

Purpose

FOR INFORMATION

Issue Date

25.01.2021

DO NOT SCALE

Job Number	Scale	Revision	Original Size
J1708	1:1000	P01	A3

Drawing Number

J1708-A20312-0100

Appendix B

Topographical Survey

A Ground Penetrating Radar (GPR) survey was conducted at Queen Alexandra Hospital, North Car Park, Cosham, Portsmouth. The survey objective was to search for evidence of buried services and other features. The survey used a GSSI Dual Frequency Radar in conjunction with 300 MHz and 800MHz antennae, giving a maximum depth penetration of roughly 1.3 m and 0.8 metres respectively.

Most ground conditions contain electrically contrasting layers, which produce reflection events on the GPR profiles. Features such as soil or fill boundaries provide the background signals around unusual features such as pipes or voids. Processing and interpretation procedures are designed to separate the reflections into various target categories, and then map the different reflection types on to a plan diagram. This process involves the interpretation of each individual radar profile, followed by an areal interpretation of all the radar profiles. Features identified across several profiles are interpolated in areas where the data is well constrained. The confidence levels placed on a plan interpretation depend on the spacing of the survey grid. A target must be intersected by at least one radar profile to be detected. Ideally, the profile spacing should allow any target to be intersected by several profiles. Consequently, the survey line spacing is selected to provide a good indication of site conditions at a reasonable cost and allow for available access.

The data interpretation identified five significant categories of reflection targets which are described below.

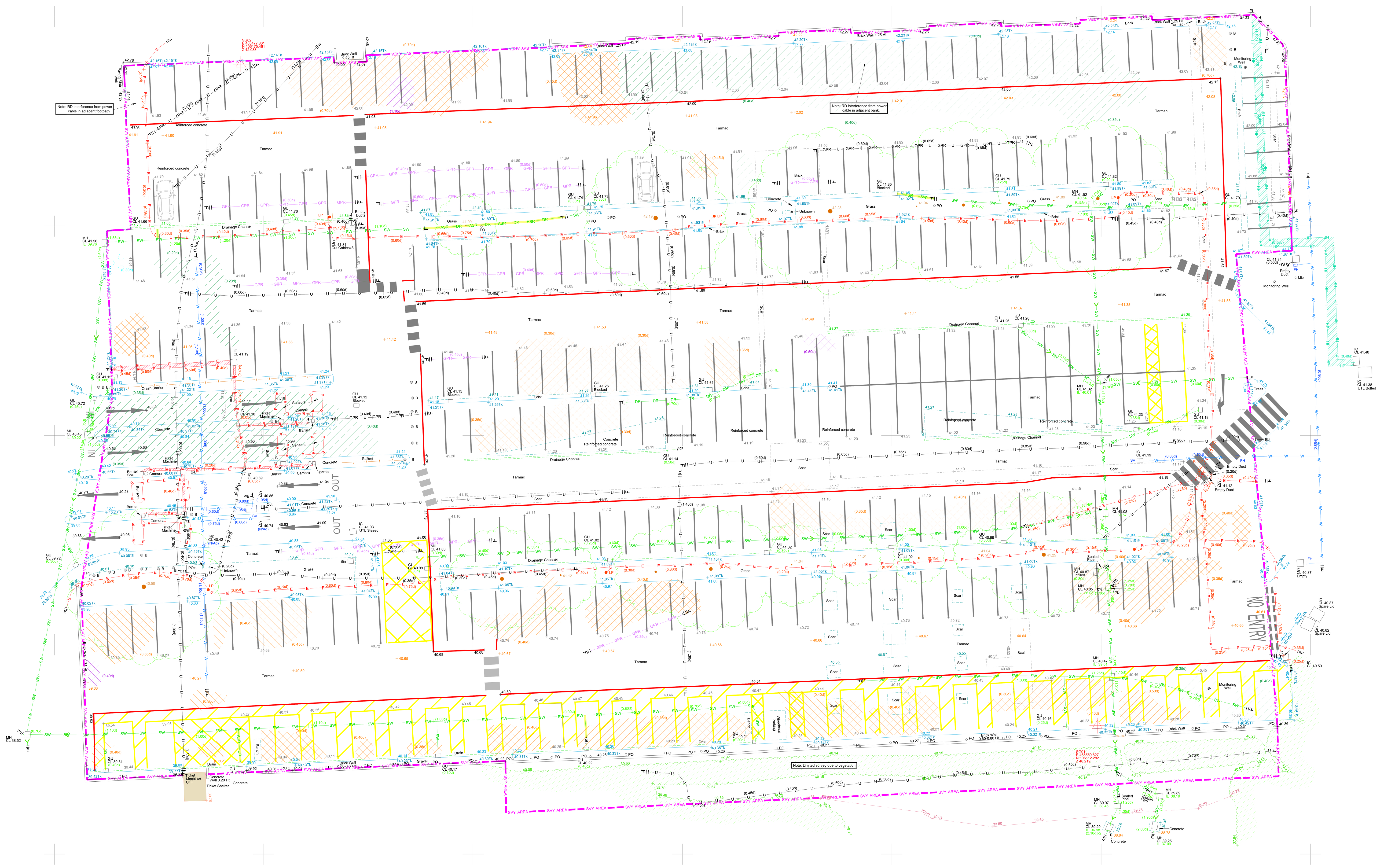
i) Possible pipe/service
A GPR profile either orthogonal or at a high angle to a length of pipe or service typically produces a steeply curved or hyperbolic reflection of moderate amplitude, which should be discernible against background reflections. The service position is located at the apex of the hyperbola. At low angles of intersection between survey lines and pipe tracks, the resultant planar reflection response is more ambiguous and can be difficult to identify. The plan interpretation shows the position of the interpreted pipe tracks. Possible services has been detected only by GPR.

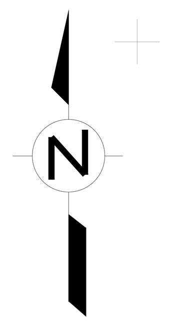
ii) Possible high void ratio ground
Possible high void ratio ground appears on the GPR data as dense zones of high amplitude reflections, in some cases displaying evidence of pulse ringing. A characteristic chaotic structure is evident caused by complex interference between numerous small, high amplitude reflections. These reflection characteristics are generally indicative of loose, high void ratio ground.

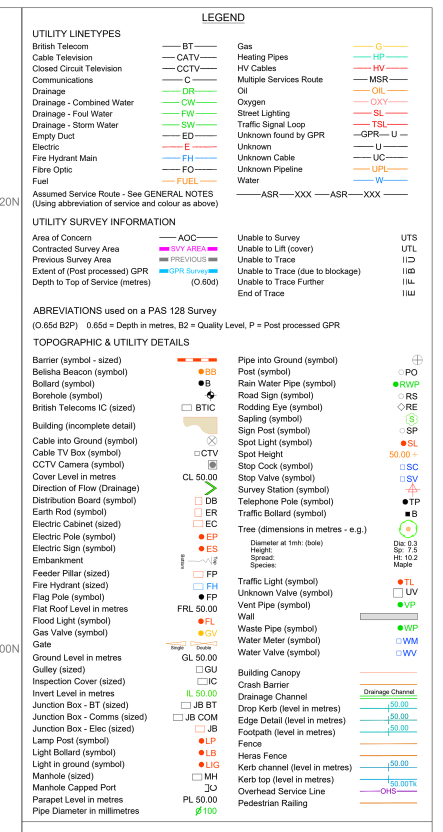
iii) Possible structure
This reflection category consists of moderate to high amplitude, well defined reflections, typically with planar top surfaces and clearly defined margins usually characterised by edge scattering.

iv) Anomalous ground
Areas identified as anomalous ground generally appear as zones of moderate amplitude, irregular, reflections with broken layering. In some cases, there is evidence of a slightly chaotic internal structure, resulting from interaction between individual reflections. Anomalous ground can be caused localised disturbance of the ground or by discrete variations in ground composition.

v) Anomalous layer
Anomalous layers occur as fairly amplitude, planar, sub-horizontal reflections with little or no evidence of edge scattering. The anomalous layering is underlain by irregular, broken moderate to high amplitude reflections sometimes displaying a more chaotic internal structures suggestive of loose ground.







GENERAL NOTES

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and pipes/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly depending on ground, weather and traffic conditions. No warranty is given in respect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the performance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth penetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Sheet 01

Note:
Information added from post processed GPR

(0.40d) Possible service
Possible high void ratio ground
Possible structure
Anomalous ground
Anomalous layer

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

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Title: Utility Mapping - SUMO+ Topographical Survey

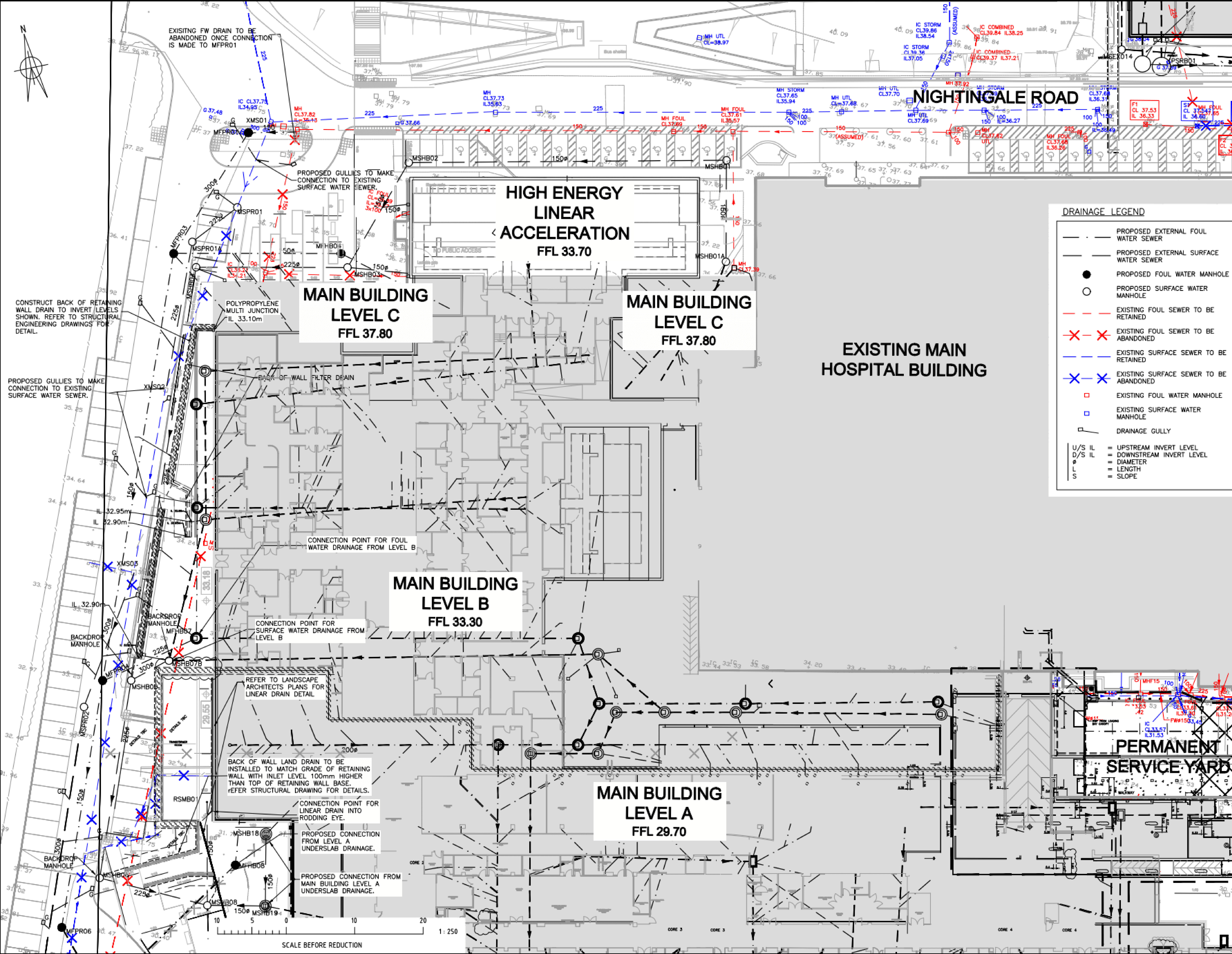
Client: Concept Building Services (Southern) Ltd

Project: Queens Alexandra Hospital, *North Car Park*, off Harvey Road, Cosham, Portsmouth.

Date Completed:	09/02/2020	Post Code:	PO6 3LY
Surveyed:	MW,SG,SW,KHH	Scale:	1/200 (A0 Sheet)
Drawn:	MWS,MUK		
Checked:	MW,SG,KHH,SW		
Job No:	Sheet 01	Dwg No: SOR017014	Rev:

Appendix C

Existing Sewer Plans



NOTES:

1. Do not scale from this drawing.
2. This drawing is to be read in conjunction with the project specification for external works.
3. Any errors or omissions in the drawing information to be brought to the attention of the engineer.
4. Bedding to be type 's' u.n.o: 360° granular bed and surround unless shown otherwise.
5. For external drainage details refer drawings C(_X)L(90)7003 – 7004.
6. For details of surface water drainage refer to relevant manhole schedules.
7. Manhole cover levels shown are approximate only. Final levels to match existing or proposed ground levels.
8. Oil separators to be installed in accordance with manufacturers requirements and specifications.
9. Existing drawings and base survey information provided by Shaw Colegate adn Glanville Group. Buro Happold accepts no responsibility for the connections or accuracy of this information. The contractor shall verify existing survey information on site.
10. For drainage invert and cover levels, refer to drainage schedules.
11. Refer Drawings C(_X)L(90)1500–1504 for FW and SW underslab drainage detail plans.
12. For all details relating to soft and hard landscaping, including levels and final gully positions, reference should be made to BDP landscape architect drawings as listed on their drawing L_(---)P(90)0007.

No	Revision	Date	drn	chk
04	DRAINAGE AMENDED	23/03/07	LJB	PLM
03	DRAINAGE AMENDMENTS	28/11/06	PJH	PLM
02	DRAINAGE AND RET WALL RE COORDINATED	27/10/06	PJH	PLM
01	DRAINAGE AMENDED	5/09/06	PJH	PLM
00	FOR CONSTRUCTION	08/05/06	EMC	PLM

CONSTRUCTION

carillion

Portsmouth Hospitals NHS Trust

THE HOSPITAL COMPANY

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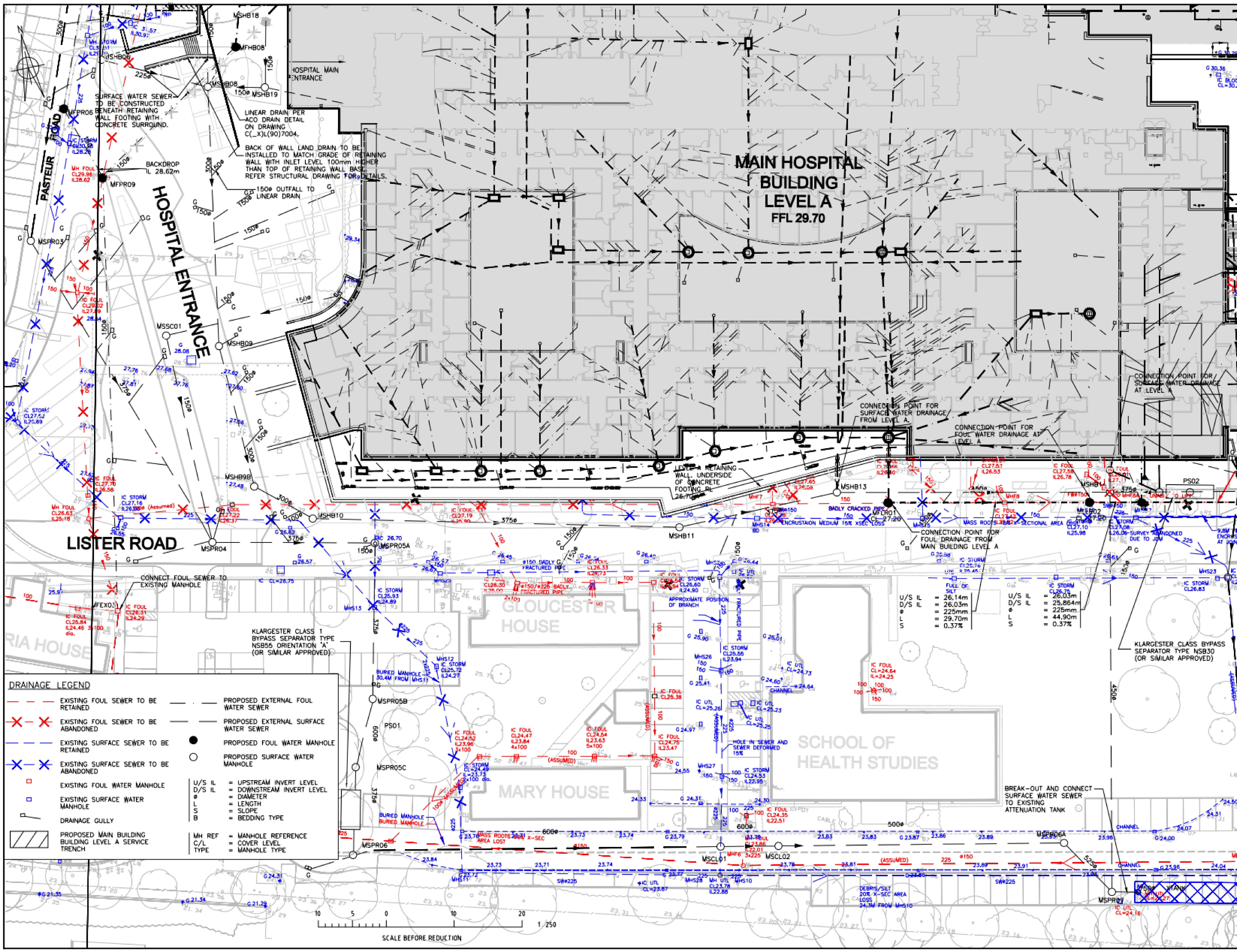
Buro Happold
Consulting Engineers

Project
QAH REDEVELOPMENT EXTERNAL WORKS

Drawing Title
EXTERNAL DRAINAGE PLAN SHEET 4 OF 6

Date	Drawn	Checked
03/04/06	EMC	PLM

Drawing No.	Revision	Scale
C(_X)L(90)1104	04	1:250@A1



NOTES:

1. Do not scale from this drawing.
2. This drawing is to be read in conjunction with the project specification for external works.
3. Any errors or omissions in the drawing information to be brought to the attention of the engineer.
4. Bedding to be type 's' u.n.o: 360° granular bed and surround unless shown otherwise.
5. For external drainage details refer drawings C(_X)L(90)7003 – 7004.
6. For details of surface water drainage refer to relevant manhole schedules.
7. Manhole cover levels shown are approximate only. Final levels to match existing or proposed ground levels.
8. Oil separators to be installed in accordance with manufacturers requirements and specifications.
9. Existing drawings and base survey information provided by Shaw Colegate adn Glanville Group. Buro Happold accepts no responsibility for the connections or accuracy of this information. The contractor shall verify existing survey information on site.
10. For drainage invert and cover levels, refer to drainge schedules.
11. Refer Drawings C(_X)L(90)1500–1504 for FW and SW underslab drainage detail plans.
12. For all details relating to soft and hard landscaping, including levels and final gully positions, reference should be made to BDP landscape architect drawings as listed on their drawing L_(---)P(90)0007.

No	Revision	Date	drn	chk
06	SEPERATOR MOVED	22/08/16	MAC	
05	DRAINAGE AMENDED	23/03/07	LJB	PLM
04	DRAINAGE AMENDED	28/11/06	PJH	PLM
03	DRAINAGE AMENDED	05/09/06	LJB	PLM
02	MINOR AMENDMENTS	22/05/06	GJB	PLM
01	DRAINAGE AMENDED TO SUIT HV CABLES AND EXISTING SERVICES	19/05/06	EMC	PLM
00	FOR CONSTRUCTION	08/05/06	EMC	PLM

CONSTRUCTION

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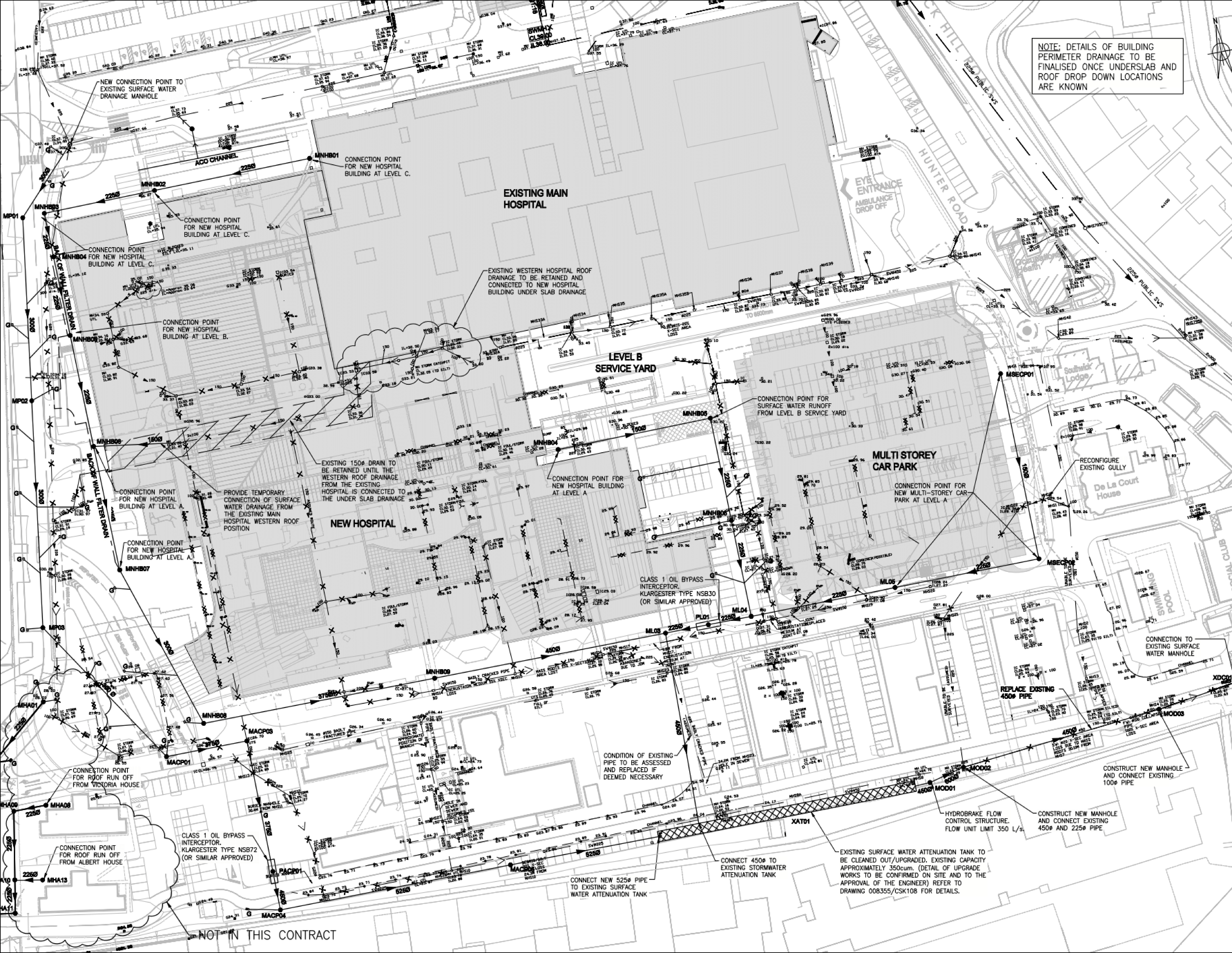
Project
QAH REDEVELOPMENT EXTERNAL WORKS

Drawing Title
EXTERNAL DRAINAGE PLAN SHEET 5 OF 6

Date	Drawn	Checked
03/04/06	EMC	PLM

Drawing No.	Revision	Scale
C(_X)L(90)1105	06	1:250@A1



GENERAL NOTES

1. For general notes refer to Buro Happold drg no. C_L(90)7900.
2. For Drainage details refer to drg no. C_L(90)7003 and 7004.
3. Proposed Surface Water connections to be 150mmø unless otherwise stated.
4. Refer to associated drainage schedules for all Pipe and Manhole Detail Information.
5. Proposed Surface Water Pipes to be Clay or Concrete in accordance with the External Civil Works Specification.

LEGEND

- Existing Surface Water (Retained)
- Existing Surface Water (Abandoned)
- Proposed Surface Water
- Existing Surface Water Channel (Retained)
- Existing Surface Water Channel (Abandoned)
- Proposed Surface Water Channel (Aco Drain)
- Existing Surface Water Manhole or Catchpit (Retained)
- Proposed Surface Water Manhole or Catchpit
- Proposed Gully trap with connection

No	Revision	Date	drn	chk
01	FOR COMMENT	07/06/04	KMR	PLM
00	For information	16/03/04	SG	PLM

FOR COMMENT

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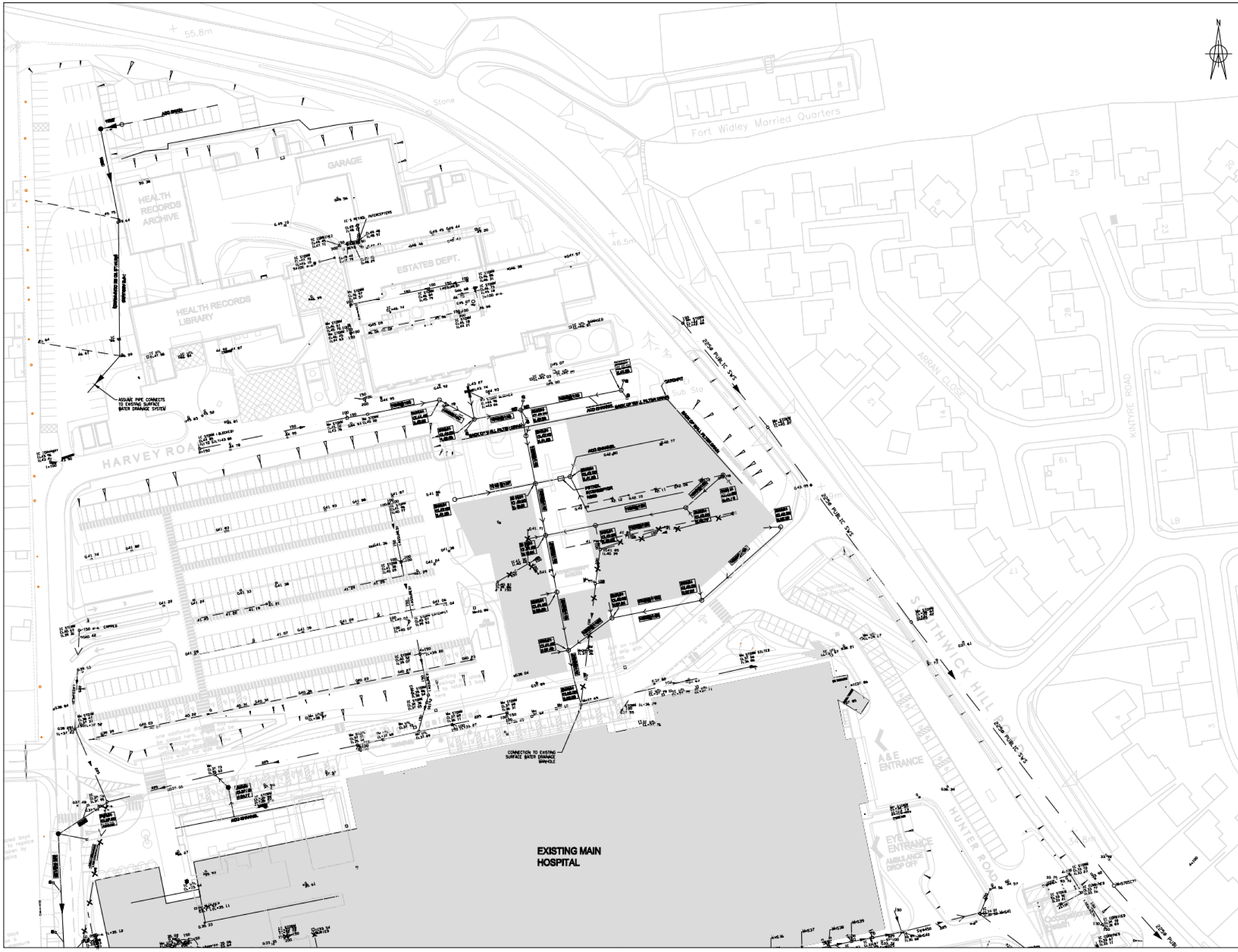
Project
REDEVELOPMENT OF THE QUEEN ALEXANDRA HOSPITAL

Drawing Title
EXTERNAL SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 3

Date	Drawn	Checked
08/03/04	SG	PM

Drawing No.	Revision	Scale
C_L(90)1010-02	01	1:500@A1



GENERAL NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. This drawing has been produced from the following survey information supplied by: Shaw Colegate, Glanville Group, Southern Water, Portsmouth City Council and is based upon Ordnance survey information supplied by HMSO, Crown copyright reserved.
4. Buro Happold accepts no responsibility for the correctness and accurcay for the contents of this drawing.
5. This drawing is to be read in conjunction with all other drawings in the same drainage series.
6. Proposed Surface Water pipes to be ? unless otherwise stated
7. Proposed Surface Water connections to be 150mmø unless otherwise stated.
8. Proposed petrol interceptors to be Class 1 Klargester unless otherwise stated.
9. All filter pipes to be 150mmø perforated unless otherwise stated.

LEGEND

- Existing Surface Water (Retained)
- Existing Surface Water (Abandoned)
- Proposed Surface Water
- Existing Surface Water Channel (Retained)
- Existing Surface Water Channel (Abandoned)
- Existing Foul Water Sewer (Retained)
- Proposed Surface Water Channel (Aco Drain)
- Existing Surface Water Manhole or Catchpit (Retained)
- Proposed Surface Water Manhole or Catchpit
- Proposed Gully trap with connection

No	Revision	Date	drn	chk
01	Interceptor Tank Indicated	22/08/16	HC	
00	For information	16/03/04	SG	PM

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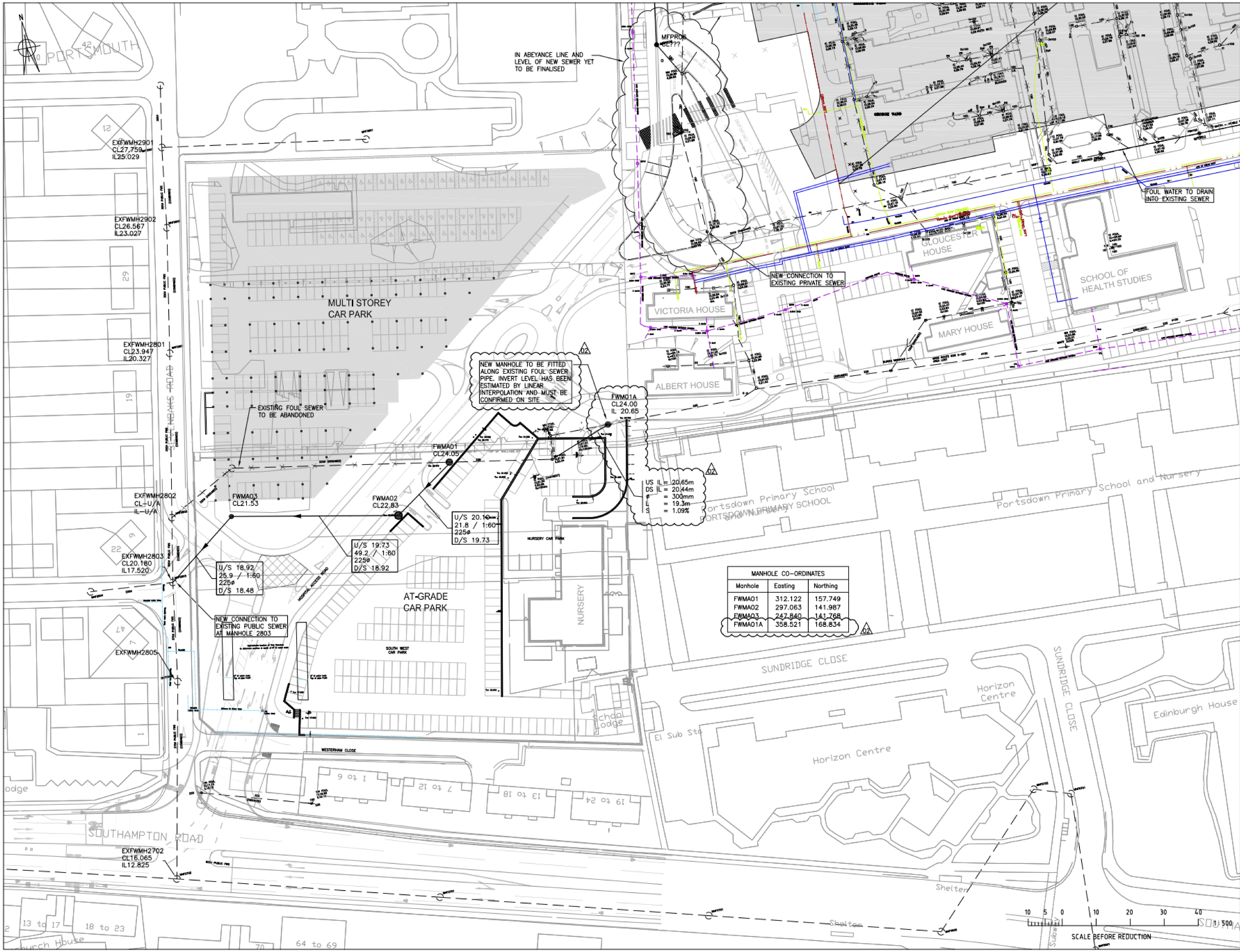
Drawing Title
EXTERNAL SURFACE WATER DRAINAGE LAYOUT SHEET 3 OF 3

Date	Drawn	Checked
08/03/04	SG	PM

Drawing No.	Revision	Scale
C_L(90)1010-03	01	1:500@A1



MANHOLE CO-ORDINATES		
Manhole	Easting	Northing
FWMA01	312.122	157.749
FWMA02	297.063	141.987
FWMA03	247.840	141.768
FWMA01A	358.521	168.834

GENERAL NOTES

1. For general notes refer to Buro Happold drg no. C_L(90)7900.
2. For Drainage details refer to drg no. C_L(90)7003 and 7004.
3. All pipes used for Foul Water Drainage shall be clay type in accordance with The External Civil Works Specification.
4. This drawing shall be read in conjunction with The External Civil Works Specification.

LEGEND

- Existing Foul Water Sewer to be retained
- Existing Foul Water Sewer to be abandoned
- Proposed Foul Water Sewer
- Existing Foul Water Sewer Manhole or Catchpit (Retained)
- Proposed Foul Water Sewer Manhole or Catchpit
- UPSTREAM INVERT LEVEL / LENGTH (m)/SLOPE(m/m) / DIAMETER (mm) / DOWNSTREAM INVERT LEVEL

No	Revision	Date	drn	chk
02	PROPOSED MANHOLE FWMA01A	19/05/06	AD	CB
01	COMMENT/ APPROVAL	04/06/04	KMR	PLM
00	For Information	16/03/04	SG	PM

FOR APPROVAL

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Project
REDEVELOPMENT OF THE QUEEN ALEXANDRA HOSPITAL

Drawing Title
FOUL WATER DRAINAGE LAYOUT SHEET 1 OF 3

Date	Drawn	Checked
10/03/2004	SG	PLM

Drawing No.	Revision	Scale
C_L(90)1210-01	02	1:500@A1

GENERAL NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. This drawing has been produced from the following survey information supplied by; Shaw Colegate, Glanville Group, Southern Water, Portsmouth City Council and is based upon Ordnance survey information supplied by HMSO. Crown copyright reserved.
4. Buro Happold accepts no responsibility for the correctness and accurcay for the contents of this drawing.
5. This drawing is to be read in conjunction with all other drawings in the same drainage series.

LEGEND

- Existing Foul Water Sewer (Retained)
- Existing Foul Water Sewer (Abandoned)
- Proposed Foul Water Sewer
- Existing Foul Water Sewer Manhole or Catchpit (Retained)
- Proposed Foul Water Sewer Manhole or Catchpit

No	Revision	Date	drn	chk
00	For Information	16/03/04	SG	PM

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Project
REDEVELOPMENT OF THE QUEEN ALEXANDRA HOSPITAL

Drawing Title
FOUL WATER DRAINAGE LAYOUT SHEET 3 OF 3

Date	Drawn	Checked
10/03/2004	SG	PM

Drawing No.	Revision	Scale
C_L(90)1210-03	00	1:500@A1

Appendix D

Site Boreholes

STRUCTURAL SOILS

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth		Client: Novitini Limited		Borehole: BH1
Contract Ref: 735569	Start: 11.12.20 End: 15.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)
						MADE GROUND: Asphalt.	0.10
						MADE GROUND: Brown mottled grey slightly sandy clayey angular to subangular fine to coarse GRAVEL of limestone and concrete.	0.25
0.30	1	B					
0.30	101	ES					
0.30		HP	c_u=38/50/50				
							0.50
0.50	2	B				MADE GROUND: Soft to firm dark brown gravelly CLAY. Gravel is angular to subangular fine to coarse of chalk, asphalt, brick fragments and flint.	0.70
0.50		HP	c_u=38/38/50				
1.00	3	B				MADE GROUND: Firm brown gravelly CLAY with a low cobble content. Gravel is angular to subangular fine to coarse of chalk and flint. Cobbles are angular of flint.	(0.80)
1.00	102	ES					1.50
1.50-1.95	4	DSPT				POSSIBLE MADE GROUND: Light brown mottled white slightly sandy clayey angular to subrounded fine to coarse GRAVEL of flint and chalk. Recovered as structureless CHALK composed of slightly sandy gravelly SILT. Gravel is weak, off-white occasionally mottled orangish brown and subangular.	
2.00	5	B					(1.50)
2.50-2.95	6	UT100	65 blows 100% recovery				
							3.00
3.00	7	D				Weak, off-white occasionally mottled orangish brown CHALK.	
3.50	8	DSPT					
4.00	9	B					
4.50-4.95	10	UT100	90 blows 100% recovery				
5.00	11	D					
6.00	12	B					
6.00-6.45	13	DSPT					
7.00	14	B				. . . From 7.00m depth occasional locally rinded flints.	
7.50-7.95	15	UT100	75 blows 100% recovery				
8.00	16	D					

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
11/12/20		0.00	-		-
11/12/20		6.00	-		-
14/12/20	08:00	6.00	3.00	150	Dry
14/12/20	17:00	20.00	3.00	150	-
15/12/20	12:00	20.00	3.00	150	-

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No groundwater encountered.
4. On completion, borehole backfilled with arisings.

All dimensions in metres Scale: 1:50

Method Used: Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:	AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth	Client: Novitini Limited	Borehole: BH1
Contract Ref: 735569	Start: 11.12.20 End: 15.12.20	Ground Level: ---
Co-ordinates: ---	Sheet: 2 of 3	

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.00	17	B				Weak, off-white occasionally mottled orangish brown CHALK. *(stratum copied from 3.00m from previous sheet)*		
9.00-9.45	18	SPT	N=45					
9.00-9.45	18	DSPT						
10.00	19	B				. . . From 10.00m depth rare locally rinded flints.		
10.50-10.95	20	UT100	100 blows 100% recovery					
11.00	21	D					(17.00)	
12.00	22	B				. . . From 12.00m depth occasional flints.		
12.00-12.45	23	SPT	N=41					
12.00-12.45	23	DSPT						
13.00	24	B						
13.50-13.95	25	UT100	100 blows 100% recovery					
14.00	26	D				. . . From 14.00m depth rare flints and rare black specks.		
15.00	27	B				. . . From 15.00m depth occasional flints.		
15.00-15.45	28	SPT	N=41					
15.00	28	DSPT						
16.00	29	B						
16.50-16.95	30	UT100	100 blows 100% recovery					
17.00	31	D						

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

AGS

STRUCTURAL SOILS

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth	Client: Novitini Limited	Borehole: BH1

Contract Ref: 735569	Start: 11.12.20 End: 15.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 3 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
18.00	32	B				Weak, off-white occasionally mottled orangish brown CHALK. *(stratum copied from 3.00m from previous sheet)*		
18.00-18.45	33	SPT	N=46					
18.00-18.45	33	DSPT						
19.00	34	B						
19.50-19.95	35	UT100	100 blows 89% recovery				20.00	
20.00	36	D				Borehole terminated at 20.00m depth.		

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract:	Client:	Borehole:
North Car Park, QAH Portsmouth	**Novitini Limited**	**BH2**

Contract Ref:	Start: / End:	Ground Level:	Co-ordinates:	Sheet:
735569	Start: **08.12.20** End: **09.12.20**	**---**	**---**	**1** of **3**

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)
						MADE GROUND: Asphalt.	0.10
0.20-0.30	101	ES				MADE GROUND: Reddish brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of chalk, asphalt, concrete and limestone.	0.25
0.35-0.45	1	B					0.45
0.40-0.45	102	ES					
0.50-0.70	2	B				MADE GROUND: Soft to firm dark brown to black slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of charcoal, ash, clinker, brick fragments and chalk.	0.75
0.50		V	c_u=65/36/42				
1.00	3	B					(0.55)
1.30-1.50	4	B				POSSIBLE MADE GROUND: Firm brown gravelly CLAY. Gravel is angular to subangular fine to coarse of chalk.	1.30
1.50-1.95	4	SPT	N=13			Firm light brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint and chalk.	(0.65)
1.50-1.95	4.1	DSPT					1.95
2.00	5	D				Structureless CHALK composed of off white mottled brown slightly sandy gravelly SILT. Gravel is very weak, off white and subangular. (Grade Dm)	
2.50-2.95	6	UT100	50 blows 100% recovery			Recovered as structureless CHALK composed of off white occasionally mottled orangish brown with rare black specks slightly sandy gravelly SILT. Gravel is weak off white and subangular.	(1.05)
							3.00
3.00	7	D				Weak off white CHALK with rare black specks and occasional brownish orange staining.	
3.50-3.95	8	SPT	N=17				
3.50-3.95	8.1	DSPT					
4.00	9	B					
4.50-4.95	10	UT100	80 blows 89% recovery				
5.00	11	D					
6.00	12	B				. . . from 6.00m to 7.00m depth occasional flints.	
6.00-6.45	13	SPT	N=42				
6.00-6.45	13.1	DSPT					
7.00	14	B					
7.50-7.95	15	UT100	100 blows 83% recovery				
8.00	16	D				. . . from 8.00m to 9.00m depth rare flints.	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
08/12/20	08:30	0.00	-		-
08/12/20	17:00	13.00	3.00	150	Dry
09/12/20	08:00	13.00	3.00	150	
09/12/20	14:00	20.00	-		-

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to ???? depth.
3. No groundwater encountered.
4. On completion, borehole backfilled with arisings.
5. SPT hammer AR1321-2020 (E_r = 52.00%) used.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2000**	**Kevin Sims**	**KDalton**	

AGS

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth	Client: Novitini Limited	Borehole: BH2

Contract Ref:	Start: 08.12.20 / End: 09.12.20	Ground Level:	Co-ordinates:	Sheet:
735569		---	---	2 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.00	17	B				Weak off white CHALK with rare black specks and occasional brownish orange staining. *(stratum copied from 3.00m from previous sheet)*		
9.00-9.45	18	SPT	N=38			. . . from 9.00m to 9.45m depth flint bands.		
9.00-9.45	18.1	DSPT						
10.00	19	B						
10.50-10.95	20	UT100	100 blows 100% recovery					
11.00	21	D					(17.00)	
12.00	22	B						
12.00-12.45	23	SPT	N=40					
12.00-12.45	23.1	DSPT						
13.00	24	B				. . . from 13.00m depth occasional flints.		
13.50-13.95	25	UT100	100 blows 100% recovery					
14.00	26	D						
15.00	27	B						
15.00-15.34	28	SPT	9,9/11,26,13 for 40mm					
15.00-15.45	28.1	DSPT						
16.00	29	B						
16.50-16.95	30	UT100	100 blows 50% recovery					
17.00	31	D						

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Cable percussion	Plant Used: Dando 2000	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

AGS

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth		Client: Novitini Limited		Borehole: BH2
Contract Ref: 735569	Start: 08.12.20 End: 09.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 3 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
18.00	32	B				Weak off white CHALK with rare black specks and occasional brownish orange staining. *(stratum copied from 3.00m from previous sheet)*		
18.00-18.32	33	SPT	9,14/17,23,10 for 20mm					
18.00	33.1	DSPT						
19.00	34	B						
19.50-19.95	35	UT100	100 blows 89% recovery				20.00	
20.00	36	D				Borehole terminated at 20.00m depth.		

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Cable percussion	Plant Used: Dando 2000	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

AGS

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract:		Client:	Borehole:
North Car Park, QAH Portsmouth		Novitini Limited	BH3
Contract Ref: 735569	Start: 09.12.20 End: 10.12.20	Ground Level: --- / Co-ordinates: ---	Sheet: 1 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)
						MADE GROUND: Asphalt.	0.10
0.25-0.35	101	ES				MADE GROUND: Reddish brown slightly sandy angular to subangular fine to coarse GRAVEL of limestone and flint.	0.25
0.30	1	B					0.35
0.50	2	B				MADE GROUND: Reddish brown mottled white slightly sandy angular to subrounded GRAVEL of flint and chalk.	(0.65)
1.00	3	B				Recovered as structureless CHALK composed of slightly sandy gravelly SILT. Gravel is off white moderately weak angular to subrounded with occasional locally rinded flint.	1.00
1.50-1.95	4	SPT	N=16			Weak off white occasionally mottled orangish brown CHALK with rare flints.	
1.50-1.95	4.1	DSPT					
2.00	5	B					
2.50-2.95	6	UT100	75 blows 100% recovery				
3.00	7	D					
3.50-3.95	8	SPT	N=21			. . . from 3.50m depth rare black specks and occasionally mottled brownish orange with no flints.	
3.50-3.95	8.1	DSPT					
4.00	9	B					
4.50-4.95	10	UT100	100 blows 61% recovery				
5.00	11	D				. . . from 5.00m depth no black specks present.	
6.00-6.45	12	SPT	N=25			. . . from 6.00m to 8.00m depth no black specks and occasional flints.	
6.00-6.45	12.1	DSPT					
7.00	13	B					
7.50-7.95	14	UT100	100 blows 100% recovery				
8.00	15	D					

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
09/12/20	14:00	0.00	-		-
09/12/20	17:00	1.20	-		-
10/12/20	08:00	1.20	-		-
10/12/20	18:00	20.00	3.00	150	-

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20 m depth.
3. No groundwater encountered.
4. On completion, borehole backfilled with arisings.
5. SPT hammer AR1321-2020 (E_r = 52.00%) used.

All dimensions in metres. Scale: 1:50

Method Used: Inspection pit + Cable percussion	Plant Used: Dando 2000	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

AGS

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract: North Car Park, QAH Portsmouth		Client: Novitini Limited		Borehole: BH3
Contract Ref: 735569	Start: 09.12.20 End: 10.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 2 of 3

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
9.00	16	B				Weak off white occasionally mottled orangish brown CHALK with rare flints. *(stratum copied from 1.00m from previous sheet)*		
9.00-9.45	17	SPT	N=26					
9.00-9.45	17.1	DSPT						
10.00	18	B				. . . from 10.00m to 10.50m depth rare flints.		
							(19.00)	
10.50-10.95	19	UT100	90 blows 100% recovery					
11.00	20	D						
12.00	21	B						
12.00-12.45	22	SPT	N=22					
12.00-12.45	22.1	DSPT						
13.00	23	B				. . . at 13.00m depth occasional flints.		
13.50-13.95	24	UT100	100 blows 100% recovery					
14.00	25	D						
15.00	26	B				. . . from 15.00m depth rare locally rinded flints.		
15.00-15.45	27	SPT	N=38					
15.00-15.45	27.1	DSPT						
16.00	28	B						
16.50-16.95	29	UT100	120 blows 9% recovery					
17.00	30	D						

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Inspection pit + Cable percussion	Plant Used: Dando 2000	Drilled By: Kevin Sims	Logged By: KDalton	Checked By:

AGS

STRUCTURAL SOILS

RAW FIELD DATA

BOREHOLE LOG

Contract:	Client:	Borehole:
North Car Park, QAH Portsmouth	**Novitini Limited**	**BH3**

Contract Ref:	Start:	End:	Ground Level:	Co-ordinates:	Sheet:
735569	**09.12.20**	**10.12.20**	**---**	**---**	**3** of **3**

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
18.00	31	B				Weak off white occasionally mottled orangish brown CHALK with rare flints. *(stratum copied from 1.00m from previous sheet)*		
18.00-18.38	32	SPT	5,15/12,14,19,5 for 5mm					
18.00-18.45	32.1	DSPT						
19.00	33	B						
19.50-19.95	34	UT100	100 blows 67% recovery				20.00	
20.00	35	D				Borehole terminated at 20.00m depth.		

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

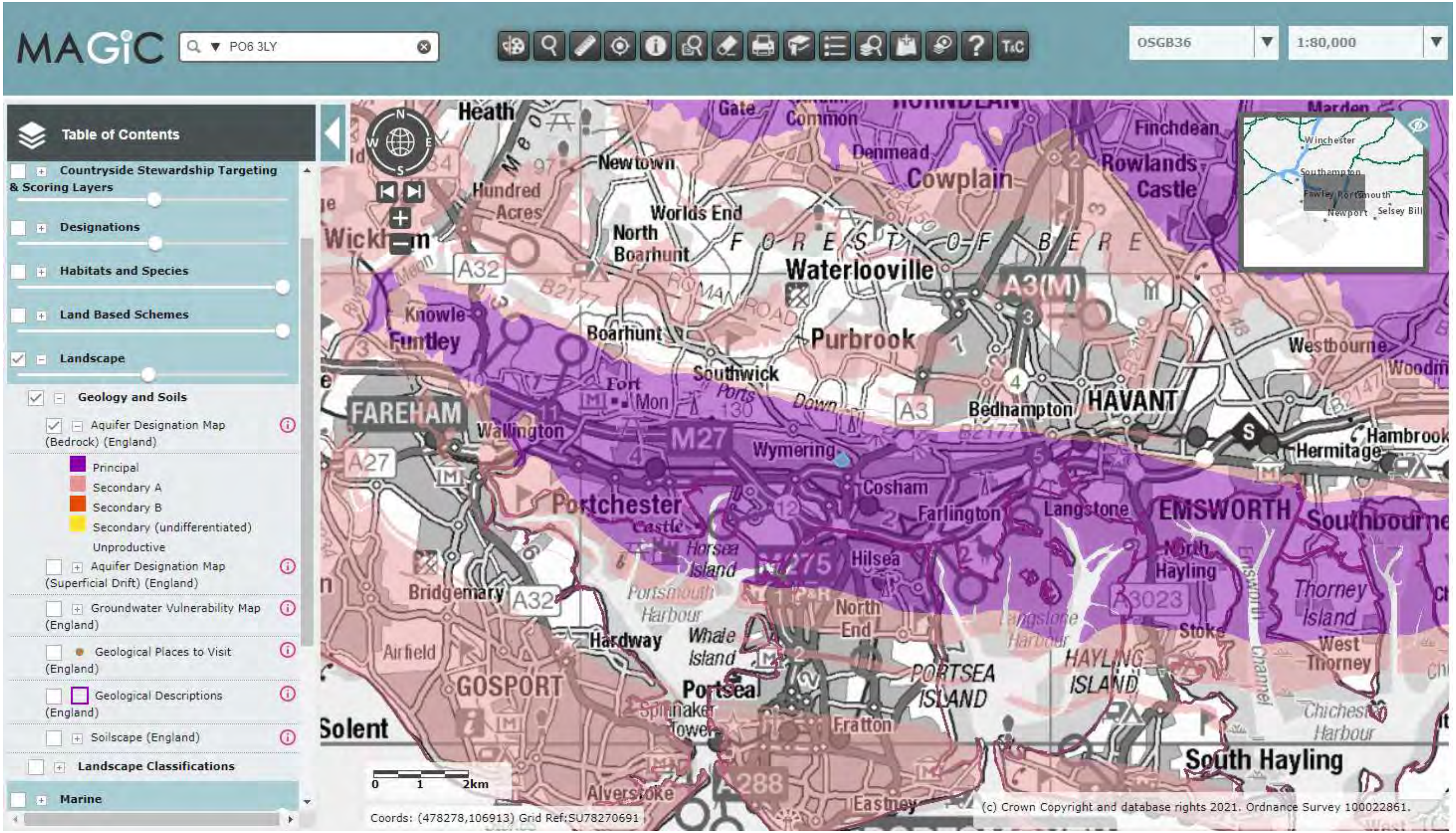
All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000**	**Kevin Sims**	**KDalton**	

AGS

Appendix E

Magic Map Geology Information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OSGB36
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Table of Contents
Countryside Stewardship Targeting & Scoring Layers
Designations
Habitats and Species
Land Based Schemes
Landscape
Geology and Soils
Aquifer Designation Map (Bedrock) (England)
Principal
Secondary A
Secondary B
Secondary (undifferentiated)
Unproductive
Aquifer Designation Map (Superficial Drift) (England)
Groundwater Vulnerability Map (England)
Geological Places to Visit (England)
Geological Descriptions (England)
Soilscape (England)
Landscape Classifications
Marine
Waterlooville
Purbrook
Cowplain
Denmead
Newtown
Worlds End
North Boarhunt
Boarhunt
Southwick
FAREHAM
Wallington
M27
Wymering
Cosham
Farlington
Bedhampton
HAVANT
Langstone
EMSWORTH
Southbourne
Westbourne
Hermitage
Hambrook
Rowlands Castle
Finchdean
Portchester
Horsea Island
Hilsea
North End
Hayling
Thorney Island
West Thorney
Bridgemary
Hardway
Whale Island
GOSPORT
Portsea
PORTSEA ISLAND
HAYLING ISLAND
Fratton
Solent
Alverstoke
Eastney
South Hayling
Portsmouth Harbour
Langstone Harbour
Chichester Harbour
Knowle
Funtley
Wickham
Hundred Acres
Winchester
Southampton
Portsmouth
Fawley
Newport
Selsey Bill
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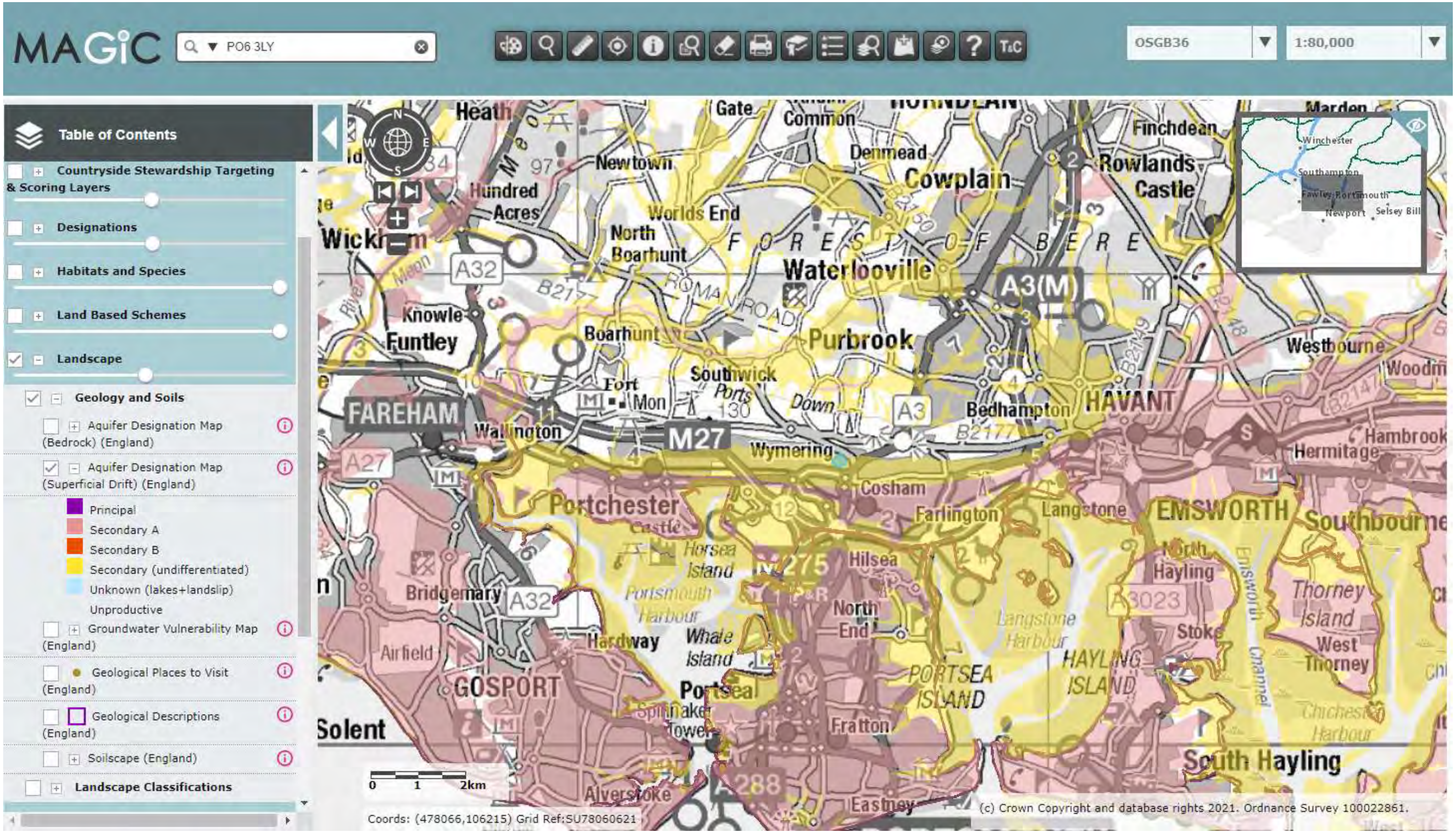
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PO6 3LY
OSGB36
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Aquifer Designation Map (Superficial Drift) (England)
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Secondary A
Secondary B
Secondary (undifferentiated)
Unknown (lakes+landslip)
Unproductive
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FAREHAM
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Purbrook
Waterlooville
Cowplain
Denmead
Newtown
Worlds End
North Boarhunt
Rowlands Castle
Finchdean
Westbourne
HAVANT
Bedhampton
Hermitage
Hambrook
Wallington
Wymering
Cosham
Farlington
Langstone
EMSWORTH
Southbourne
Portchester Castle
Horsea Island
Hilsea
North Hayling
Bridgemary
Portsmouth Harbour
Hardway
Whale Island
North End
Langstone Harbour
Thorney Island
West Thorney
GOSPORT
Portsea
PORTSEA ISLAND
HAYLING ISLAND
Fratton
Chichester Harbour
South Hayling
Solent
Alverstoke
Eastney
Airfield
M27
A3(M)
A32
A27
A3
Winchester
Southampton
Portsmouth
Newport
Selsey Bill
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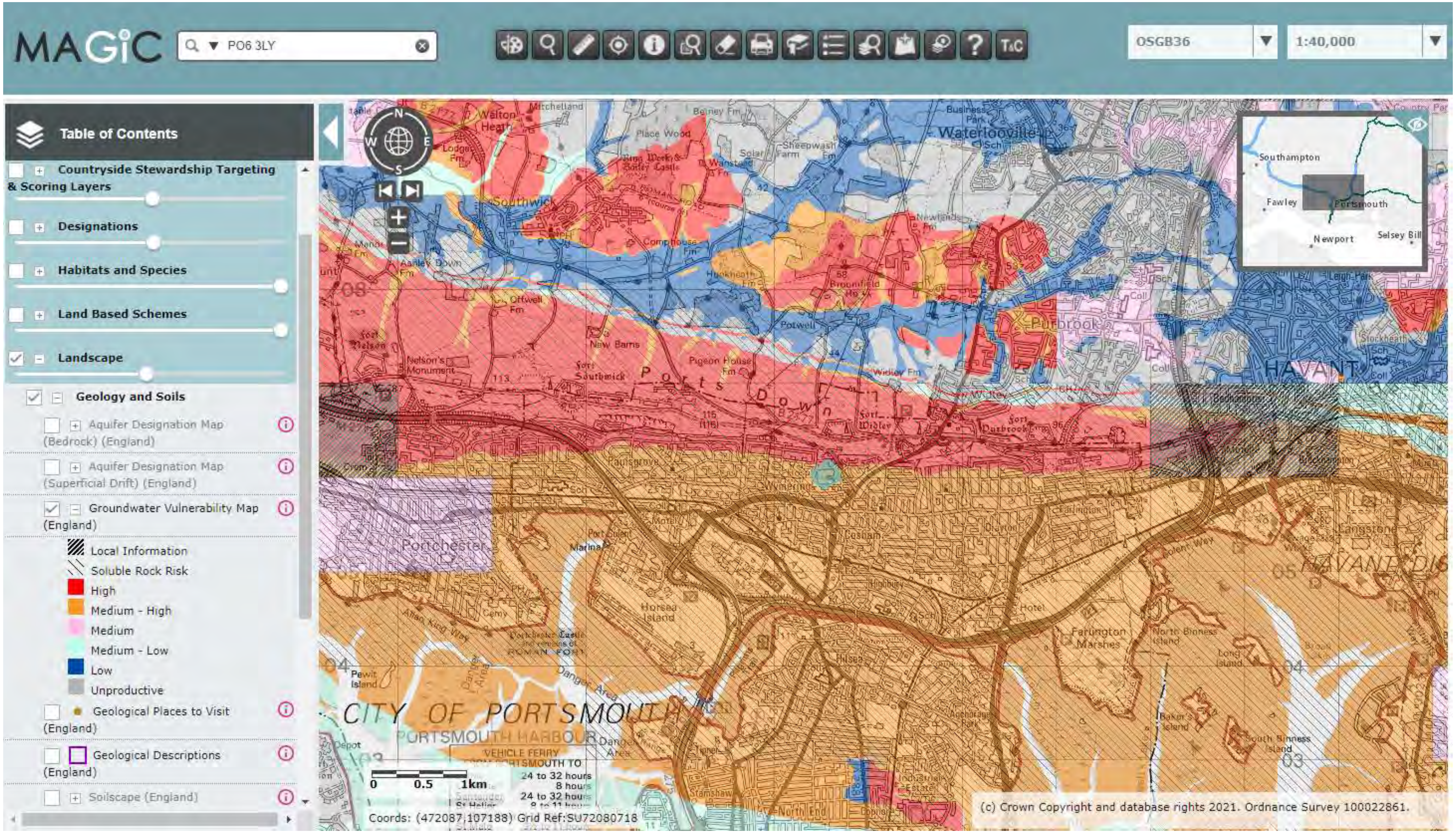
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Medium - High
Medium
Medium - Low
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Portsmouth
Newport
Selsey Bill
Waterlooville
Southwick
Purbrook
HAVANT
Portchester
CITY OF PORTSMOUTH
PORTSMOUTH HARBOUR
0 0.5 1km
Coords: (472087,107188) Grid Ref:SU72080718
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Appendix F

Greenfield Run-Off

ICP SUDS Mean Annual Flood

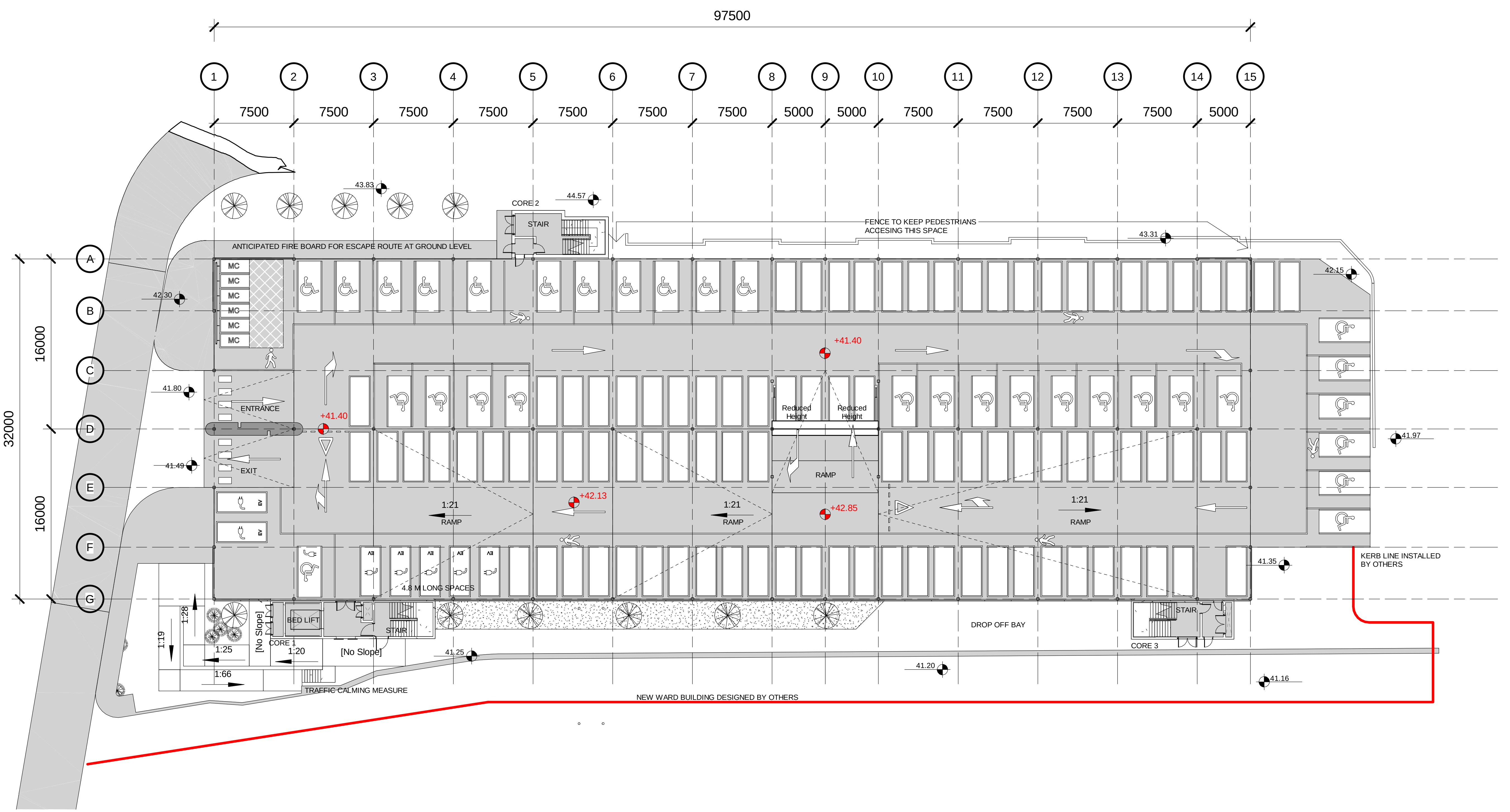
Input

Return Period (years)	1	Soil	0.400
Area (ha)	0.453	Urban	0.700
SAAR (mm)	800	Region Number	Region 7

Results	**l/s**
QBAR Rural	1.8
QBAR Urban	4.6
Q1 year	3.9
Q1 year	3.9
Q30 years	8.1
Q100 years	9.5

Appendix G

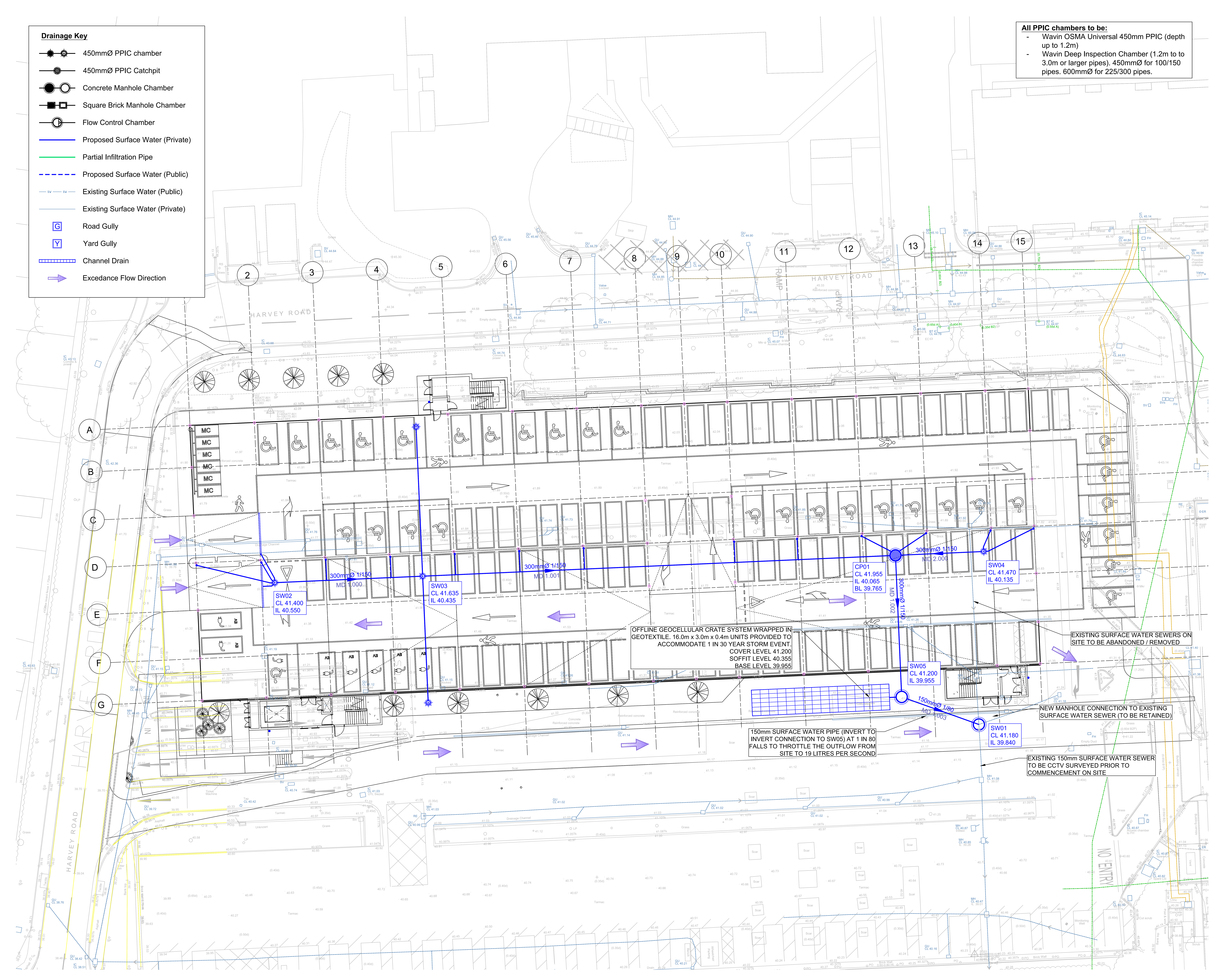
Proposed Site Plan



97500
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
7500
5000
A
B
C
D
E
F
G
16000
32000
ANTICIPATED FIRE BOARD FOR ESCAPE ROUTE AT GROUND LEVEL
CORE 2
STAIR
FENCE TO KEEP PEDESTRIANS ACCESING THIS SPACE
43.83
44.57
43.31
42.15
42.30
41.80
41.49
41.97
41.35
41.25
41.20
41.16
MC
ENTRANCE
EXIT
+41.40
+42.13
+42.85
Reduced Height
RAMP
1:21
4.8 M LONG SPACES
BED LIFT
CORE 1
CORE 3
[No Slope]
1:28
1:19
1:25
1:20
1:66
TRAFFIC CALMING MEASURE
DROP OFF BAY
KERB LINE INSTALLED BY OTHERS
NEW WARD BUILDING DESIGNED BY OTHERS

Appendix H

Schematic Drainage Layout



Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimeters unless noted otherwise.
3. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings.

Drainage Construction Notes

1. All materials and workmanship related to private sewers shall be in accordance with Part H of the Building Regulations and BS EN752 and best practice
2. All materials and workmanship related to adoptable sewers shall be in accordance with the Design and Construction Guidance 2020 as published by the Water Services Association and any subsequent revisions shown by the water authority
3. All sustainable drainage systems to be designed and maintained in accordance with CIRIA C753 The SuDS Manual and best practice guidance.
4. Gulley and channel grating shall be ductile iron to BS EN124, Load Class D400, and kitemarked.
5. Manhole covers and frames to be ductile iron to BS EN124 Class D400 in carriageways and Class B125 in verges unless otherwise specified. Covers may be kitemarked and badged "SW" or "FW" as appropriate unless otherwise instructed by the water authority. Brick/brick infilled manhole covers are not to be used on adoptable manholes.
6. All clayware pipes to be vitrified clay to BS EN 295 or BS 65 and of minimum strength Class 120 or Extra Strength respectively.
7. All plastic pipes to be PVC-U in accordance with BS EN 1401.
8. All underfloor hung drainage to be ductile iron in accordance with BS EN 545: 1994 and BS EN 598: 1994 unless explicitly noted on the drawing.
9. All carrier drains under carriageway to be constructed with BEDDING TYPES S or Z depending on depth of cover as described on Typical Drainage Details drawing.
10. First flexible joint in pipes adjacent to a manhole shall be 600mm from inside face of manhole, connecting to rocker pipe. For pipes of 150-450mm, the rocker pipe length shall be 500mm-750mm and for pipe diameters 451-750 rocker pipe shall be 750mm-1000mm.
11. Pipes shall be laid to their true line and level by laser or by boning each end and middle.
12. All soft spots within pipe trenches shall be removed.
13. No water shall be allowed to accumulate in pipe trenches during construction.
14. All fill material shall be consolidated in layers not exceeding 225mm.
15. P.C concrete lintels to be used over pipes and ducts passing through walls, subject to design by structural engineer.
16. All insitu concrete used in pipe protection to be min. grade ST2 unless noted otherwise on the typical details.
17. Compressible filler for interruption of concrete pipe protection shall consist of bitumen impregnated insulating board to BS 1142 at each pipe joint.
18. All redundant drains shall be removed or concrete sealed.
19. All pipe runs to be laid with flexible joints.
20. All pipe connections to be made soffit to soffit unless noted.
21. All pipework with less than 1.2m cover within roads or parking areas to have concrete bed & surround.
22. If the contractor finds any discrepancies in the information provided then he must notify the engineer immediately before any materials are ordered or works undertaken
23. All underslab drainage at minimum 1 in 40 fall unless noted on the drawing.

Rev	Rev Date	Revision Description	Drawn	Check'd	Apprv'd
P0x	dd/mm/yy				

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Project
QA HOSPITAL MSCP PORTSMOUTH
COSHAM, PORTSMOUTH, PO6 3LY

Title
DRAINAGE LAYOUT
GROUND FLOOR LEVEL
(STRATEGY)

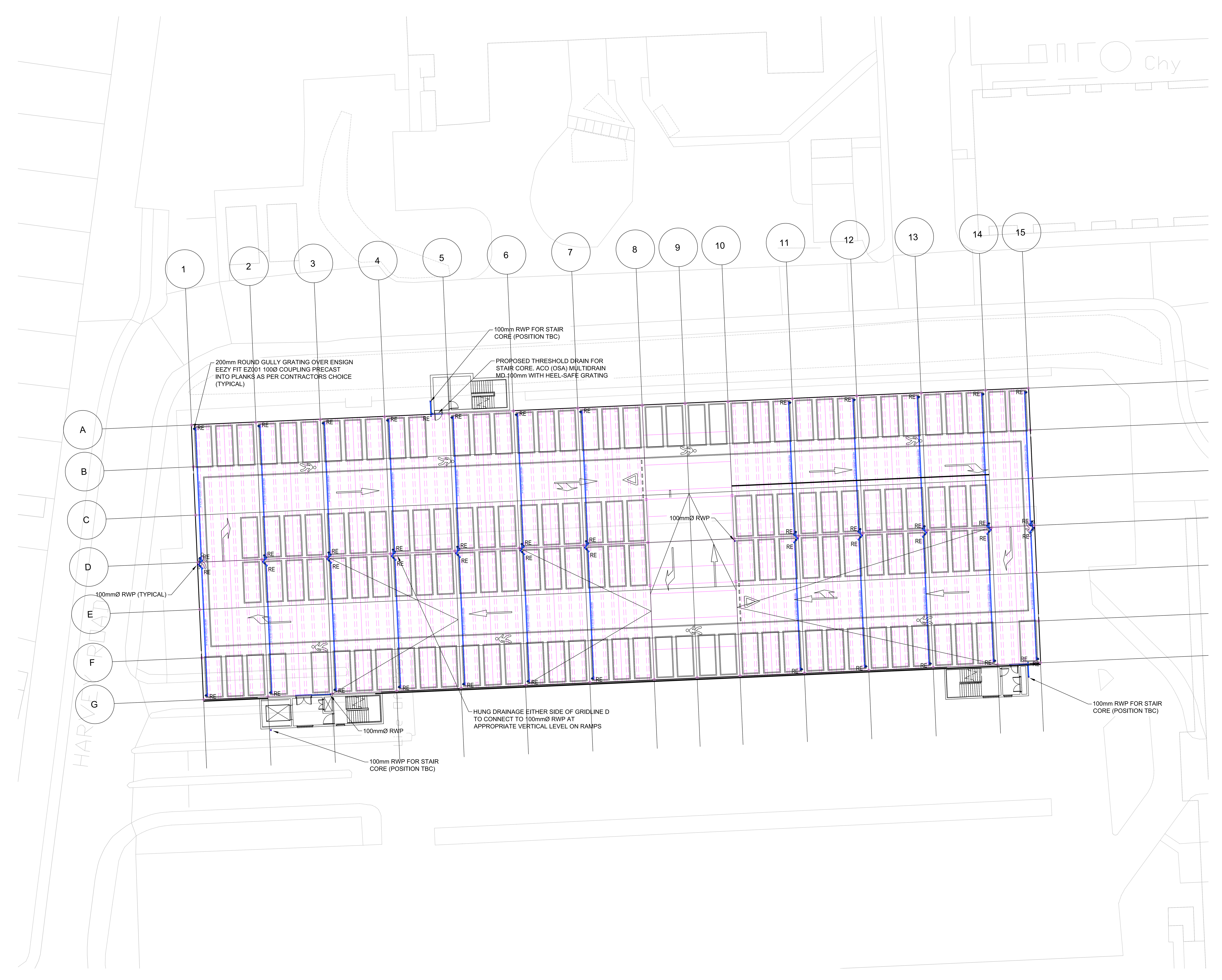
Purpose
FOR INFORMATION

Issue Date
MAR 2021

DO NOT SCALE

Job Number	Scale	Revision	Original Size
J1708	1:200	P01	A1

Drawing Number
J1708-A20312-0200



Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimeters unless noted otherwise.
3. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings.

Rev	Rev Date	Revision Description	Drawn	Check'd	Appv'd
P0x	dd/mm/yy				

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Title
DRAINAGE LAYOUT
INTERMEDIATE DECK LEVEL

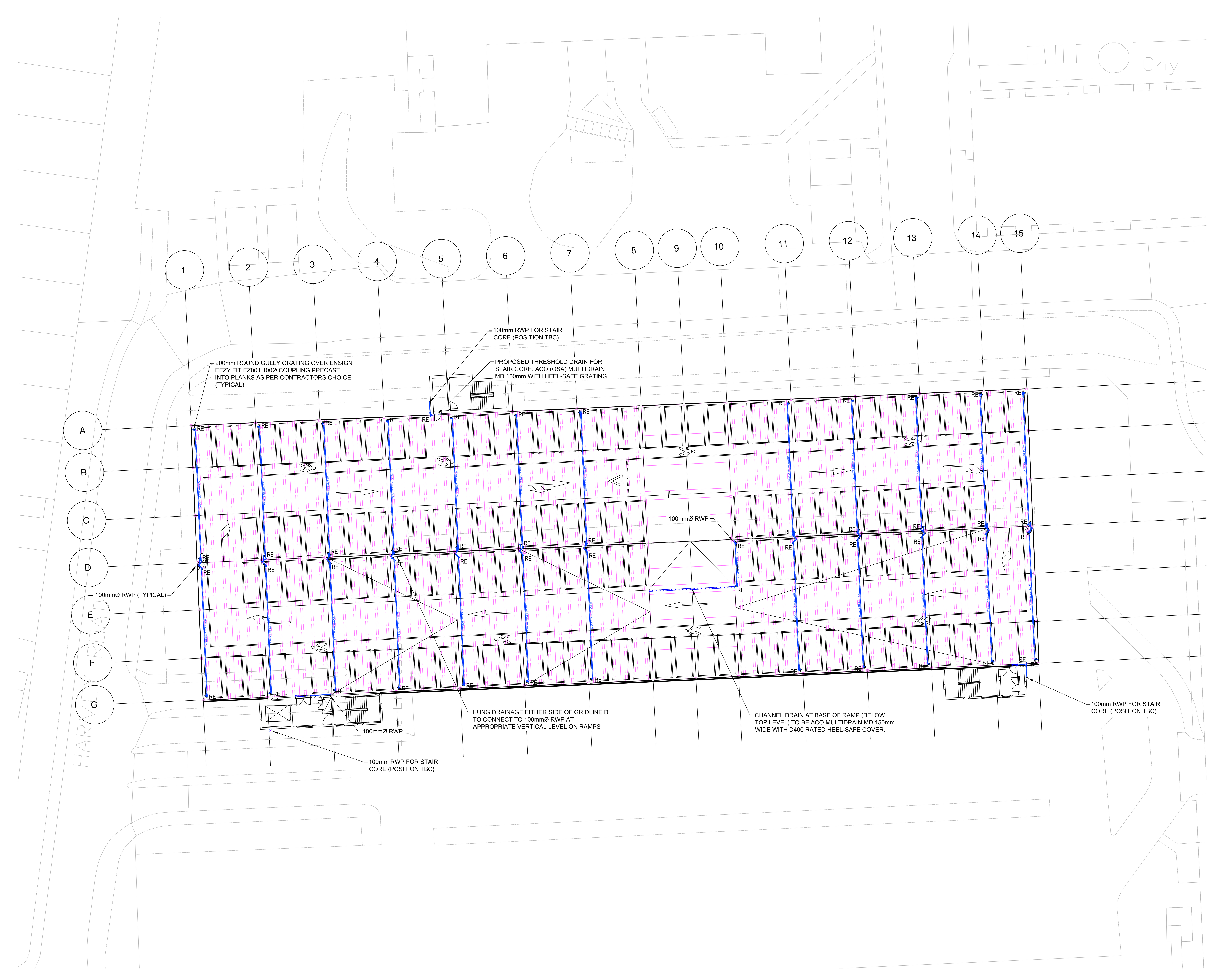
Purpose
FOR INFORMATION

Issue Date
MAR 2021

DO NOT SCALE

Job Number	Scale	Revision	Original Size
J1708	1:200	P01	A1

Drawing Number
J1708-A20312-0201



Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimeters unless noted otherwise.
3. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings.

Rev	Rev Date	Revision Description	Drawn	Check'd	Apprv'd
P0x	dd/mm/yy				

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COSHAM, PORTSMOUTH, PO6 3LY

Title
DRAINAGE LAYOUT
TOP DECK LEVEL

Purpose
FOR INFORMATION

Issue Date
MAR 2021

DO NOT SCALE

Job Number	Scale	Revision	Original Size
J1708	1:200	P01	A1

Drawing Number
J1708-A20312-0202

Appendix J

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	17.291	0.115	150.4	0.077	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.001	54.979	0.370	148.6	0.142	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
2.000	10.245	0.070	146.4	0.052	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.002	16.430	0.110	149.4	0.074	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.003	9.547	0.119	80.0	0.040	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

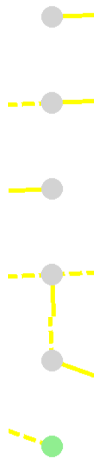
Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.23	40.550	0.077	0.0	0.0	0.0	1.28	90.5	10.4
1.001	50.00	5.94	40.435	0.219	0.0	0.0	0.0	1.29	91.0	29.6
2.000	50.00	5.13	40.135	0.052	0.0	0.0	0.0	1.30	91.7	7.0
1.002	50.00	6.15	40.065	0.345	0.0	0.0	0.0	1.28	90.8	46.7
1.003	50.00	6.29	39.955	0.385	0.0	0.0	0.0	1.12	19.9«	52.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SW02	41.400	0.850	Open Manhole	600	1.000	40.550	300				
SW03	41.635	1.200	Open Manhole	600	1.001	40.435	300	1.000	40.435	300	
SW04	41.320	1.185	Open Manhole	600	2.000	40.135	300				
CP01	41.955	1.890	Open Manhole	1200	1.002	40.065	300	1.001	40.065	300	
								2.000	40.065	300	
SW05	41.200	1.245	Open Manhole	1200	1.003	39.955	150	1.002	39.955	300	
SW01	41.180	1.344	Open Manhole	1200		OUTFALL		1.003	39.836	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW02	465478.247	106155.514	465478.247	106155.514	Required	
SW03	465495.522	106156.271	465495.522	106156.271	Required	
SW04	465560.683	106159.125	465560.683	106159.125	Required	
CP01	465550.449	106158.649	465550.449	106158.649	Required	
SW05	465551.185	106142.236	465551.185	106142.236	Required	
SW01	465560.178	106139.029			No Entry	



PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SW02	41.400	40.550	0.550	Open Manhole	600
1.001	o	300	SW03	41.635	40.435	0.900	Open Manhole	600
2.000	o	300	SW04	41.320	40.135	0.885	Open Manhole	600
1.002	o	300	CP01	41.955	40.065	1.590	Open Manhole	1200
1.003	o	150	SW05	41.200	39.955	1.095	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	17.291	150.4	SW03	41.635	40.435	0.900	Open Manhole	600
1.001	54.979	148.6	CP01	41.955	40.065	1.590	Open Manhole	1200
2.000	10.245	146.4	CP01	41.955	40.065	1.590	Open Manhole	1200
1.002	16.430	149.4	SW05	41.200	39.955	0.945	Open Manhole	1200
1.003	9.547	80.0	SW01	41.180	39.836	1.194	Open Manhole	1200

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

Storage Structures for Storm

Cellular Storage Manhole: SW05, DS/PN: 1.003

Invert Level (m) 39.955 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	48.0	48.0	0.500	0.0	63.2
0.400	48.0	63.2			

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW02	15 Winter	1	+0%	30/15 Summer	100/15 Summer			40.624
1.001	SW03	15 Winter	1	+0%	30/15 Summer				40.552
2.000	SW04	15 Winter	1	+0%	30/15 Summer	100/15 Summer			40.231
1.002	CP01	15 Winter	1	+0%	30/15 Summer				40.224
1.003	SW05	15 Winter	1	+0%	1/15 Summer	100/15 Summer			40.193

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW02	-0.226	0.000	0.14			10.7	OK	9
1.001	SW03	-0.183	0.000	0.31			26.8	OK	
2.000	SW04	-0.204	0.000	0.11			7.0	OK	9
1.002	CP01	-0.141	0.000	0.54			41.9	OK	
1.003	SW05	0.088	0.000	1.34		10	23.6	SURCHARGED	9

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW02	30 Winter	30	+0%	30/15 Summer	100/15 Summer			41.379
1.001	SW03	30 Winter	30	+0%	30/15 Summer				41.367
2.000	SW04	30 Winter	30	+0%	30/15 Summer	100/15 Summer			41.260
1.002	CP01	30 Winter	30	+0%	30/15 Summer				41.254
1.003	SW05	30 Winter	30	+0%	1/15 Summer	100/15 Summer			41.150

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW02	0.529	0.000	0.26			20.1	FLOOD RISK	9
1.001	SW03	0.632	0.000	0.65			55.6	FLOOD RISK	
2.000	SW04	0.825	0.000	0.18			11.9	FLOOD RISK	9
1.002	CP01	0.889	0.000	0.91			70.4	SURCHARGED	
1.003	SW05	1.045	0.000	3.13		22	55.1	FLOOD RISK	9

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW02	30 Winter	100	+40%	30/15 Summer	100/15 Summer			41.422
1.001	SW03	15 Winter	100	+40%	30/15 Summer				41.616
2.000	SW04	15 Winter	100	+40%	30/15 Summer	100/15 Summer			41.328
1.002	CP01	15 Winter	100	+40%	30/15 Summer				41.456
1.003	SW05	30 Winter	100	+40%	1/15 Summer	100/15 Summer			41.217

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW02	0.572	21.608	0.59			45.9	FLOOD	9
1.001	SW03	0.881	0.000	0.96			82.9	FLOOD RISK	
2.000	SW04	0.893	7.883	0.30			19.8	FLOOD	9
1.002	CP01	1.091	0.000	1.41			108.6	SURCHARGED	
1.003	SW05	1.112	17.435	3.22		26	56.8	FLOOD	9