ESTATES ANNEXE CONTENTS:

VOLUME 1: ARCHITECTURE

VERSION CONTROL

16.11.16	Rev 01	Updated following Technical Team Review
28.10.16	Rev -	Draft OBC Issue

INTRODUCTION

During the development of the Strategic Outline Case the Trust considered how services could best be configured across the two sites (PRH and RSH) based on the need to provide:

- one Emergency Department(ED);
- one Critical Care (CC) Unit, to be co-located with the ED;
- two Urgent Care Centres (UCC), one at each site;
- a clinically optimum balance of activity across the two sites (PRH and RSH).

The site which accommodates the ED, CC Unit and a UCC would then become the Emergency Site. The site which accommodates the stand-alone UCC becomes the Planned Care site.

This OBC describes two potential solutions:
- Emergency Care at PRH and Planned Care at RSH (Option B)
- Emergency Care at RSH and Planned Care at PRH (Option C1)

As referenced within the main OBC document, and in the context of Future Fit, a further variation of the Emergency Care at RSH and Planned Care at PRH is the location of the Women & Children's Services. This option is referred to as Option C2

Based on the required configuration of services, shortlist options have been worked up in more detail as follows:

Option B (Emergency Care at PRH)
- ED and Critical Care at PRH
- Majority of planned care at RSH
- Urgent Care Centre, Outpatients, Diagnostics at both PRH and RSH

Option C1 (Emergency Care at RSH)
- ED and Critical Care at RSH
- Majority of planned care at PRH
- Urgent Care Centre, Outpatients, Diagnostics at both RSH and PRH

Option C2 (Emergency Care at RSH/W&C at PRH)
- ED and Critical Care at RSH
- Women and Children's at PRH
- Majority of planned care at PRH
- Urgent Care Centre, Outpatients, Diagnostics at both RSH and PRH

The physical form and development of each of these options is illustrated in the following Estates Annexe document.

CONTENTS PAGE

AHR

1.0 SITE ANALYSIS

1.1 PRH_SITE ANALYSIS

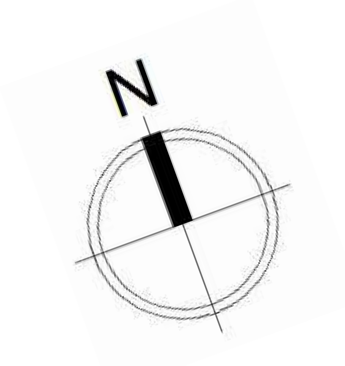
SURROUNDING CONTEXT

The Princess Royal Hospital (PRH) site covers approximately 14 hectares and lies in the north-east of Telford, to the north of Wellington. The PRH site is surrounded by woodland, effectively screening it from surrounding roads and developments. The site was developed in the late 1980's following the 'Nucleus' design philosophy, with a repeating cruciform pattern of departmental templates, linked via a main corridor or 'hospital street'. It was originally designed as a single entity, with further extension and development over time, most notably the construction of the Women & Children's Unit which was completed in 2014. Surrounding buildings comprise Clinical Uses in the form of Melling Health and the Severn Hospice. Family homes bound the northern and eastern edges of the hospital site.

The natural topography of the site is gently sloping, but in the construction of the original building and subsequent developments, the levels have been altered by moving earth to open areas of the site, which has resulted in localised banking and level changes. Vehicles access the site from two alternative entrances, and buses are able to undertake a through-route across the site. This dual entrance enables segregation of service vehicles from public and blue light traffic, and there is a further perimeter route which 'fast-tracks' blue light vehicles to the Emergency department without being obstructed by visitor traffic. There is site wide resilience enabled by a circular route around the site.

The existing buildings are 2-storey brick built structures with pitched roofs, planned as a series of nucleus templates around a series of courtyards. There are separate pedestrian entrances for Emergency and Main entrance users, although these are signified by signage rather than intuitive measures within the architecture. Secondary entrances exist for the Women & Children's Unit, the MLU and Day Hospital and the Fracture Clinic/ termination of the hospital street.

The site overall feels 'leafy' and 'green' and there is evidence of the use of external spaces socially by both staff and visitors. There is street furniture along the South-facing pedestrian path between the hospital and visitor car parking. The site connects to the adjoining Silken Way cycleway.



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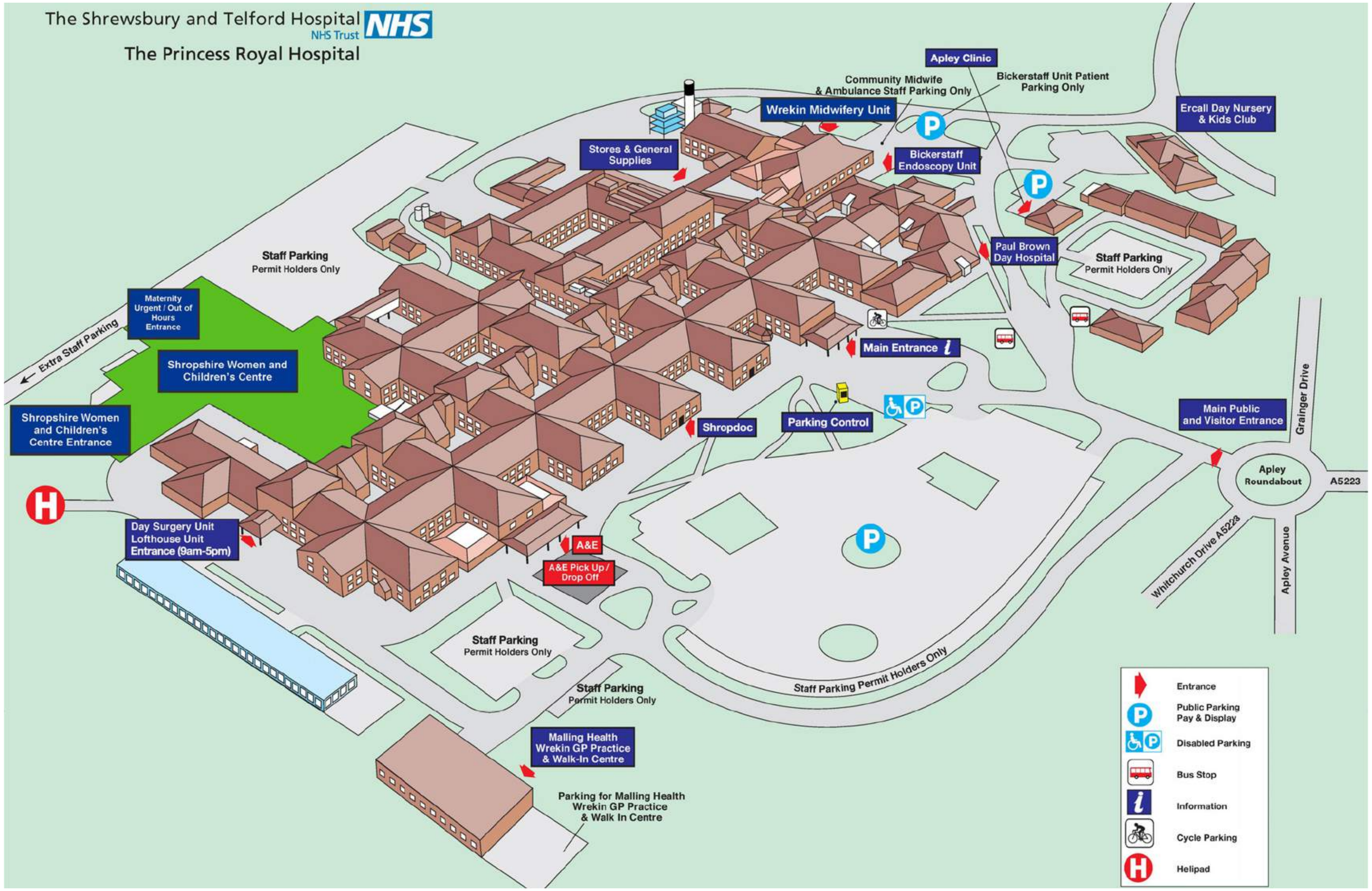

The Shrewsbury and Telford Hospital NHS Trust
NHS
The Princess Royal Hospital
Apley Clinic
Community Midwife & Ambulance Staff Parking Only
Bickerstaff Unit Patient Parking Only
Wrekin Midwifery Unit
Ercall Day Nursery & Kids Club
Stores & General Supplies
Bickerstaff Endoscopy Unit
Staff Parking Permit Holders Only
Paul Brown Day Hospital
Staff Parking Permit Holders Only
Maternity Urgent / Out of Hours Entrance
Extra Staff Parking
Shropshire Women and Children's Centre
Main Entrance
Shropshire Women and Children's Centre Entrance
Shropdoc
Parking Control
Main Public and Visitor Entrance
Grainger Drive
Apley Roundabout
A5223
Day Surgery Unit Lofthouse Unit Entrance (9am-5pm)
A&E
A&E Pick Up / Drop Off
Whitchurch Drive A5224
Apley Avenue
Staff Parking Permit Holders Only
Staff Parking Permit Holders Only
Staff Parking Permit Holders Only
Malling Health Wrekin GP Practice & Walk-In Centre
Parking for Malling Health Wrekin GP Practice & Walk In Centre
Entrance
Public Parking Pay & Display
Disabled Parking
Bus Stop
Information
Cycle Parking
Helipad

A:
Recent good quality clinical accommodation

B:
Clinical & Non-clinical support

C:
FM & Service Accommodation

D:
Nucleus templates, cruciform blocks

E:
Temporary Buildings

Hospital Street

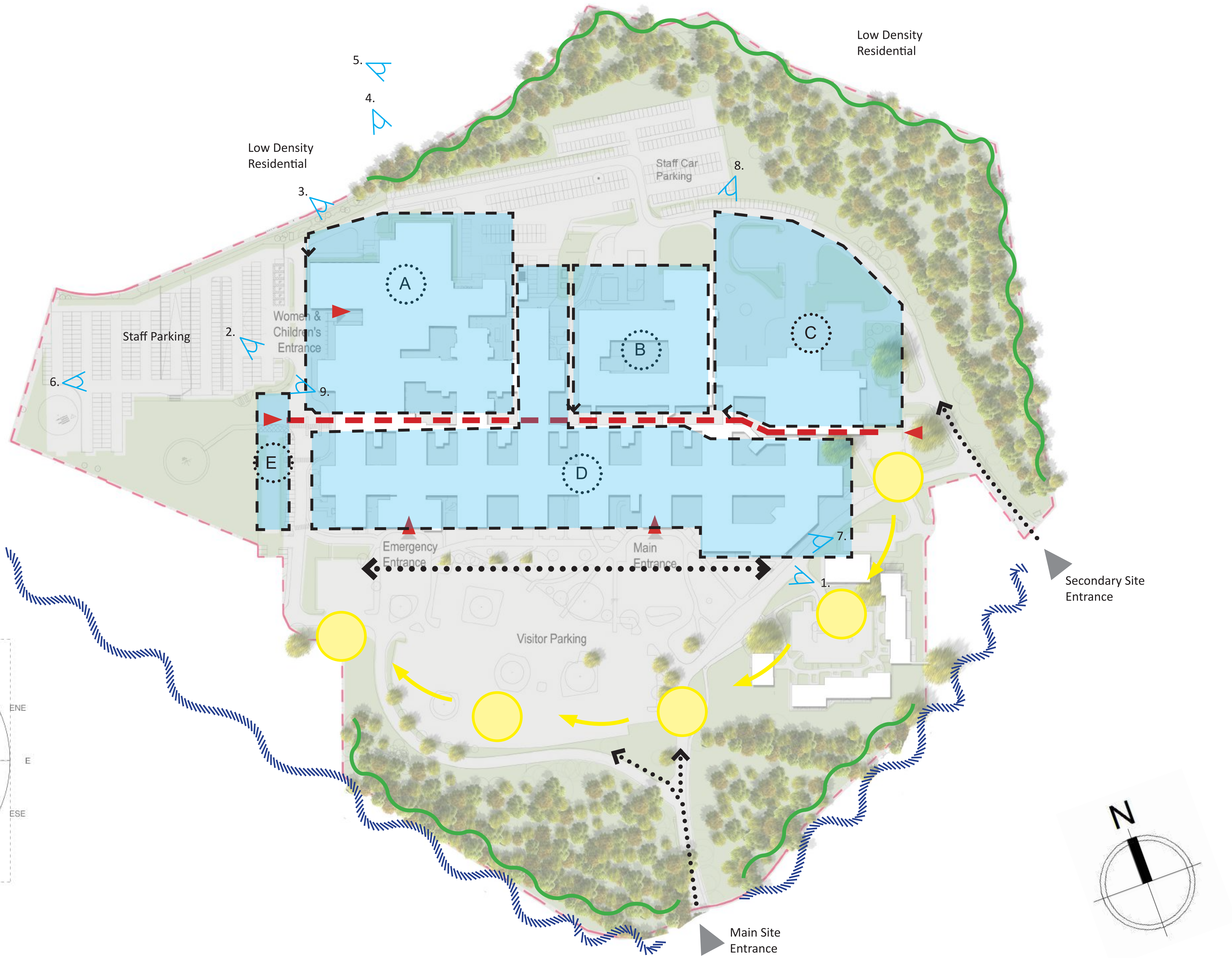
Mature Trees to Boundary

Noise

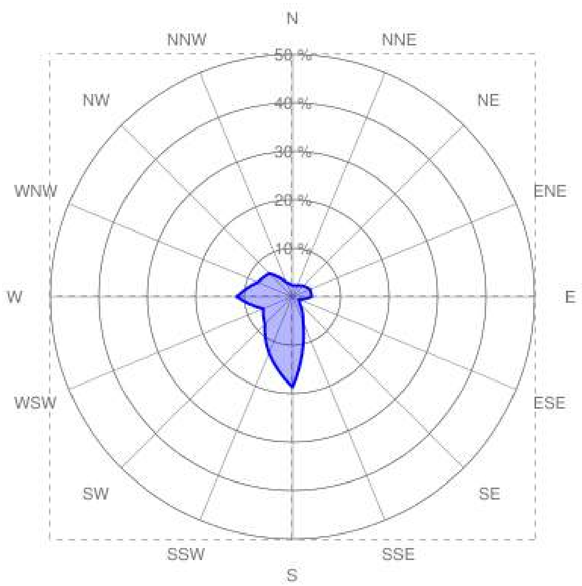
Hospital Entrance

Sun Path

Photograph Location



Wind Rose



EXISTING ESTATE

Locations of numbers are shown on the previous plan.

The existing nucleus templates and hospital street enable effective circulation; the majority of internal traffic utilises the ground floor street, with the first floor route less congested. There is a mixture of visitor patient and FM traffic; while this is generally able to be accommodated within the width of the hospital street, there are some serious challenges presented by the integration of pedestrians, bed traffic and tugs.

1. MAIN ENTRANCE

The existing main entrance is cluttered and congested, and retail and catering opportunities are not maximised. Wayfinding is heavily dependent on signage, and users may find themselves walking a considerable distance from the main entrance to access their relevant departments.

2. OTHER ENTRANCES

3. WOMENS AND CHILDREN'S UNIT

4. LANDSCAPE SCULPTURES (WOMENS AND CHILDREN'S)

5. LANDSCAPE SCULPTURES

Many departments have now expanded into adjoining templates as the existing template floorspace is too restrictive to meet current clinical needs. Many of the advantages of a rational structured framework of departments have been lost and waiting areas are congested and inadequate. Sections heights are limited and service routes in the roof voids are at capacity in many cases.

Within the template wards and departments, glazing is limited, and views from beds are restricted. Central staff areas within departments have no access to daylight. The existing hospital street has large areas of glazing to the internal courtyards and feels lights and airy but courtyard spaces are generally unoccupied and underused.

6. CAR PARKING ISSUES

7. THERAPY AREA

8. SERVICE YARD

9. TEMPORARY BUILDINGS ON SITE

- Visitor Pedestrian Routes
- Visitor Car Routes
- Service Routes
- Blue Light
- Staff Routes
- Fire Tender Access
- Public Transport Route
- Hospital Entrances

A:
Womens and Children's

B:
Theatres and Wards

C:
Clinical and Non-Clinical

D:
Service Zone

E:
MLU

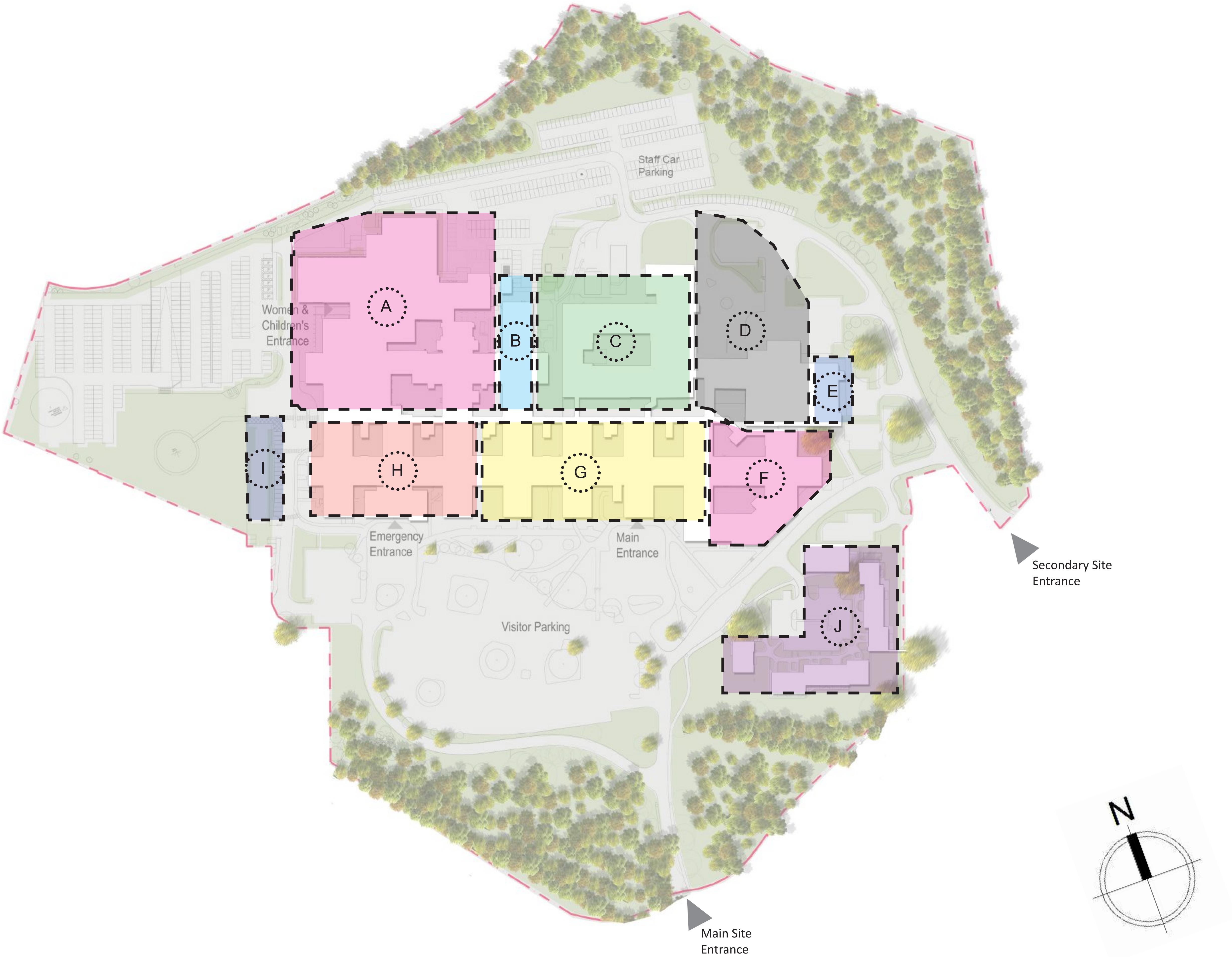
F:
Day Hospital

G:
Out Patient / In Patient

H:
Emergency / Diagnostic

I:
Temporary Accommodation

J:
Residential / Offices



BUILD STRATEGY OPTIONS

A development of the scale of the SSP scheme is limited in the number of locations on site where it could be accommodated:

Option A - To the West of Women & Children's Unit

Positives:
- Proximity to Women & Children's Unit
- Proximity to Imaging
- Proximity to the helipad
- Connectivity to the existing hospital street
- Maintains effective segregation of vehicle routes

Negatives:
- Distance from Main Entrance
- Potentially Significant Cut and Fill requirements
- Potential planning issues caused by proposing the construction of a large scale clinical building close to low rise residential accommodation and sensitive adjoining clinical accommodation
- Lack of visibility from the main entrance
- Loss of Staff & Visitor Parking
- Compromises existing Women & Children's Entrance and drop-off
- Compounds the challenges of travel distances by extending the current linear arrangement.

Option B - To the South of the existing A&E

Positives:
- Maximises visual impact on arrival
- Ability to maintain segregation of vehicle routes
- Proximity to imaging
- Proximity to the helipad
- Creates a compact overall building footprint
- Potential to create 'on-stage'/ 'off-stage' circulation strategy
- Can be delivered with minimal disruption to existing hospital activities
- Ability to connect directly into a number of templates

Negatives:
- Loss of Visitor Parking
- Some Existing Mature trees
- Some topographical issues

Option C - At the North of the site to the rear of Women and Children's and Support Areas

Positives:
- Proximity to Theatres
- Proximity to Women & Children's
- Reduced Cut and Fill requirements

Negatives:
- The 'Front of house', 'back of house' site zoning would be lost- Blue light, visitor, Staff and Servicing traffic would be mixed
- Potential planning issues caused by proposing the construction of a large scale clinical building close to low rise residential accommodation
- Lack of proximity to the helipad
- Lack of visibility from the site entrance
- Distance from Imaging
- Loss of Staff Parking
- Loss a circular vehicle route through the site
- Proximity to and potential impact on existing services
- Lack of connectivity to the Hospital Street
- New accommodation with an open aspect would be predominantly North-facing

Preferred Option

Following on from the build strategy appraisal collaborating with other consultants, it was deemend Option B to be the preferred site.

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1.2 RSH_SITE ANALYSIS

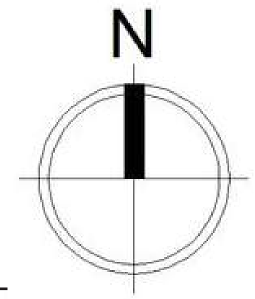
SURROUNDING CONTEXT

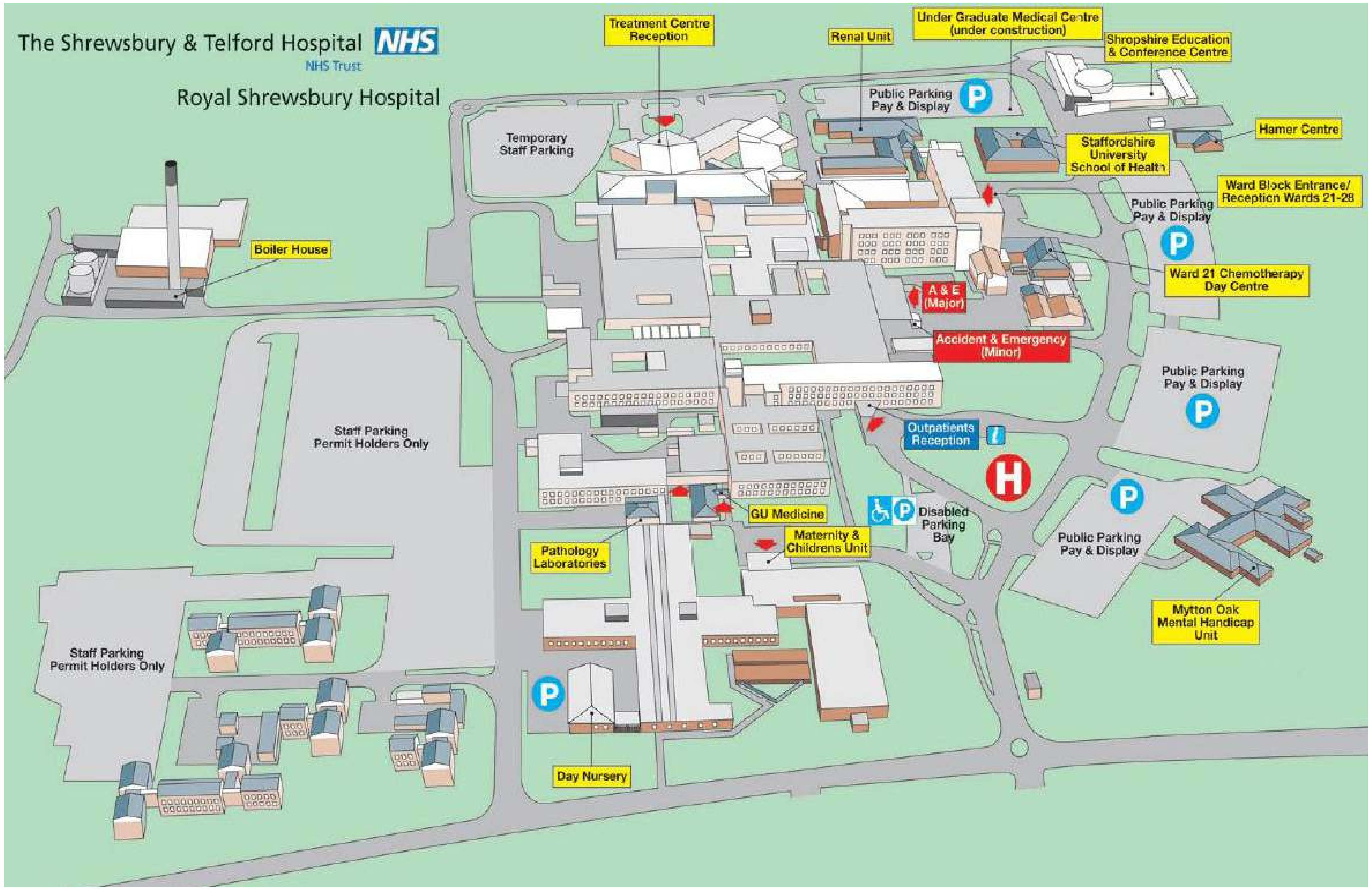
The Royal Shrewsbury Hospital is located on the north side of Mytton Oak Road to the west of the town centre. The hospital was founded in 1979 following the closure of the Royal Salop Infirmary which had occupied a position in the centre of Shrewsbury. The current estate of the Royal Shrewsbury Hospital was formed by merging of the Copthorne Hospital and Copthorne Maternity Hospital which were situated either side of Mytton Oak Road. In 2004 Copthorne Hospital closed and all departments transferred across to the main site on the north side of Mytton Oak Road. This historical context as part of a wider health campus is reflected in the nature of the surrounding context. Some new healthcare accommodation has been constructed in the form of the Redwood Mental Health Facility to the west of the site, while historic hospital estate to the North West is currently being converted to Residential. There is extensive new build low rise residential is taking place to the south of the hospital site, and existing residential to the North and East.

The hospital in its current form occupies a site of approximately 21 hectares, with a variety of building types and scales. A large proportion of the site is single or 2-storey, but includes a 5 storey ward block. The estates mix dates from the 1970's up to the present day. The architectural style of the campus is eclectic with a wide variety materials and design approaches. As a result there is no cohesive architectural language for the site enabling a new development to respond to the immediate context and design brief rather than having to align with any restrictive site wide aesthetic.

The topography of the site at Shrewsbury offers both challenges and opportunities with a 3 storey level change across the site. While this currently presents some significant challenges with circulation and wayfinding from entrances at different levels it presents some interesting opportunities for vertical zoning. There are a series of significant existing retaining structures associated with these level changes evident throughout the site.

There are some artificial mounds on the site which may cover existing redundant structures. Refer to the site investigation report in the Civil and Structural Volume for more detailed information on the site conditions.





The Shrewsbury & Telford Hospital NHS
NHS Trust
Royal Shrewsbury Hospital
Treatment Centre Reception
Renal Unit
Under Graduate Medical Centre (under construction)
Shropshire Education & Conference Centre
Public Parking Pay & Display
Temporary Staff Parking
Hamer Centre
Staffordshire University School of Health
Ward Block Entrance/ Reception Wards 21-28
Public Parking Pay & Display
Boiler House
Ward 21 Chemotherapy Day Centre
A & E (Major)
Accident & Emergency (Minor)
Public Parking Pay & Display
Staff Parking Permit Holders Only
Outpatients Reception
GU Medicine
Disabled Parking Bay
Public Parking Pay & Display
Maternity & Childrens Unit
Pathology Laboratories
Mytton Oak Mental Handicap Unit
Staff Parking Permit Holders Only
Day Nursery

A:
Recent good quality clinical accommodation

B:
FM accommodation in core clinical

C:
Under utilised poor quality support accommodation

D:
Congested deep planned clinical accommodation

E:
Recent good quality clinical accommodation

F:
Education and Conference Zone

Hospital Street

Mature Trees to Boundary

Noise

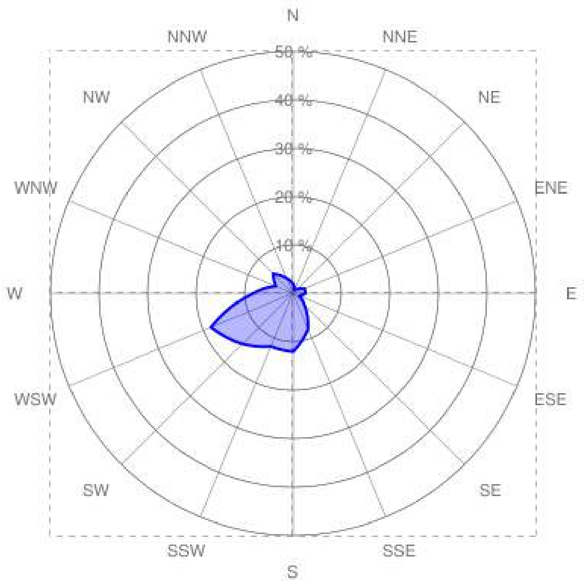
Hospital Entrance

Sun Path

Photograph Locations

Level Change

Wind Rose



EXISTING ESTATE

Locations of numbers are shown on the previous plan.

The Royal Shrewsbury Hospital has not had the benefit of being developed within a cohesive masterplan, and has been developed over a period of time in a piecemeal manner. As a result of this departmental adjacencies are sub-optimal, circulation routes, both horizontal and vertical are indirect and indistinct, and there is no segregation of flows of visitor, patient and FM traffic. The site has large areas of single storey accommodation, resulting in a linear footprint and extended travel times between these departments and a lack of efficiency as a result.

1. KEY DEPARTMENTS LANDLOCKED

2. EMERGENCY ENTRANCE

3. WARD BLOCK MAIN ENTRANCE

4. LANDSCAPE SCULPTURES

5. LANDSCAPE SCULPTURES

Key departments are 'land-locked' by narrow public circulation routes, compromising clinical adjacencies and reducing patient dignity.

Existing building footprints and section heights are inappropriate for use as modern effective clinical space and the condition of the existing estate is poor in many instances.

The lack of a clear architectural style means that entrances are not clearly defined, both in terms of their location and architectural style. Multiple entrances compound this problem and the lack of open orientation spaces make wayfinding is very challenging. The sightlines to A&E are blocked by temporary accommodation and shielded from view by existing buildings.

The site externally, though benefitting from some areas of green space is not a coherent overall site and the existing hard landscape and soft landscaping do not contribute to wayfinding or opportunities for social or personal use.

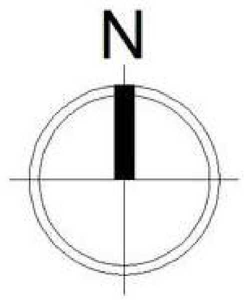
6. EXPOSED SERVICE AREA

7. LANDSCAPED AREA

8. PATHOLOGY BLOCK

9. TREATMENT CENTRE

- Visitor Pedestrian Routes
- Visitor Car Routes
- Service Routes
- Blue Light
- Staff Routes
- Fire Tender Access
- Public Transport Route
- Recycling & Waste Service Route
- Hospital Entrances



A:
Service Zone

B:
Day Case / Treatment Centre

C:
Renal

D:
Education / Admin

E:
Support Services

F:
Theatres

G:
In Patients

H:
Emergency / Diagnostic

I:
Radiotherapy

J:
Outpatients

K:
Residential / Admin

L:
Empty Maternity

M:
Mental Health

A development of the scale of the SSP scheme is limited in the number of locations on site where it could be accommodated:

Option A - Multi-Storey development on the site of the existing estates and staff car-parking- Bridge link back to the existing hospital

Positives:
- Scheme can be constructed with minimal impact on the operation of the existing hospital
- Only Estates requires demolition and re-provision
- Creates distinct and separate 'Emergency' Entrance
- Emergency and visitor traffic can be segregated
- Creates a more compact footprint by creating a cruciform configuration

Negatives:
- Lack of adjacency to key 'hot services' e.g. Imaging and theatres
- Distance from helipad- new location would be required
- Does not address any of the challenges of entrance and circulation within the existing site.
- Construction over existing service duct

Option B -Demolish the existing Copthorne Building- construct new build multi-storey building; create new covered link back to the existing hospital street

Positives:
- Proposals utilise the site of the Copthorne Building which was vacated as part of FCHS
- Development has a prominent position at the entrance to the site
- Potential to segregate blue light traffic from service and visitor traffic
- Site level changes- potential to create innovative 3D circulation strategy

Negatives:
- Development location compounds the existing issues of a very linear hospital by extending the North- South Axis
- Proposal utilises site which has previously been identified with the DCP as having potential for disposal
- Lack of adjacency to key 'hot services' e.g. Imaging and theatres
- Distance from helipad- new location would be required
- Does not address any of the challenges of entrance and circulation within the existing site.
- Lack of adjacency to ward block
- Lack of adjacency to FM and support services
- Development of significant scale directly opposite low rise residential accommodation- potential planning issues
- Site Level Changes- may require significant retaining structures

Option C – New Multi-Storey Building adjoining the existing ward block entrance; new main entrance

Positives:
- Proposals centralise inpatient accommodation
- Creation of a new main entrance with associated catering and retail opportunities
- Scheme can be constructed with minimal impact on the operation of the existing hospital
- Only Estates requires demolition and re-provision
- Creates distinct and separate 'Emergency' Entrance
- Emergency and visitor traffic can be segregated
- Creates a more compact footprint by creating a cruciform configuration
- Maintains segregation of visitor and FM traffic

Negatives:
- Lack of adjacency to key 'hot services' e.g. Imaging and theatres
- Distance from helipad- new location would be required
- Development of significant scale directly adjoining low rise residential accommodation- potential planning issues
- Site Level Changes- creates a main entrance at Level 2 rather than Level 1 where the bulk of the clinical accommodation is located.
- Site level changes- The building will be a storey higher in this location, unless extensive excavation is undertaken.
- Relatively small footprint of land available will result in a building of significant height to accommodate all of the required area
- Vehicle route will need to be maintained to ensure resilience of circular vehicle route around the site

Preferred Option

Following on from the build strategy appraisal collaborating with other consultants, it was deemend Option D to be the preferred site.

Option D: Construct new accommodation on the location of the existing Catering & Stores; re-provide stores at Level 0

Positives:
- Enables required adjacencies of ED and CCU to Theatres and Imaging
- Creates distinct and separate 'Emergency' Entrance
- Emergency, servicing and visitor traffic can be segregated
- Creates a more compact footprint by creating a cruciform configuration
- Good adjacencies to existing inpatient accommodation
- Opportunity to create 'on-stage/ off-stage' servicing strategy to new build accommodation
- Centralised core of 'hot activities'

Negatives:
- Requires the demolition and re-provision of stores & catering
- Will require some phased construction
- Site Level Changes- may require significant retaining structures
- Distance from helipad- new location would be required
- Does not address the challenges associated with the current configuration of multiple entrances

Option E: Standalone unit for E.D; additional wards to the east of the existing inpatient accommodation

Positives:
- Scheme can be constructed with minimal impact on the operation of the existing hospital
- Creates distinct and separate 'Emergency' Entrance
- Creates a more compact footprint by creating a cruciform configuration
- Emergency and service traffic can be segregated
- Close proximity to the helipad
- Creates a new 'Main Entrance'

Negatives:
- Needs emergency theatres and dedicated imaging.
- Construction works in 2 separate locations
- Loss of large areas of visitor parking
- Does not create an overall cohesive hospital which is fully accessible internally
- Vehicles would be required to undertake transfers
- Staff would be isolated from the rest of the hospital
- Lack of connectivity to other services
- Development of significant scale directly adjoining low rise residential accommodation- potential planning issues
- Site Level Changes- creates a main entrance at Level 2 rather than Level 1 where the bulk of the clinical accommodation is located.
- Site level changes- The inpatient building will be a storey higher in this location, unless extensive excavation is undertaken.
- New main entrance is located a long way from some departments e.g.
- Outpatients- multiple entrances are likely to remain in this proposal

Option F: Multi-storey Building to the North of the Treatment Centre

Positives:
- Scheme can be constructed with minimal impact on the operation of the existing hospital
- Creates distinct and separate 'Emergency' Entrance
- Emergency and visitor traffic can be segregated

Negatives:
- Lack of adjacency to key 'hot services' e.g. Imaging and theatres
- Distance from helipad- new location would be required
- Does not address any of the challenges of entrance and circulation within the existing site.
- The single storey treatment centre prevents any connectivity from the new building at the upper levels
- Development location compounds the existing issues of a very linear hospital by extending the North- South Axis
- Lack of adjacency to ward block
- Development of significant scale directly adjoining low rise residential accommodation- potential planning issues
- Eliminates circular vehicle route around the site and compromises resilience
- Loss of large areas of staff parking
- Lack of visibility from main entrance

2.0 DESIGN PROPOSALS - CONCEPT DESIGN

2.1 SITE WIDE ADJACENCY MATRIX AND BRIEF

2.2 EXISTING PLANS_PRH
- PRH_EXISTING SITE PLAN
- PRH_EXISTING PLANS LEVEL 1
- PRH_EXISTING PLANS LEVEL 2

2.3 EXISTING PLANS_RSH
- RSH_EXISTING PLANS LEVEL 0
- RSH_EXISTING PLANS LEVEL 1
- RSH_EXISTING PLANS LEVEL 2
- RSH_EXISTING PLANS LEVEL 3
- RSH_EXISTING PLANS LEVEL 4
- RSH_EXISTING PLANS LEVEL 5

2.4 MASSING STUDY DIAGRAMS

2.5 PRH DESIGN STRATEGY
- PRH_CONCEPT DIAGRAMS
- PRH_MAIN ENTRANCE DESIGN STRATEGY
- PRH_MAIN ENTRANCE_ARTIST IMPRESSIONS

2.6 RSH DESIGN STRATEGY
- RSH_CONCEPT DIAGRAMS
- RSH_MAIN ENTRANCE DESIGN STRATEGY
- RSH_MAIN ENTRANCE_ARTIST IMPRESSIONS

2.7 OPTION B - PRH EMERGENCY SITE
- RSH PLANNED CARE SITE
- PRH_OPTION B LEVELS 1-2
- PRH_ACCOMMODATION SCHEDULE
- PRH_SITE WIDE IMPACTS PLAN
- PRH_ESTATES BACKLOG IMPACT
- RSH_OPTION B LEVELS 0-5
- RSH_ACCOMMODATION SCHEDULE
- RSH_ESTATES BACKLOG IMPACT

2.8 OPTION C1 - RSH EMERGENCY SITE
- PRH PLANNED CARE SITE
- RSH_OPTION C1 LEVELS 0-5
- RSH_ACCOMMODATION SCHEDULE
- RSH_SITE WIDE IMPACTS PLAN
- RSH_ESTATES BACKLOG IMPACT
- PRH_OPTION C1 LEVELS 1-2
- PRH_ACCOMMODATION SCHEDULE
- PRH_ESTATES BACKLOG IMPACT

2.9 OPTION C2 - RSH EMERGENCY SITE
- PRH PLANNED CARE SITE WITH WOMEN AND CHILDREN'S
- RSH_OPTION C2 LEVELS 0-5
- RSH_ACCOMMODATION SCHEDULE
- RSH_SITE WIDE IMPACTS PLAN
- RSH_ESTATES BACKLOG IMPACT
- PRH_OPTION C2 LEVELS 1-2
- PRH_ACCOMMODATION SCHEDULE
- PRH_SITE WIDE IMPACTS PLAN
- PRH_ESTATES BACKLOG IMPACT

2.10 PHASING STRATEGY
- OPTION B
- OPTION C1
- OPTION C2

ESSENTIAL

DESIRABLE

	AEC	Antenatal Day Assessment	Antenatal inpatients	Chemotherapy Day Treatment	Children's Assessment Unit	Children's Inpatients	Children's Oncology	Critical Care Unit	Day Surgery	Delivery Suite	Endoscopy	EPAS	Emergency Department	Emergency Gynaecology	Gynaecology	Imaging	Inpatient Wards	Main Entrance/ Concourse	MLU	Mortuary	Neonatal	Obstetric Theatres	OPD	Operating Theatres	Pathology	Pharmacy	Post Natal Inpatients	Training & Education	Transitional Care	Urgent Care Centre
AEC																														
Antenatal Day Assessment																														
Antenatal inpatients		D																												
Chemotherapy Day Treatment																														
Children's Assessment Unit																														
Children's Inpatients					E																									
Children's Oncology					E	E																								
Critical Care Unit																														
Day Surgery																														
Delivery Suite		D	E					D																						
Endoscopy	D																													
EPAS		D																												
Emergency Department	E				E	E	D	E		D																				
Emergency Gynaecology												D	D																	
Gynaecology														E																
Imaging	E							E	D				E	E																
Inpatient Wards													D			D														
Main Entrance/ Concourse									D								D													
MLU		E	D							D			D																	
Mortuary								D					D				D													
Neonatal										E																				
Obstetric Theatres			E																D		E									
OPD																		D												
Operating Theatres									E													D								
Pathology																														
Pharmacy																														
Post Natal Inpatients			E							E									D			E								
Training & Education																		D												
Transitional Care																					E	D					E			
Urgent Care Centre	E				E	E		E					E	E		E								E						

THE DESIGN PROPOSALS

The design strategies for each of the sites and the architectural proposals in response to each of the options have been developed through a close collaboration with the Clinical Working Groups and a clear understanding of the Programme drivers, Development Control Plan, Clinical Model and overall Trust Vision.

Service Planning Assumptions

- In planning the facility requirements, certain key service planning principles have been established by the Sustainable Services Programme. These include:
- The emergency route in to the Emergency Site (UCC & ED) will be via a single door;
- Emergency and planned care facilities to be separated from each other;
- Ambulatory Emergency Care is provided on the Emergency Site only
- The balance of services across the emergency and planned care sites has been agreed in detail through iterative dialogue with Trust clinicians; some specialties, such as breast surgery and bariatric surgery, are exploring how to develop their services on the planned care site as centres of excellence; Cardiology is exploring the development of a Centre of Excellence on the Emergency Site.
- Critical Care – physical capacity will be provided for 30 spaces; work is being undertaken to establish the staffed capacity to be provided from day 1 of the new unit opening;
- Any proposed solution must be affordable and deliverable

Design Strategy Drivers

The drivers behind the design strategy, which address legacy issues and maximise opportunities are consistent across both sites and evident through each of the options:

- Creating a more compact building footprint
- Embedding Lean Principles from the outset
- Separating Public, Blue Light and Service Traffic
- Improving flows internally and externally and reducing conflicts and cross flowS between service, patient and public movements
- Improving departmental adjacencies
- Rationalising entrances and improving wayfinding
- Using Evidence-based design to provide high-quality patient focused spaces

Accessibility of the building, is an integral part of the overall strategy to improve access to services. The design proposals are developed in the context of a Trust-Wide Travel Plan, and in the context of local and wider transport strategies and initiatives, and considerations such as public transport, car parking and cycle access are integral in the design of the site plan and landscaping. The External Spaces will contribute to the Trust's aspirations for biodiversity and environmental enhancement, and the hard landscaping design will contribute to the coherence and legibility of the overall site. Each hospital site recognises and values its role within its community and consideration will be given as to how to expand the positive contribution each makes to the local area.

Rationalising entrances will reduce confusion and simplify site-wide directional signage; Unifying central spaces such as the atrium will assist with orientation and wayfinding and provide a central hub of information for patients and visitors. A Food Court caters for the changing needs of the hospital throughout the day, flexing in scale and offer to align with customer needs. The ability to adapt these spaces for a variety of uses is efficient and effective enabling this space to be used as an 'airport-style' lounge offering real-time information and high quality facilities for patients awaiting appointments within departments elsewhere within the site. The creation of a compact 3-dimensional building makes the shared use of central facilities a very deliverable solution.

Considered interior design, integrating art, wayfinding and furnishings, will create a sense of place, and can make a genuine positive contribution to healing. Spatial quality and natural daylight promote well-being in staff and visitors and careful selection of quality durable materials ensure that the new facilities remain vibrant and functional for many years. The design will strive for inclusivity, recognising the diverse needs of the building users. Designs will be dementia-friendly and through engagement sessions the specific needs of user groups can be recognised. The value of outside space will be promoted within the design, using Sky-gardens for children's play areas and terraces and courtyards for reflective moments.

Designing patient- focused environments, respecting the need for privacy and dignity through all stages of care is paramount and the design team will continue to promote the development of innovate solutions and strategies to support this.

The design proposals recognise that the building will need to be inherently flexible, throughout the day, to meet seasonal shifts and to adapt over time to a changing clinical need. Space utilisation opportunities are maximised through careful consideration of adjacencies and the creation of multi-use spaces. Efficiency is further maximised by detailed integration of the servicing and delivery strategy and integrating the lean techniques developed from SATH's collaboration with the Virginia Mason Institute.

Deliverability had been driving the design from the outset, with coherent phased solutions across both sites created to minimise disruption to the hospital operation and revenue streams and deliver the new clinical model and its resulting benefits as early as possible.

Patient Area Standards

It is not considered that there will be any derogation at the level of OBC. It is anticipated that there will be the potential development of some more specific derogations as the detailed designs are developed which will be discussed and agreed with at the time. In principle, standard guidance will be followed as deemed applicable to the engineering requirements of the project.

Natural light and ventilation

The design of the building will incorporate window designs to provide good natural daylight and access to external views from beds and seating areas. Evidence suggests there is a clear relationship between indoor daylight environments and a patient's average length of stay in hospital, this, together with access to fresh air and control of ventilation and the room environmental conditions has a therapeutic benefit to patients, enhances the working environment for staff and contributes to the wellbeing of all occupants

To prevent any reduction in the positive effects of maximising daylight within the building Solar gains will be controlled by a combination of measures including;

- Natural shading from recessed windows and overhanging eaves
- Building orientation
- External shading above the windows
- Internal, or interstitial, blinds
- External planting of trees

Building Information Modelling (BIM)

In accordance with the Government Construction Strategy, the project will be delivered to BIM Level 2, and will benefit from the collaborative behaviours and efficiencies in production that result from this method of design and delivery.

Statutory Compliance

All buildings within the scheme will be designed and constructed in accordance with the principles and provisions of the suite of HTM documents which form the Firecode Series.

All buildings within the scope of the project will be designed and constructed to meet the requirements of all sections of the Building Regulations.

Patient Space Standards

New Build areas of the scheme will be designed to align with HBN Standards, supported by Best Practice captured from successful schemes delivered elsewhere, and complemented by the efficiencies offered by the use of the Repeatable Room templates.

Security

The design will integrate security design elements and considerations that address the delivery of patient care services in a safe and secure environment. The design of individual elements of the scheme will consider the recommendations of recognised standards such as the Park Mark safer parking scheme and the Secured by Design Guidance for Healthcare Premises. The scheme will meet the Regulatory and licencing requirements for Storage of Control drugs etc. and will work the user teams and IT workstreams to develop proposals which do not compromise security of information and data. The Security policies and brief will be developed in conjunction with the Trust's Security Adviser.

Meeting the needs of patients and staff

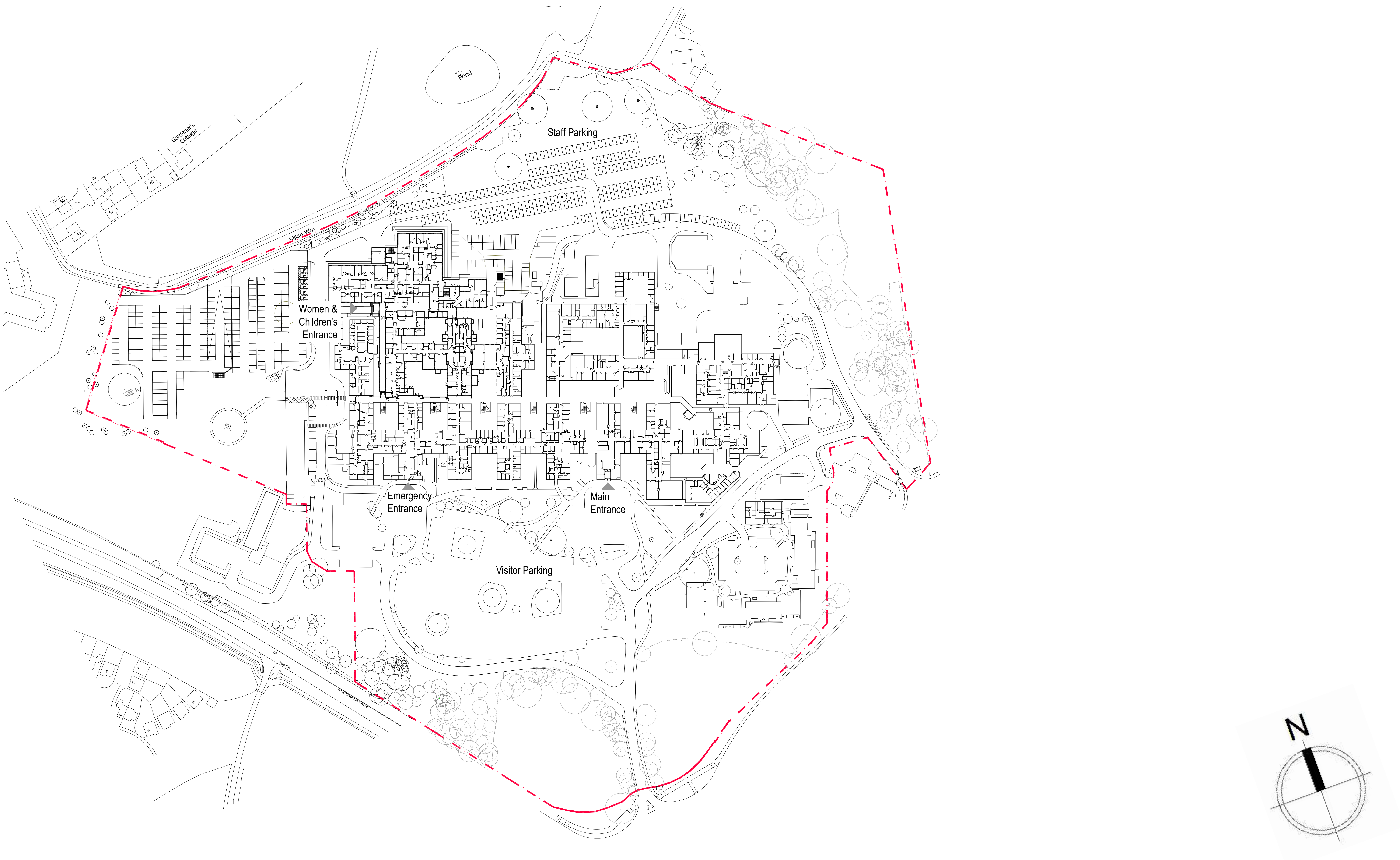
The Trust has a vibrant Critical Friends Group that has contributed to discussions on design. This will continue as the project develops. The Trust also has a successful Communication Strategy which includes extensive engagement with patients past, present and future.

The inpatient wards been designed to enable parents and carers to stay overnight in the room with patients, supplemented by relatives lounges and shower facilities. Relative's rooms are available for Neonatal parents. New food and beverage offers will be introduced to meet the needs of staff and visitors throughout the day and night. Where appropriate, new build in-patient areas will incorporate Gender-Specific day rooms.

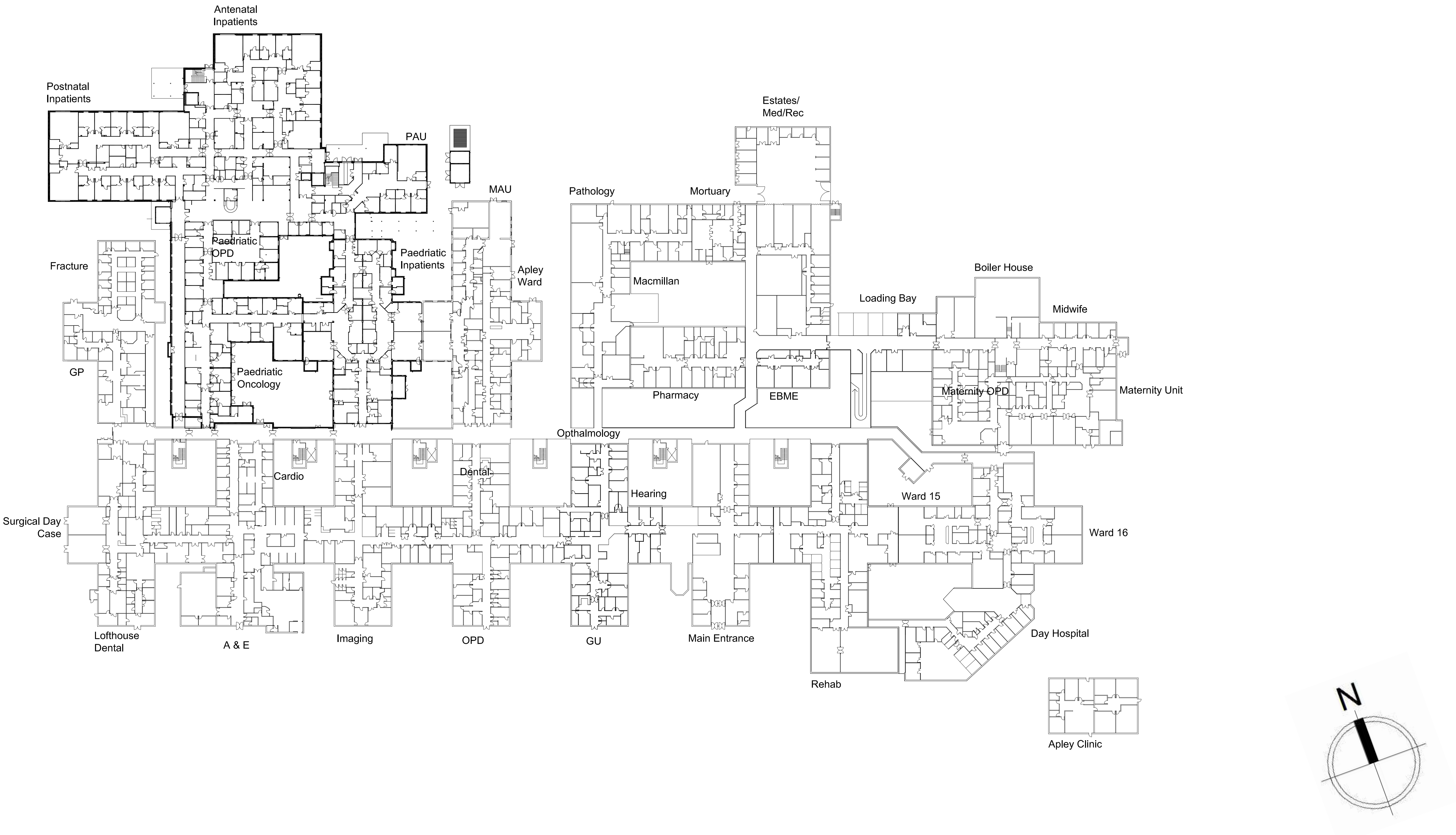
The Components of the Brief

Through the Clinical Working Groups and Task and Finish groups, the design team developed hospital wide adjacency matrices and adjacency diagrams. These adjacencies identified a hot core of existing clinically intensive space which became the heart of the scheme, with the related and dependant departments wrapping around as a mix new build and refurbished accommodation. This briefing information, together with the draft operational policies and clinical model establish the functional content of the scheme, which can then by developed by the Healthcare planners using HBN Guidance and best practice from elsewhere to form Schedules of Accommodation

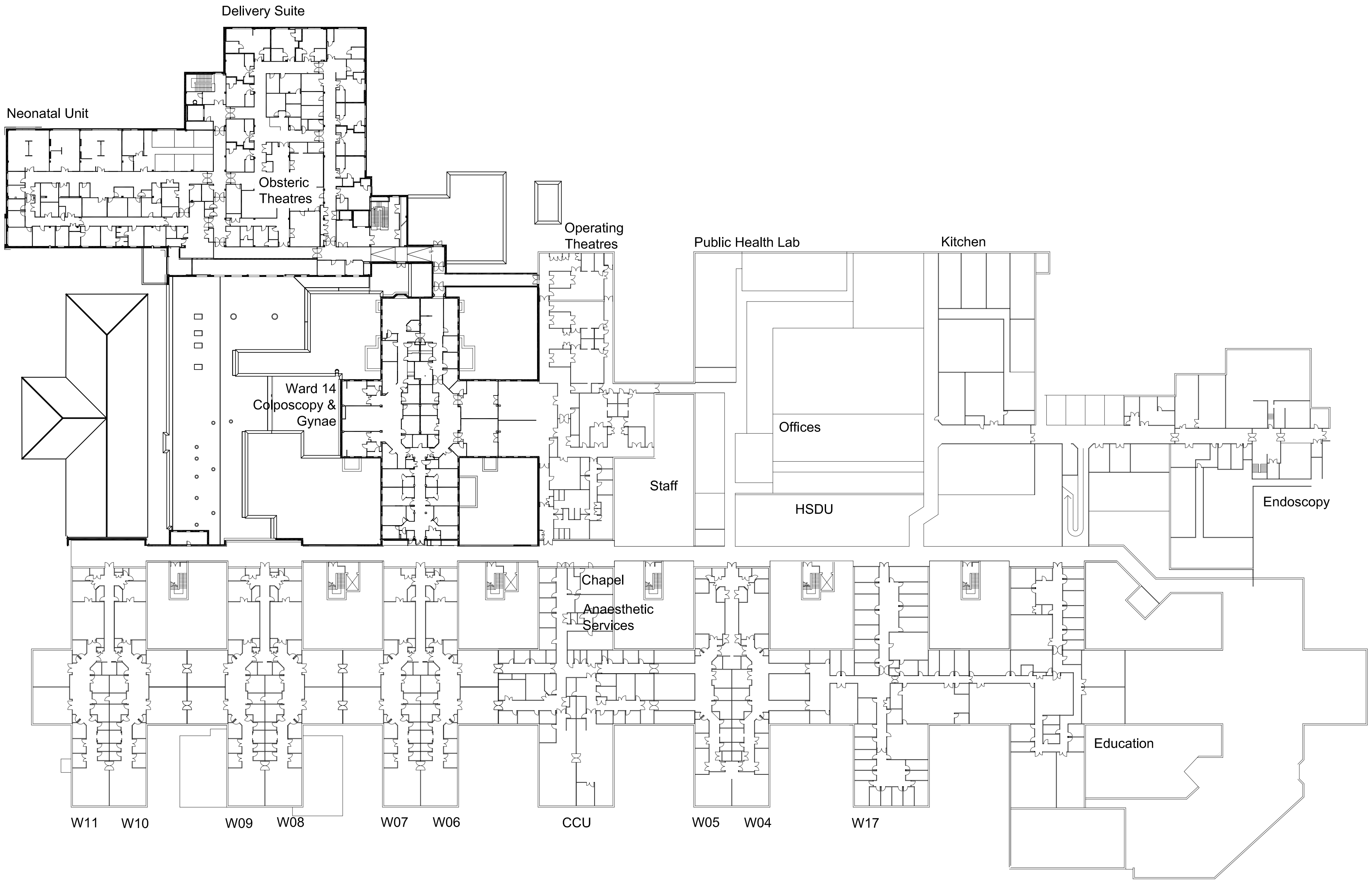
EXISTING SITE PLAN

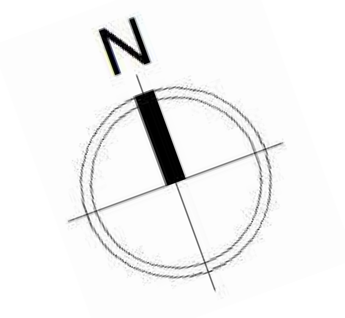


EXISTING LEVEL 1 PLAN



EXISTING LEVEL 2 PLAN





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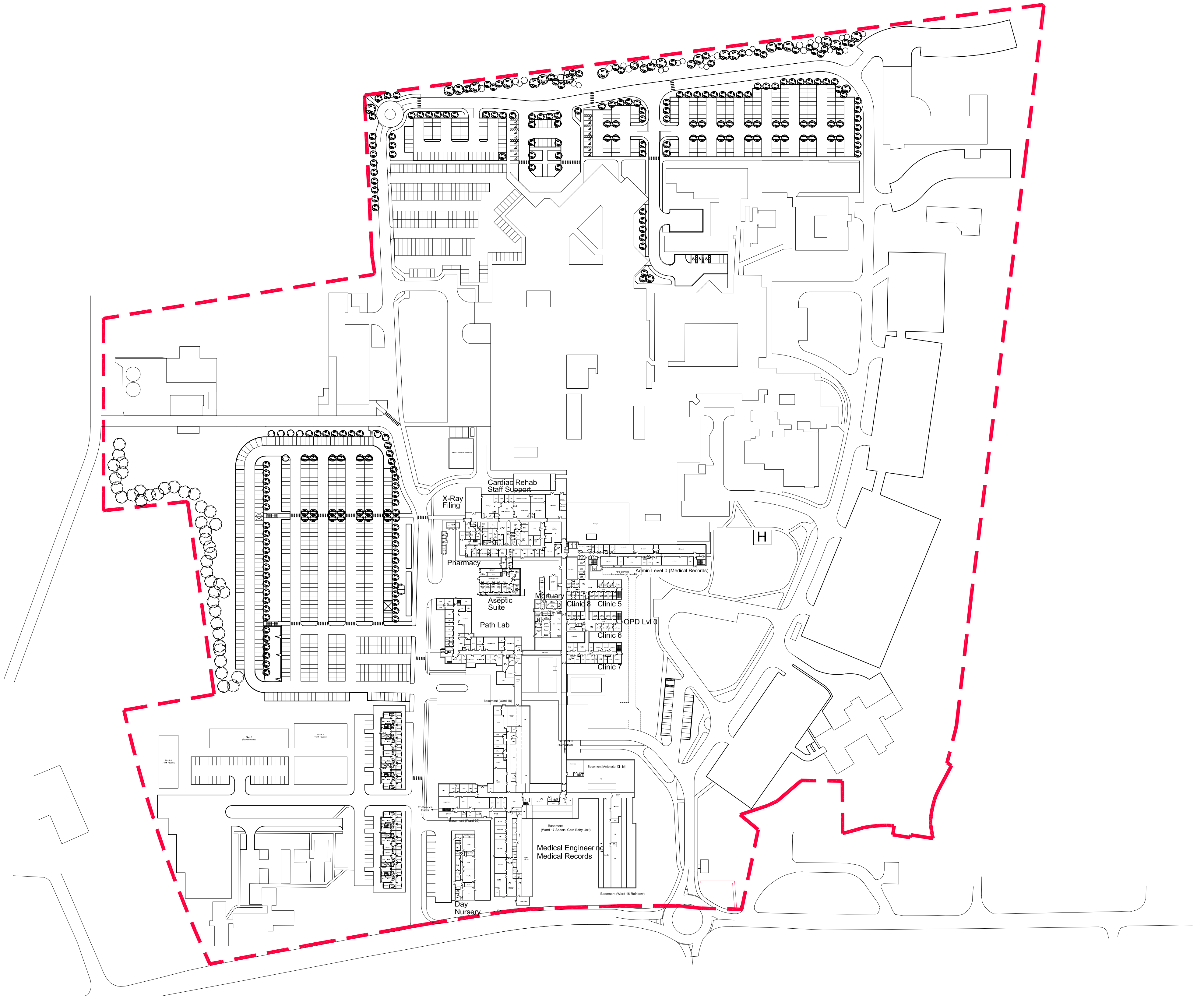
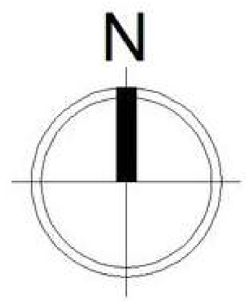
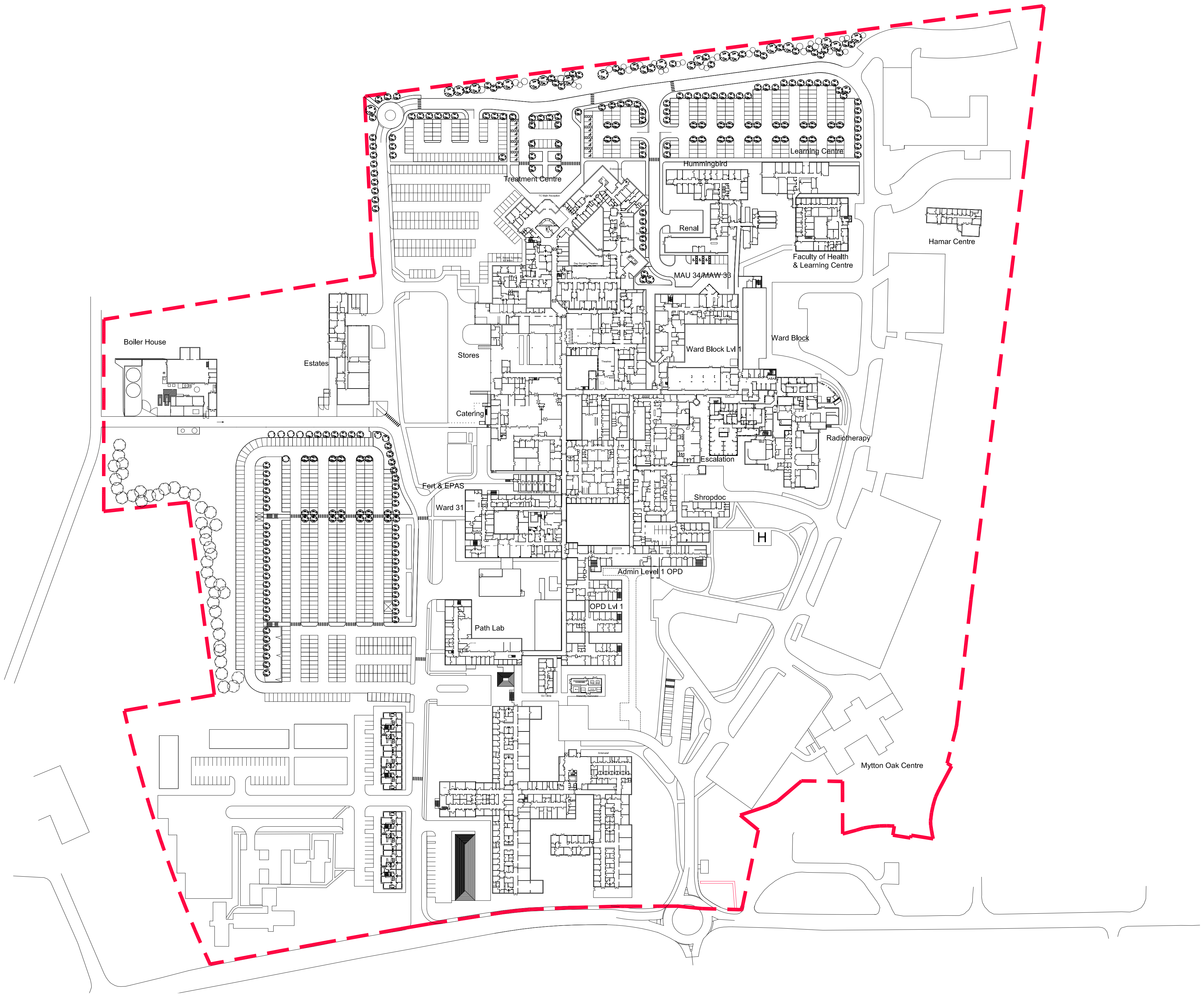
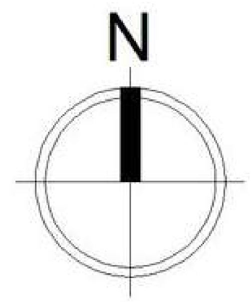
EXISTING LEVEL 0 PLAN





EXISTING LEVEL 1 SITE PLAN





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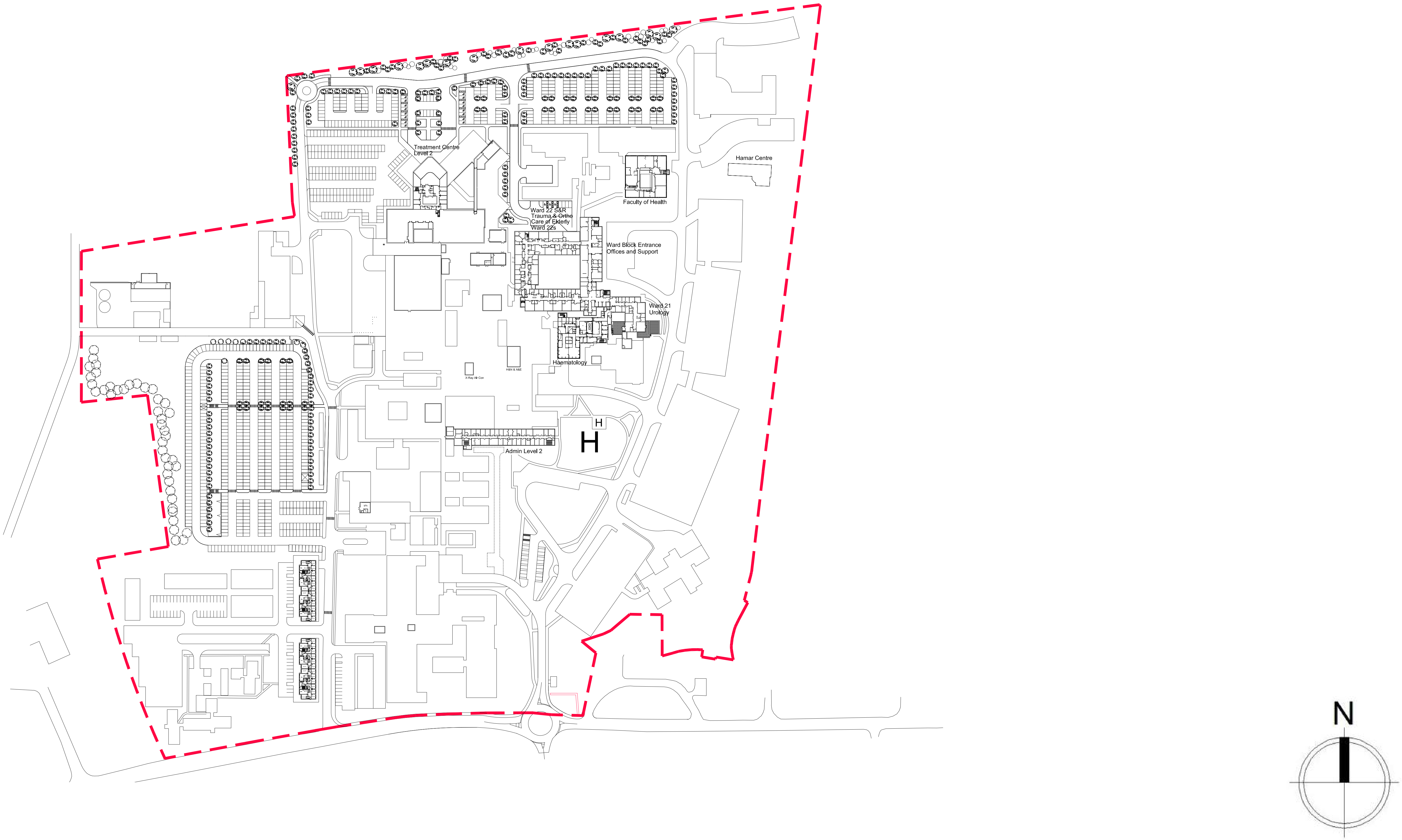
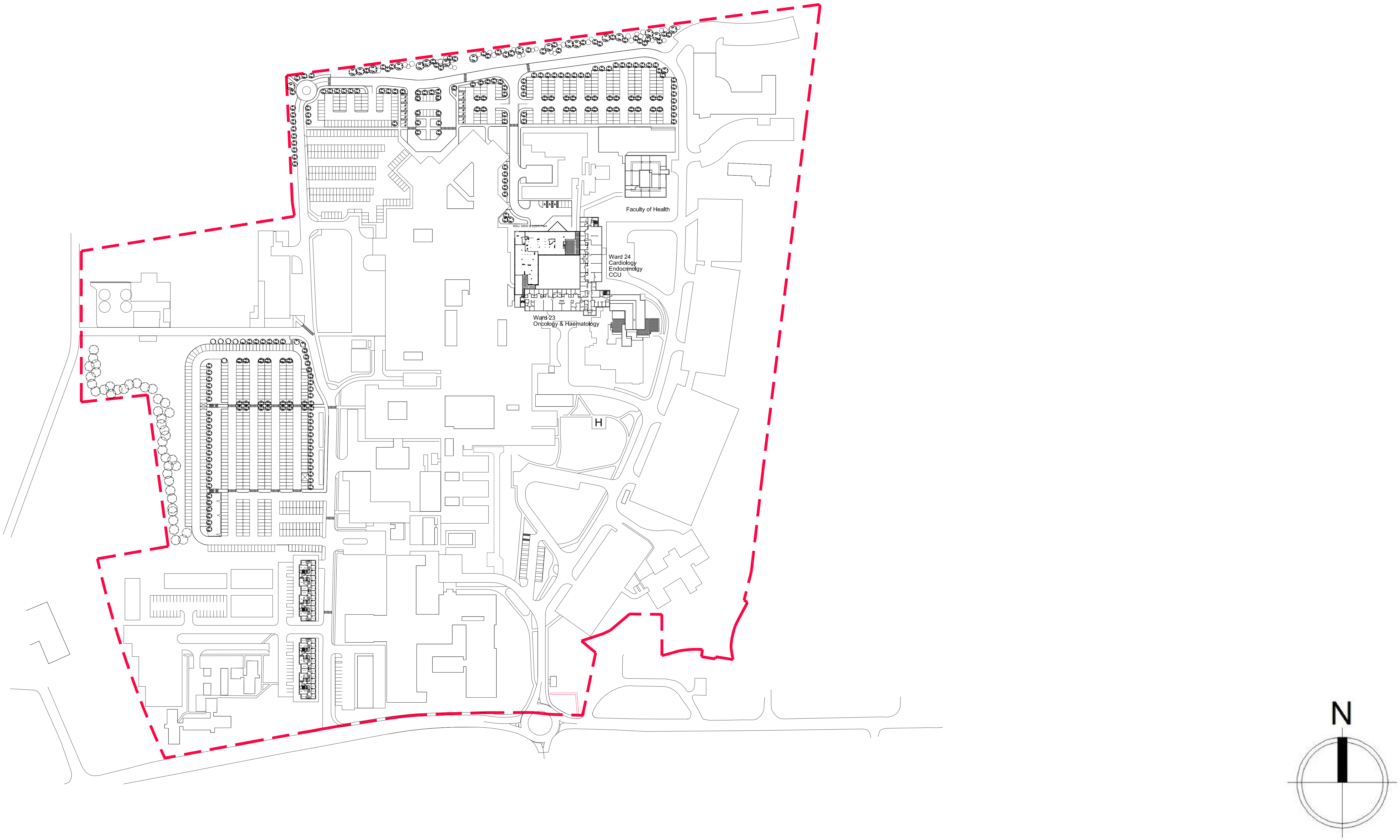


EXISTING LEVEL 3 PLAN



EXISTING LEVEL 4 PLAN

EXISTING LEVEL 5 PLAN

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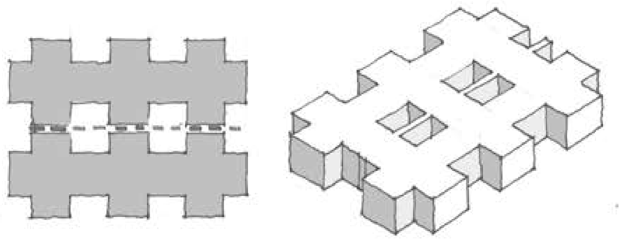
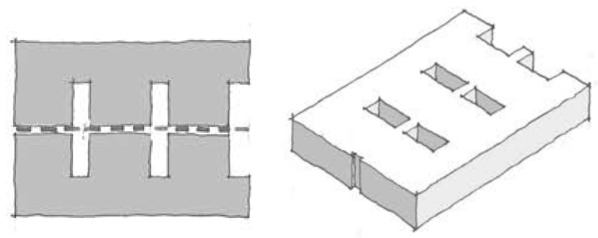


MASSING 1



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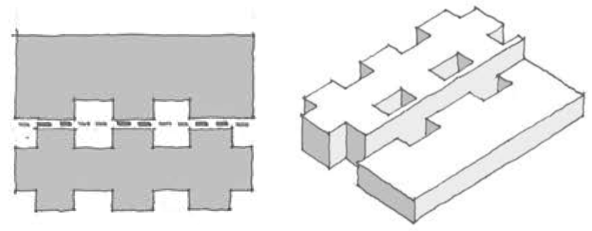

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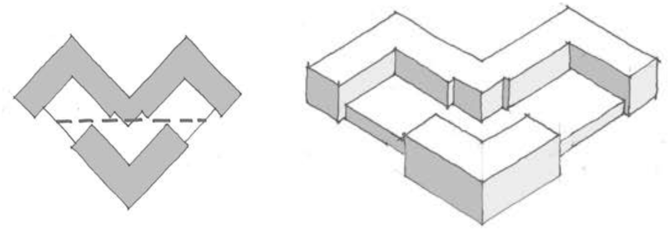

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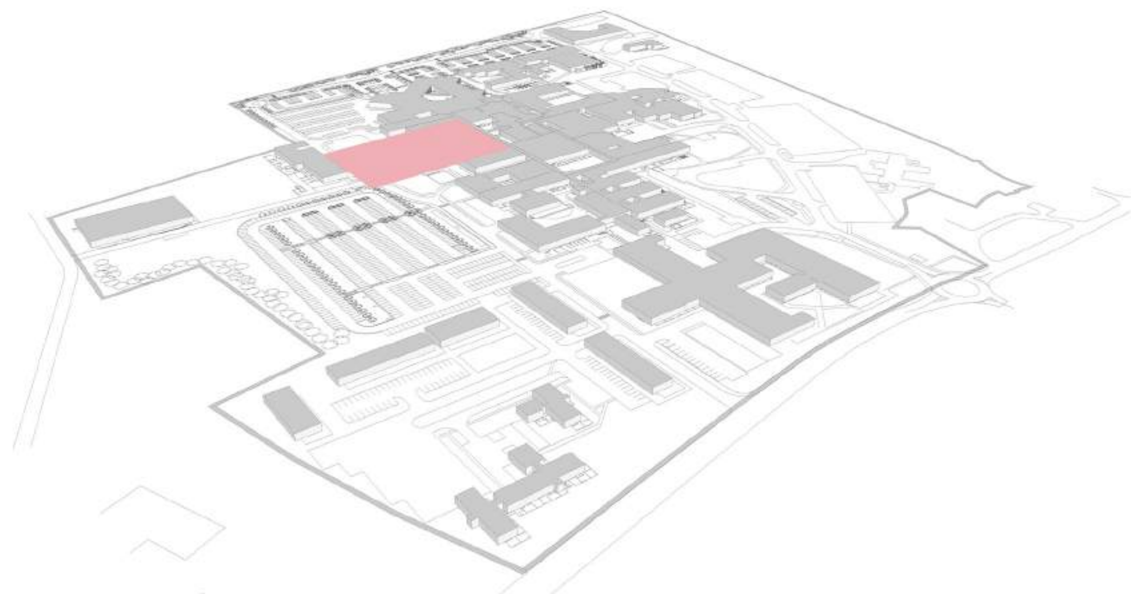
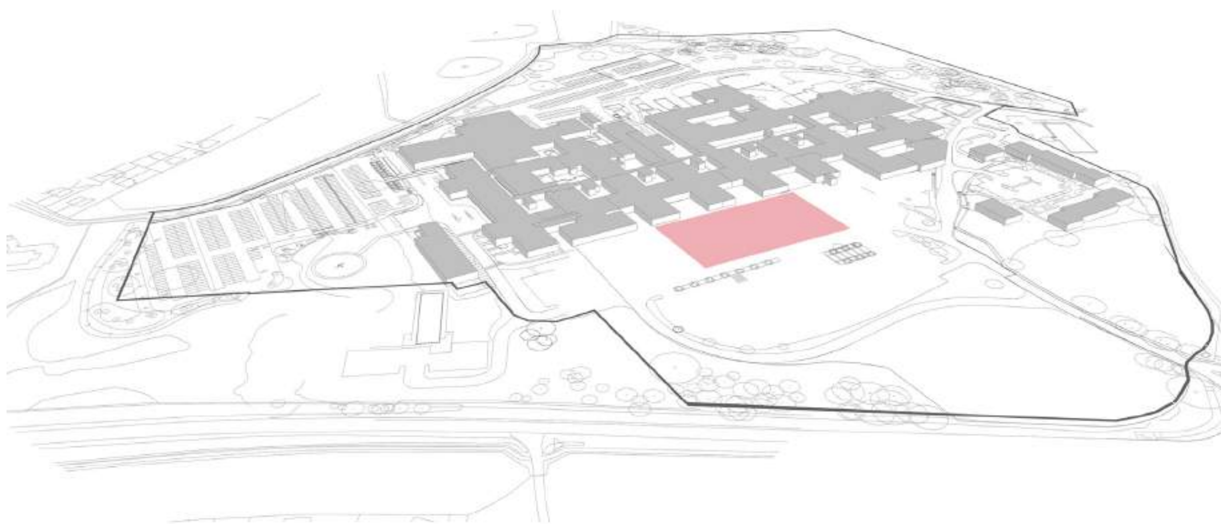


RSH - SITE PLAN

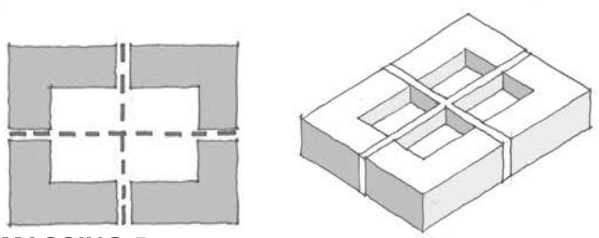


PRH - SITE PLAN

MASSING STUDIES

The 1:500 Layouts have been developed on the basis of clinical adjacency, circulation and flow and site appraisal. The development of the 1:200 layouts and 1:50 spaces creates a set of component parts which can then be assembled in different configurations, evolving from an architectural concept and a contextual response.

The massing, style and composition of the building form will continue to develop through the FBC design, directly influencing and responding to the views and advice of the Task & Finish Groups and wider Stakeholders.



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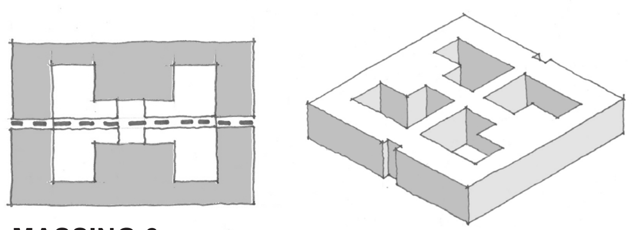

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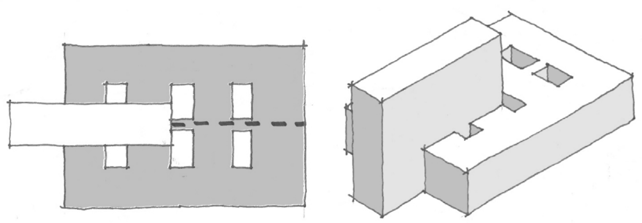
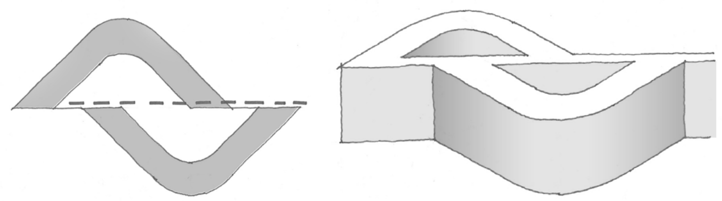


MASSING 7



MASSING 8

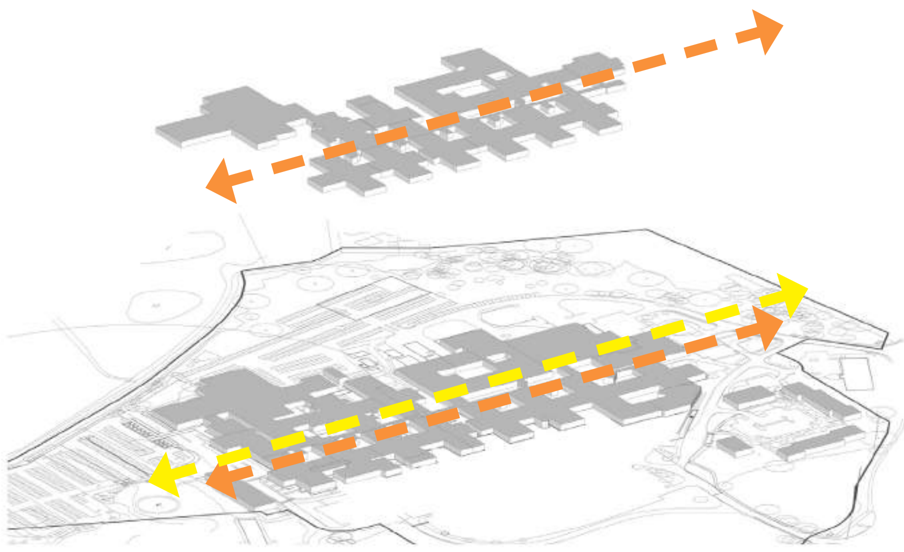
PRH DESIGN STRATEGY

The design proposals for PRH expand on the existing positive elements of the current building, maintaining the dual entrances for the Main Entrance and the Emergency Portal, while delivering the orientation space to the main entrance which is currently lacking. The new facilities will be clearly visible on entry to the site and are located to effectively separate pedestrian flows into the two distinct entrances.

The new-build facilities deliver the flexible, adaptable clinical space and configuration which are difficult to accommodate within the restriction of the existing nucleus template. Between the existing and new-build accommodation, the opportunity to create a parallel street unlocks the circulation flow challenges and enables dedicated service routes to be created.

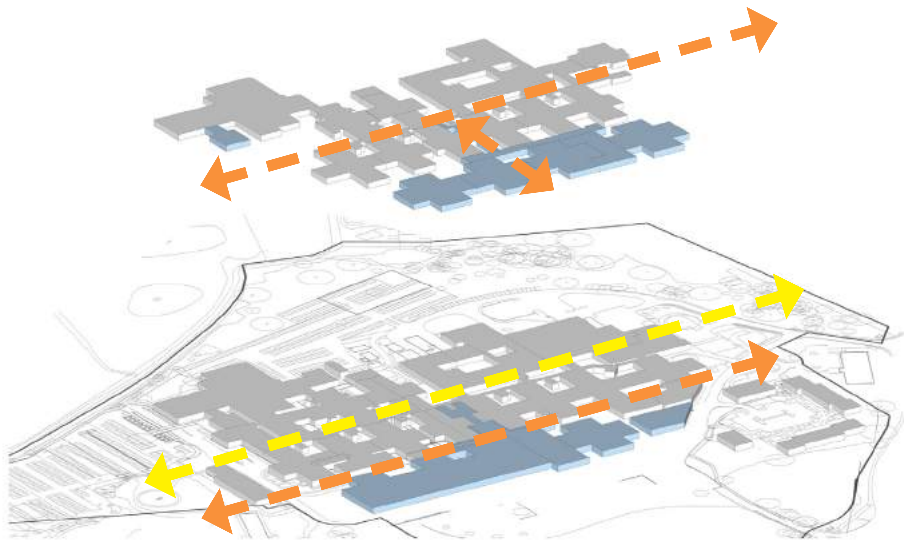
The new atrium entrance, together with the existing atrium within the Women and Children's Unit, effectively 'book-end' the accommodation, with the 'Big Front Door' of the Emergency Portal between.

The landscaped plaza and subtle, natural soft landscaping naturally direct visitors around the site and offer opportunities for social interaction or quieter places of sanctuary.



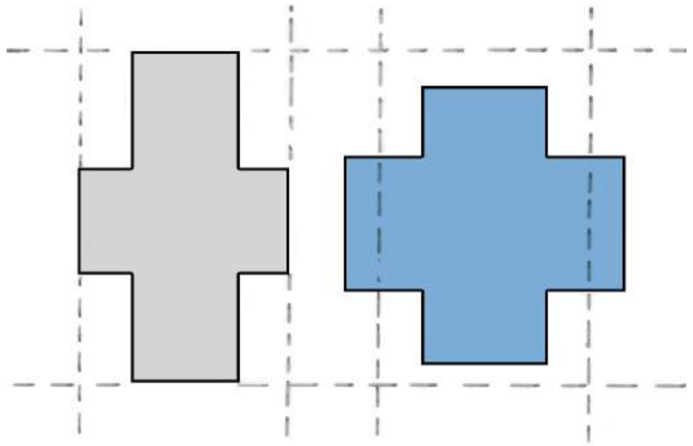
1. Existing Site Plan (Emergency and Planned Care Site)

Existing routes throughout hospital use one singular Hospital Street. Currently service routes, visitors and patients are all using the same corridor.

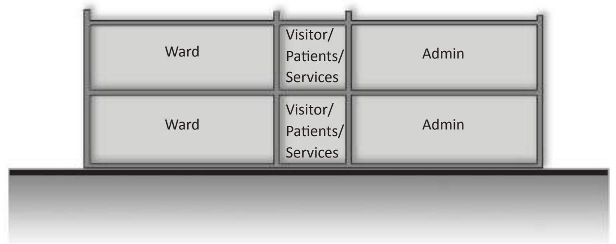


2. Proposed Site Plan (Emergency and Planned Care Site)

New proposal creates a new Hospital Street on Level 1 separating services from visitors and patients. A new link is created on Level 2 to connect the new Hospital Street to the existing by a new link covered by an ETFE roof.

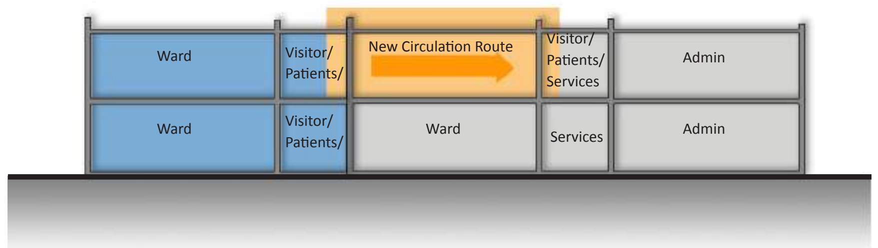


3. Existing nucleus template isn't appropriate for current standards. Floorplate for the new proposed wards is much larger.



4. Existing Section (Emergency and Planned Care Site)

The building is formed by repeatable Nucleus templates along a Hospital Street

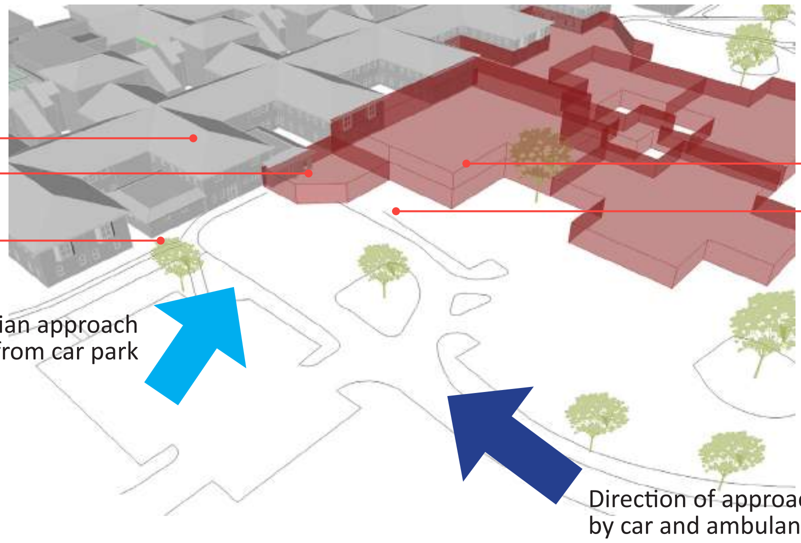


5. Proposed Section (Emergency and Planned Care Site)

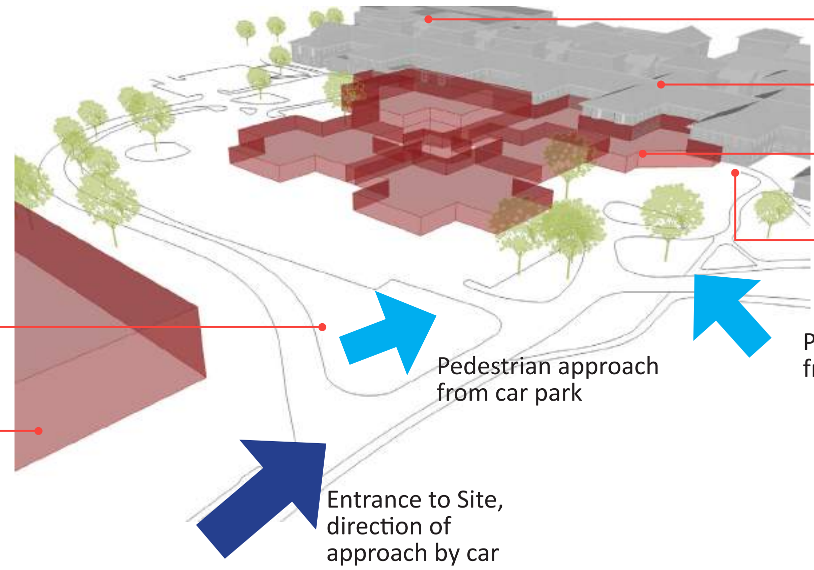
6. Orientation & Wayfinding Rationalisation

7. Main Entrance with Food Courts

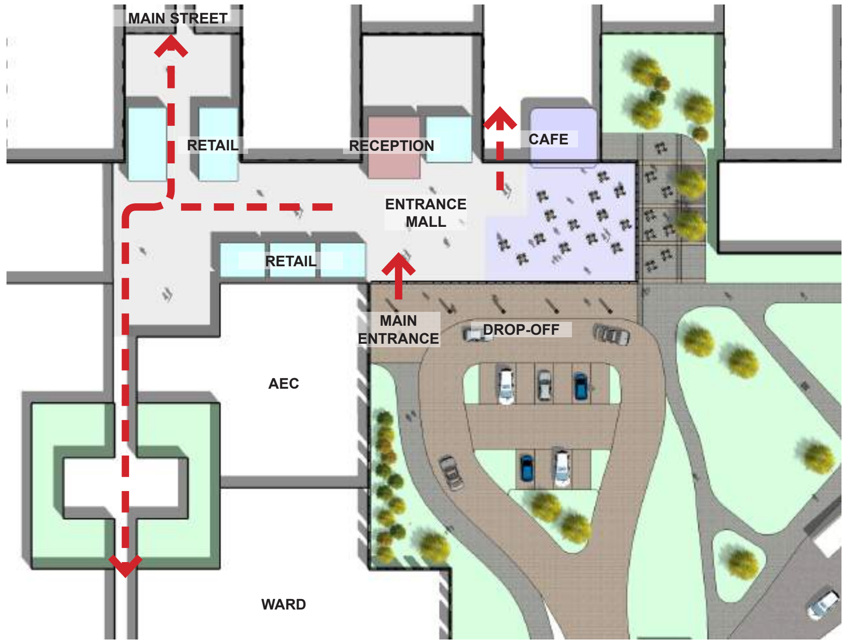
Emergency Entrance Site Issues



Main Entrance Site Issues



Main Entrance Initial Design



Emergency Entrance Initial Design

Emergency Entrance - Artist Impression

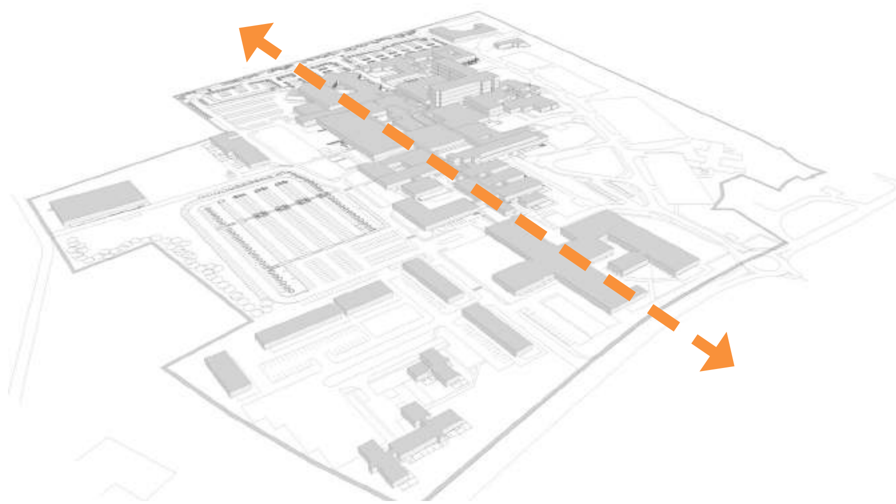
Main Entrance - Artist Impression

RSH DESIGN STRATEGY

The design proposals for RSH re-address the perceptions from the point of arrival, where two distinct entrances direct you to the Main Entrance or the Emergency Portal. Visitor Parking areas and drop-off zones are clearly defined and routes to points of entry are intuitive, aided by the careful design of the hard and soft landscape. Entrance areas have been transformed by the creation of light, airy orientation spaces, providing information and high quality facilities to support the needs of visitors, patients and staff.

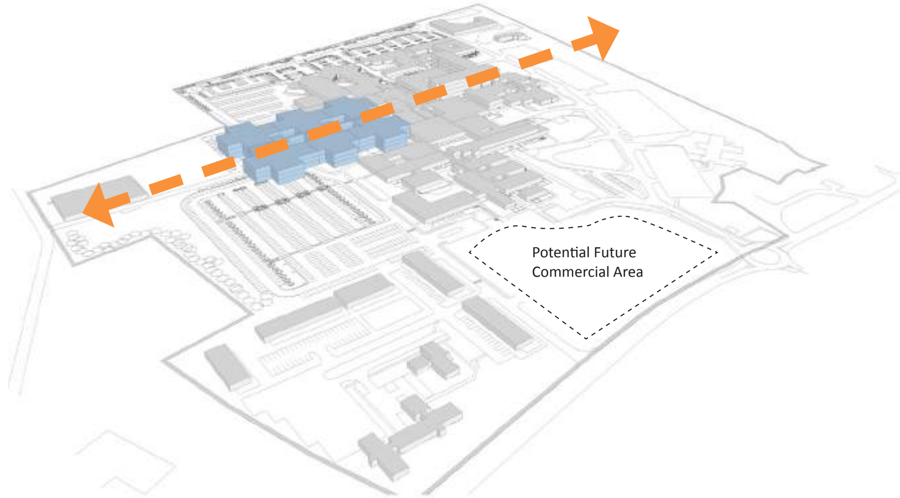
The key to unlocking the efficiency of this site has been resolving the challenges of separating patient, visitor and support service flows in 3-dimensions. This has been achieved by creating a circulation hub at Level 2, a storey above the atrium entrance level, generally accessed by escalator and linking to the Level 2 Clinic and ward accommodation and linking via a bank of lifts to the new build accommodation above and below. This has enabled the previously landlocked 'hot core' of Clinical services to link to adjacent departments without crossing public routes.

The Site Levels at RSH enable a lower level service zone to link directly into the Clinical accommodation from below, enabling the creation of an 'on-stage/ offstage' circulation strategy keeping service traffic away from patient and visitor areas.



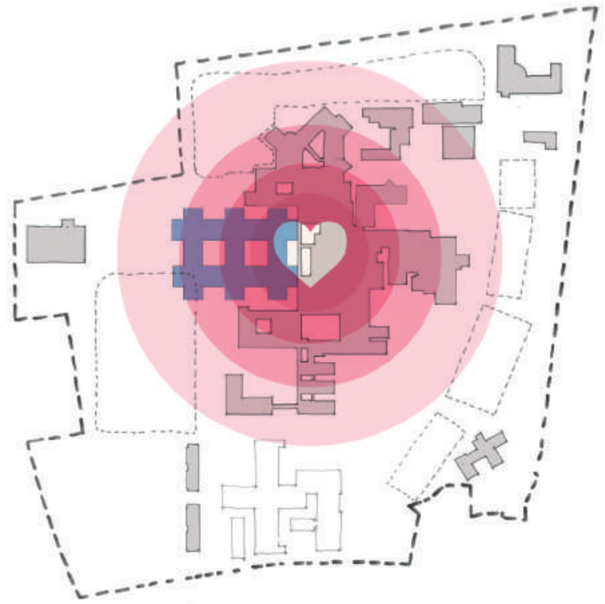
1. Existing Site Plan (Emergency and Planned Care Site)

- Currently North - South and spread across the site leading to areas distant from critical areas.

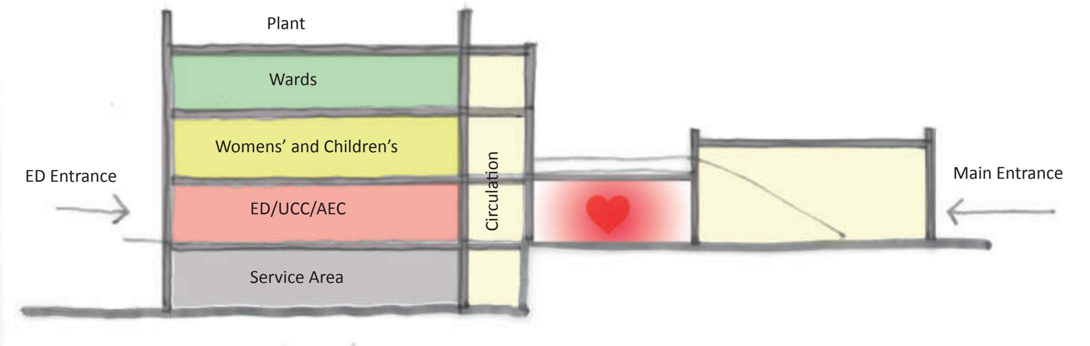


2. Proposed Site Plan (Emergency and Planned Care Site)

- More compact form, East-West orientation, locating services nearer each other.



3. Hospital is built around a clincal 'hot' core.



4. 3-dimensional distinct circulation.

- Resolving flows through the hospital. New escalator to link straight from main entrance atrium/food court to main vertical circulation in new Emergency/Paeds/Wards Block.
- Service area at Level 0 with its own entrance and service routes, seperated from visitor and patients routes

6. Main Entrance with Food Courts

7. Children's Sky Garden - Outdoor Play

High level walls - e.g. Green walls, glazing

5. Orientation & Wayfinding Rationalisation

8. Escalators from main entrance to Circulation Core

Navigates visitors to W&C's level and main circulation core, where way-finding signage and art work will direct people to their required destination.

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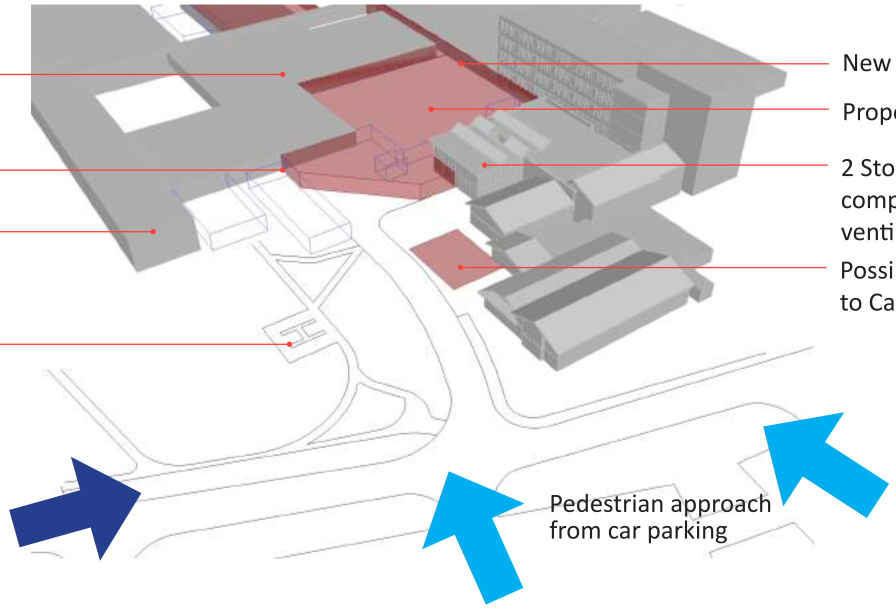
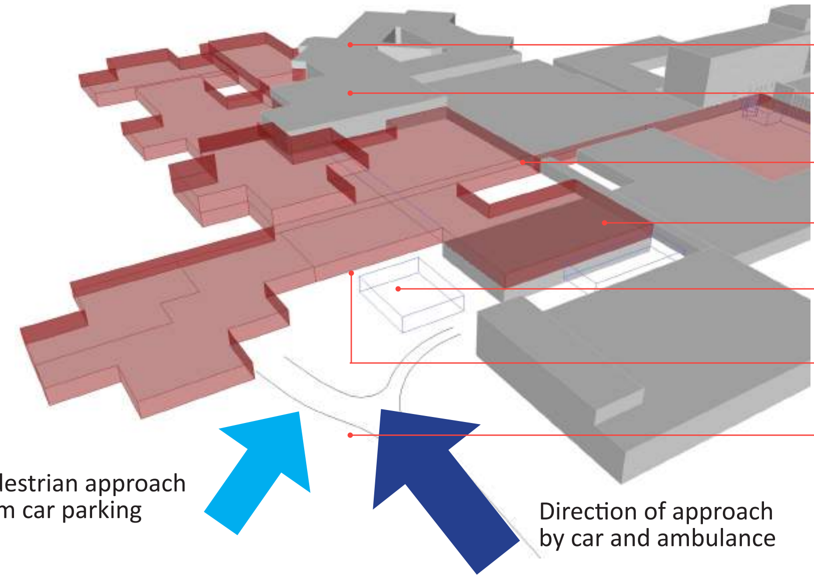
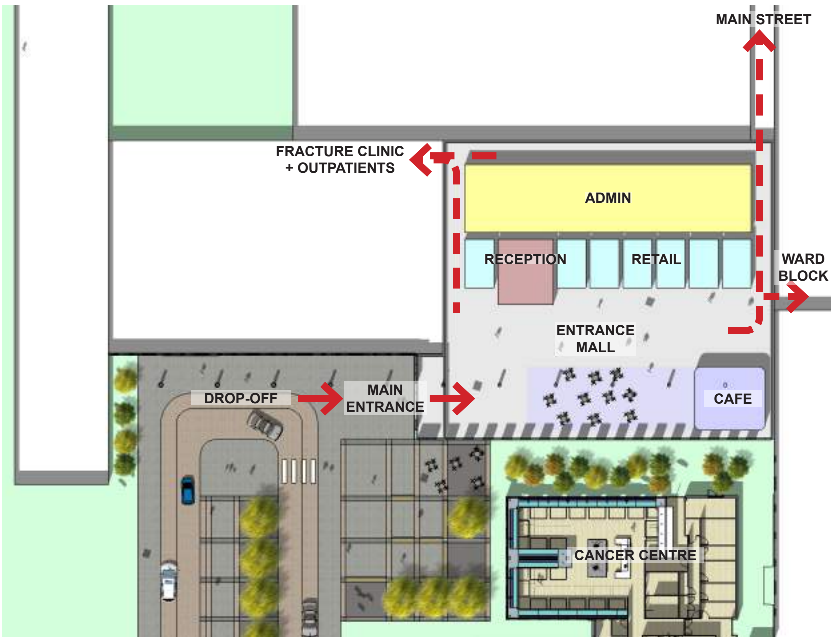
Main Entrance Site Issues



Emergency Entrance Site Issues



Main Entrance Initial Design



Emergency Entrance Initial Design

Emergency Entrance - Artist Impression

Main Entrance - Artist Impression

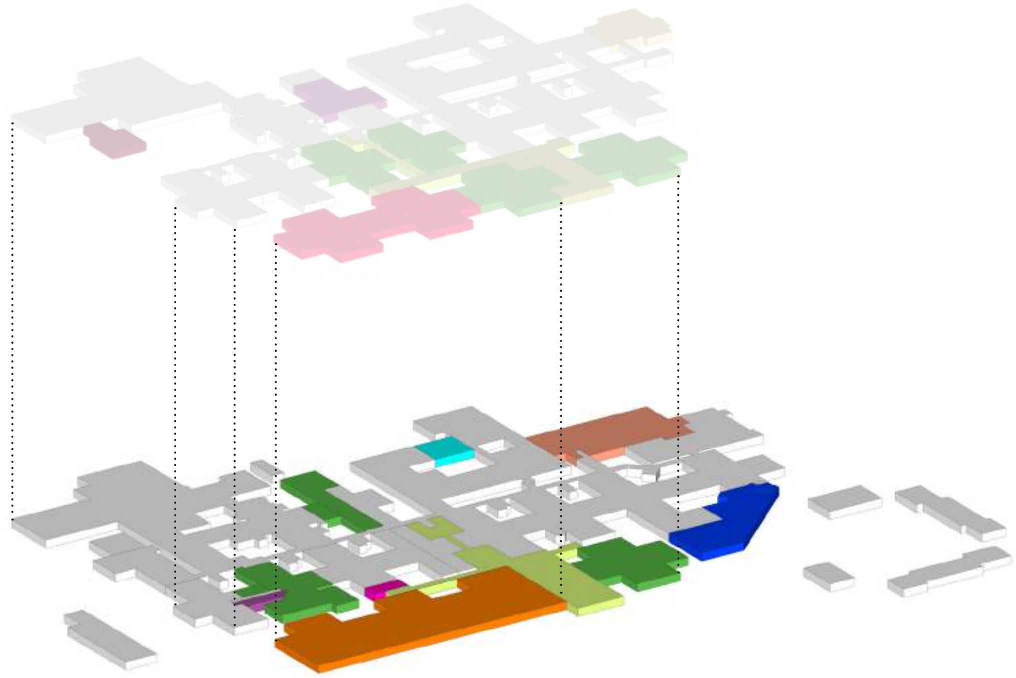
2.7 OPTION B
PRH_EMERGENCY SITE
RSH_PLANNED CARE SITE

PRH_OPTION B LEVELS 1-2
PRH_ACCOMMODATION SCHEDULE
PRH_SITE WIDE IMPACTS PLAN
PRH_ESTATES BACKLOG IMPACT
RSH_OPTION B LEVELS 0-5
RSH_ACCOMMODATION SCHEDULE
RSH_ESTATES BACKLOG IMPACT

OPTION B LEVEL 1 PLAN

WARD	EDUCATION
ED / UCC / AEC	MORTUARY
THEATRES	IMAGING
CRITICAL CARE	OFFICE / ADMIN
CIRCULATION	LOADING BAY
TRANSITIONAL CARE	

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished

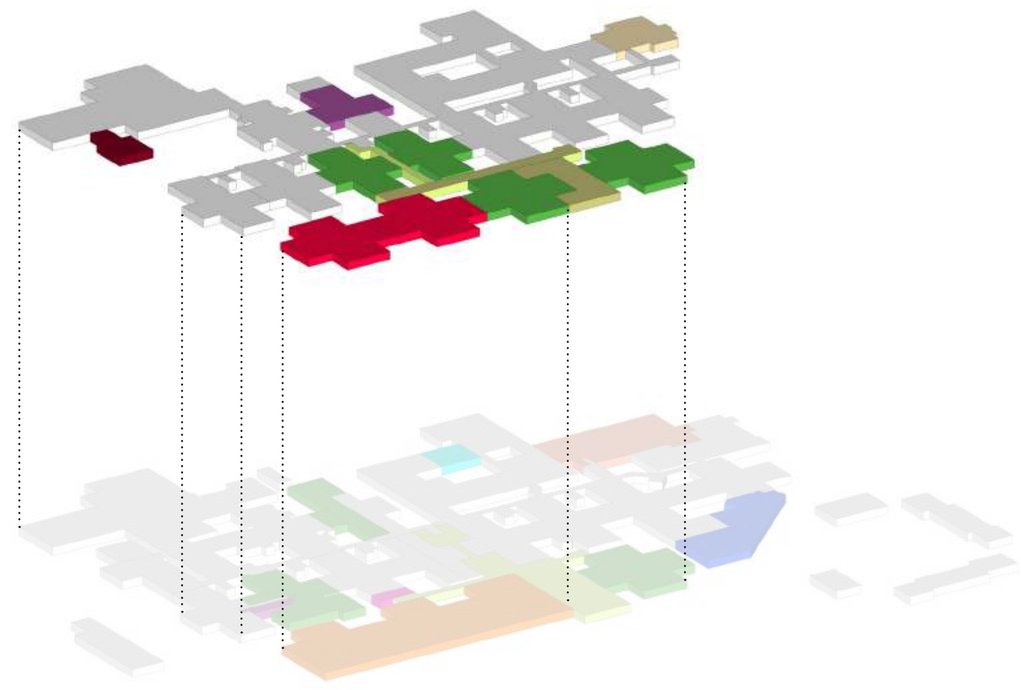


OPTION B - 3D MASSING

OPTION B LEVEL 2 PLAN

- WARD
- ED / UCC / AEC
- THEATRES
- CRITICAL CARE
- CIRCULATION
- TRANSITIONAL CARE
- EDUCATION
- MORTUARY
- IMAGING
- OFFICE / ADMIN
- LOADING BAY

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



OPTION B - 3D MASSING

- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

Option B-PRH Emergency Site

To be read in conjunction with RSH Planned Care Site

Area Ref	Description	Floor Level	SSP Baseline: New Build	SSP Baseline Refurb: Refresh	SSP Baseline Refurb: Light	SSP Baseline Refurb: Medium	SSP Baseline Refurb: Heavy	Estates Implications: New Build	Estates Implications Refurb: Refresh	Estates Implications Refurb: Light	Estates Implications Refurb: Medium	Estates Implications Refurb: Heavy	Backlog: New Build	Backlog Refurb: Refresh	Backlog Refurb: Light	Backlog Refurb: Medium	Backlog Refurb: Heavy	Current Use	Notes
1	Main Entrance & Retail	01 (Ground)	1760															Admin	1760 overall- comprising 1567m2 scheduled + 193m2 additional circulation. Double height space @ 50%
2	Emergency Department UCC AEC/ CDU Discharge Lounge	01 (Ground)	3770																
3	Inpatient Ward	01 (Ground)	1288																
4	Inpatient Ward	2	1288																
5	Circulation	01 (Ground)	57																
6	Circulation	01 (Ground)	148																
7	Imaging	01 (Ground)									115								Reconfiguration to accommdate breakthrough from new ED
8	Day Surgery	01 (Ground)														120			
9	Inpatient Ward	01 (Ground)													765				
10	Loading Bay	01 (Ground)														1100			
11	Loading Bay	01 (Ground)	520																Internal/ External reconfiguration of loading area and loading docks
11a	Ward	01 (Ground)									1230							A and E	
12	Inpatient Ward	2	1288																
13	Circulation	2	475																
14	Critical Care	2	2290																
15	Ward	2												500					
16	Inpatient Ward	2													500				
17	Inpatient Ward	2													1000				
18	Theatres	2														750			
19	Admin/ Offices	2													700			Endoscopy	
20	Education Centre	1				600												Therapies	
21	Morturay	1				225													
22	Transitional Care	1	500																
23	Education Extension	1	700																

	Demolitions		
T25	Demolition	55m2	Single storey conservatory

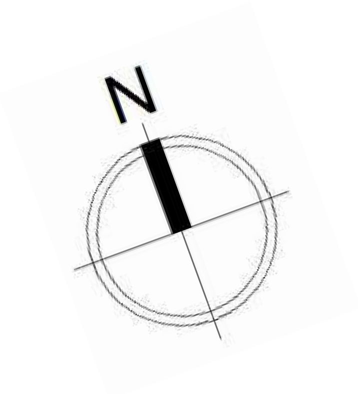
	Abnormals		
T1	MSCP	4 Storeys Flat plate- 312 Cars	Assume 22 sq m/ car 2 No. Vertical Circulation Cores; 2 No. 13 Person passenger lifts
GEN	Vertical Circulation Cores	4 No. Bed Lifts; 4 No. 17P Passenger Lifts; 2 No. Goods Lifts	
T6	Feature Landscaping	4185 m2	Assume 80% Hard Landscaping- 20% Soft Landscaping
T7	Entrance Canopy	1 No. @ ~~36~~ 21 linear Metres;	12m Wide Feature Glass & Steel Architectural Quality Canopies
T8	Bridge Link		Included within general circulation- include extra over for independent structure and envelope
T9	ETFE Roof over existing Outpatients		
T10	Entrance Canopy	1 No. @ 62 linear Metres	12m Wide Feature Glass & Steel Architectural Quality Canopies
T12	Retaining wall	Refer to Structural Engineer's Drawings	
T20	Breakthroughs to existing buildings		
T21	Breakthroughs to existing buildings		
T22	Breakthroughs to existing buildings		
T23	Courtyard Landscaping	220 m2	Assume 80% Hard Landscaping- 20% Soft Landscaping
T24	Courtyard Landscaping	221 m2	Assume 80% Hard Landscaping- 20% Soft Landscaping
T26	MSCP	3 Storey Flat Plate- 234 m 2	
T27	Transitional Care	Remove existing roof and enchance existing structure. TBC by Capita	
T28	Service Yard Canopy	330 sq m	Metal Canopy with Sedum Roof
Gen	Buildings for Services Infrastructure	To be Advised	

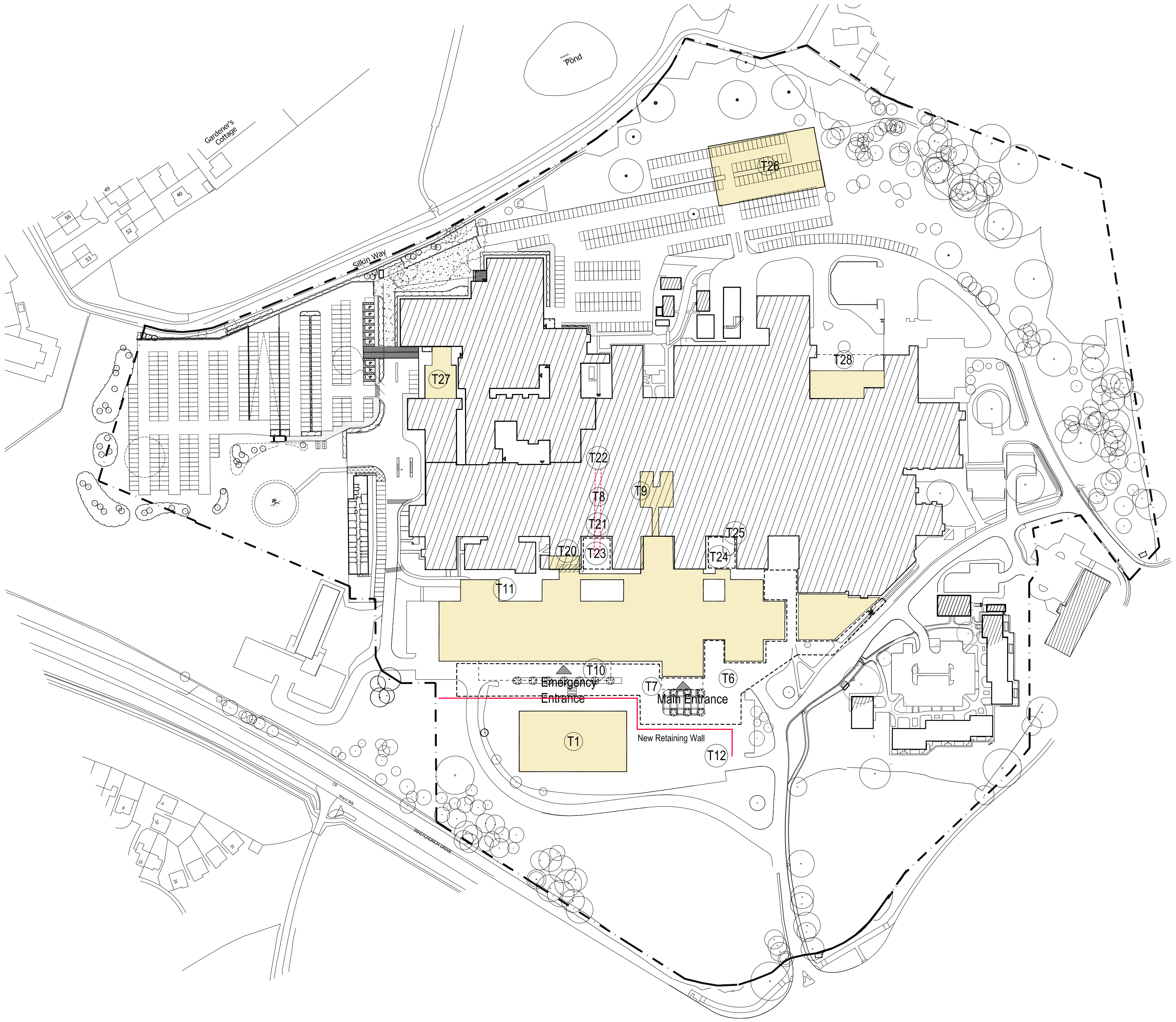
NEW LINK TO EXISTING CORRIDOR

RETAINING WALL

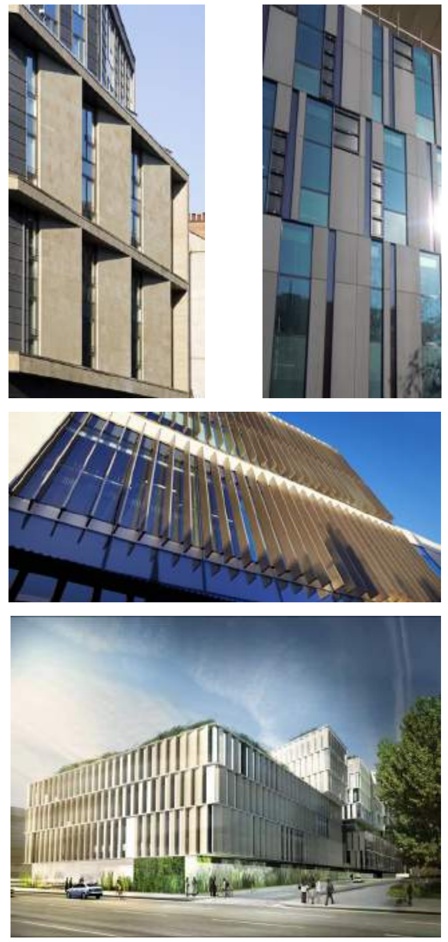
NEW BUILD

- T1 - Multi-storey Car Park
- T6 - Feature Landscaping
- T7 - Entrance Canopy
- T8 - Bridge Link
- T10 - Entrance Canopy
- T12 - Retaining Wall
- T20 - Breakthrough to existing buildings
- T21 - Breakthrough to existing buildings
- T22 - Breakthrough to existing buildings
- T23 - Courtyard Landscaping
- T24 - Courtyard Landscaping
- T26 - Multi-storey Car Park
- T27 - Transitional Care
- T28 - Service Yard Canopy





2. Multi-storey Car Park
Cladded in green walls, timber battens, zinc cladding panels



3. Building Facade Treatments
Repeatable Elevations, concrete, zinc, timber, glazing

1. Feature Landscaping
Courtyards, soft and hard landscaping, tree boulevards, wild flowers, signage

OPTION B - PRH_ESTATES BACKLOG IMPACT

SUSTAINABLE SERVICES PROGRAMME

BACKLOG

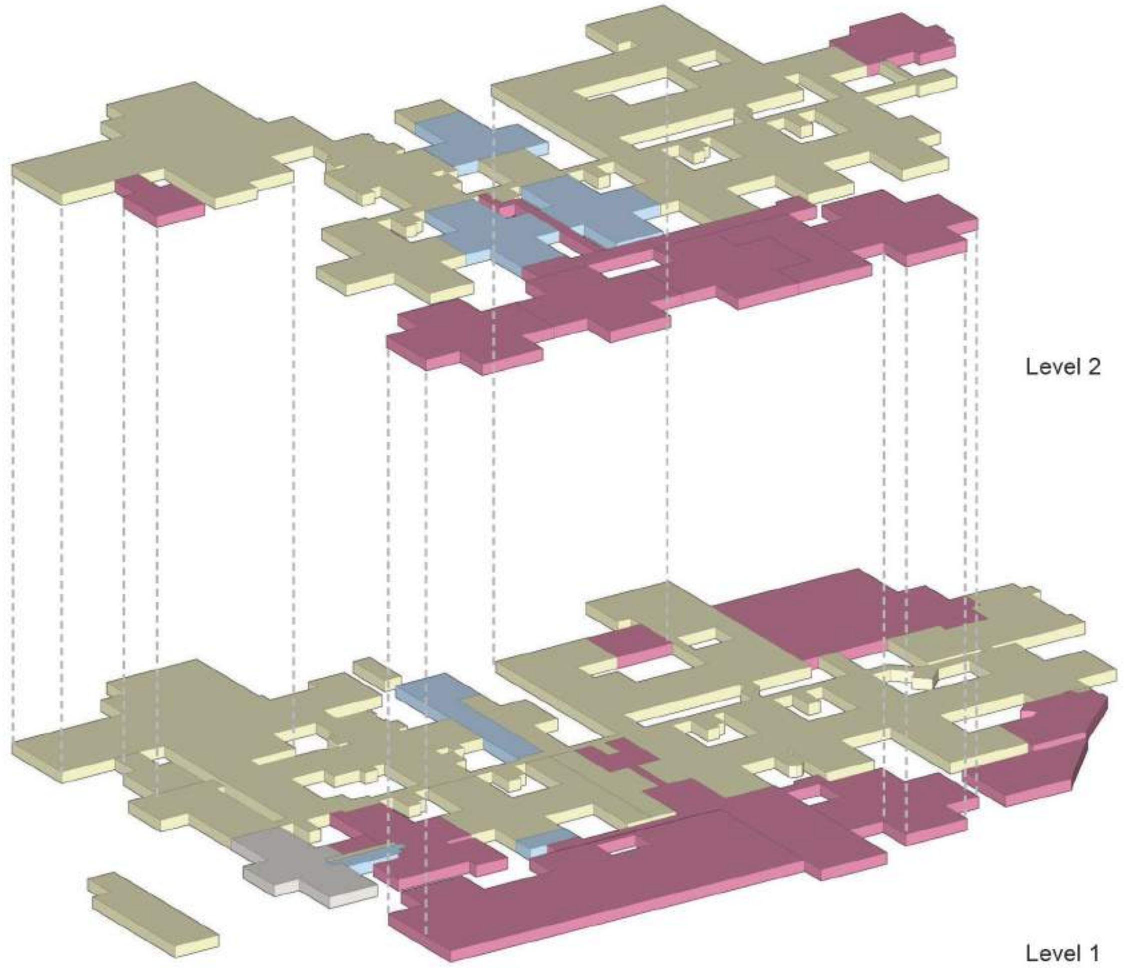
RESIDUAL BACKLOG

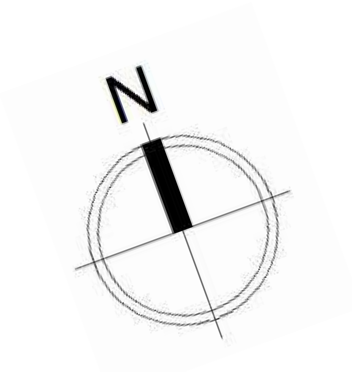
EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.

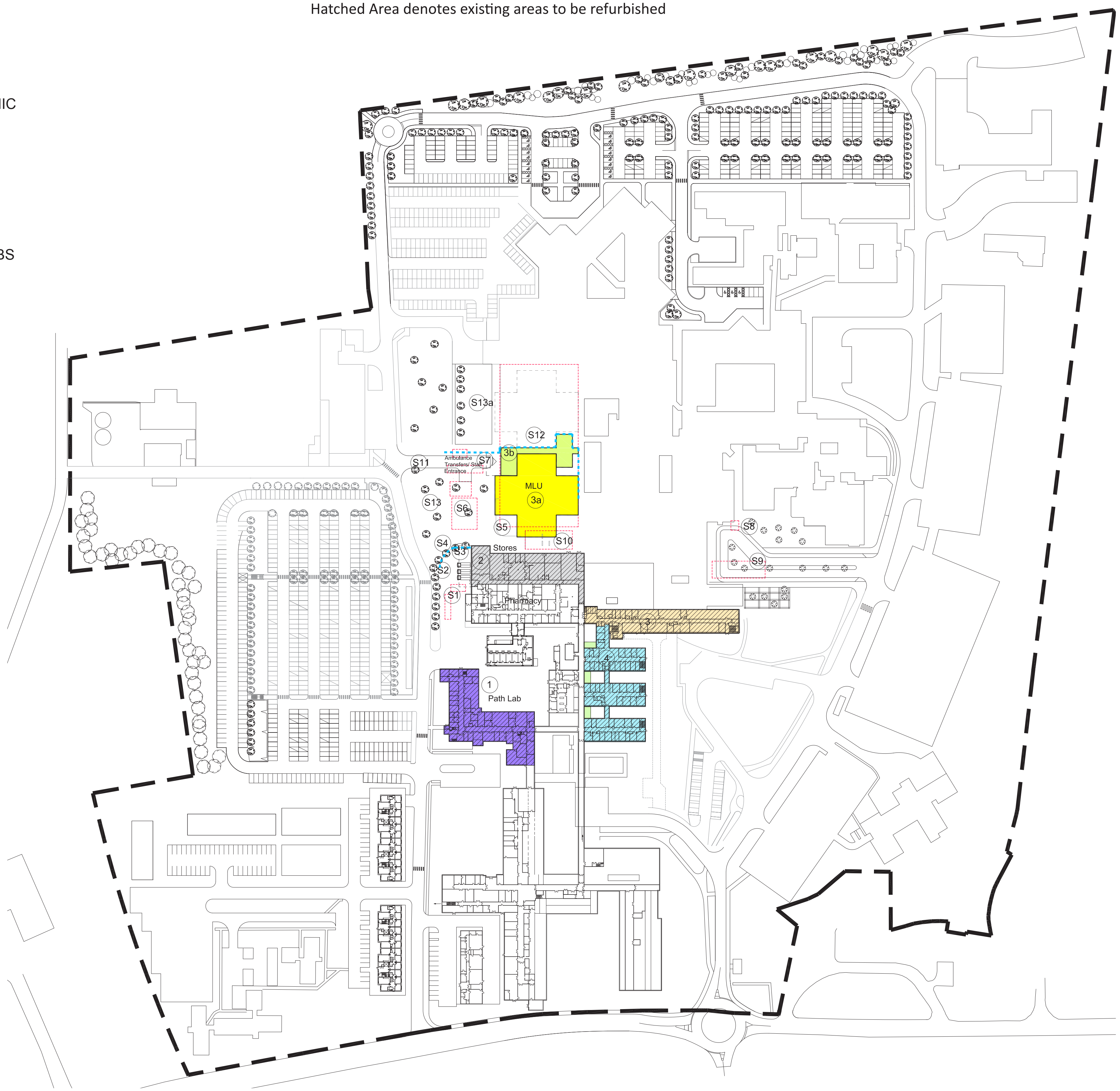


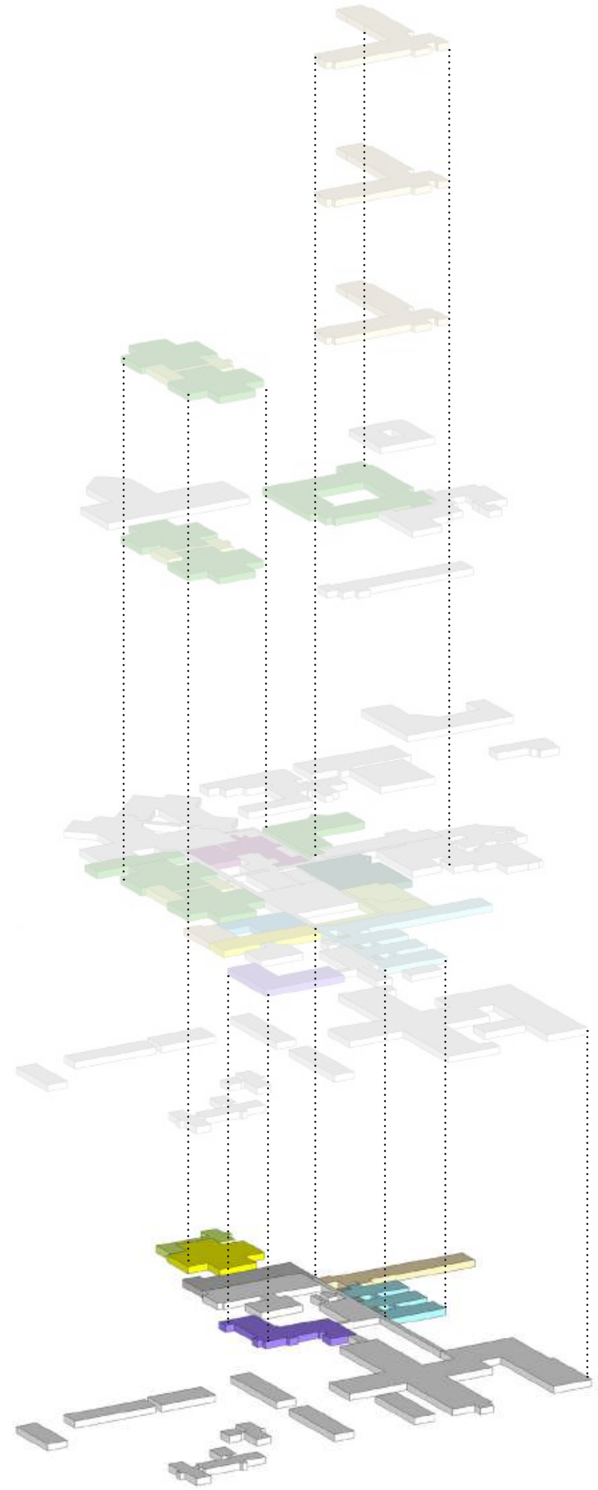


OPTION B LEVEL 0 PLAN

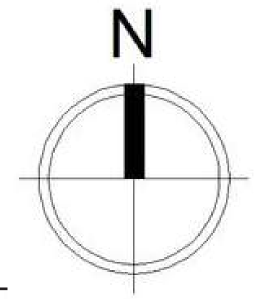
- WARD
- OUTPATIENTS
- THEATRES
- MLU/FERTILITY
- FRACTURE CLINIC
- STORES
- CIRCULATION
- OFFICE / ADMIN
- UCC
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished





OPTION B - 3D MASSING



OPTION B LEVEL 1 PLAN

- WARD
- OUTPATIENTS
- THEATRES
- MLU/FERTILITY
- FRACTURE CLINIC
- STORES
- CIRCULATION
- OFFICE / ADMIN
- UCC
- PATHOLOGY LABS
- DEMOLITION

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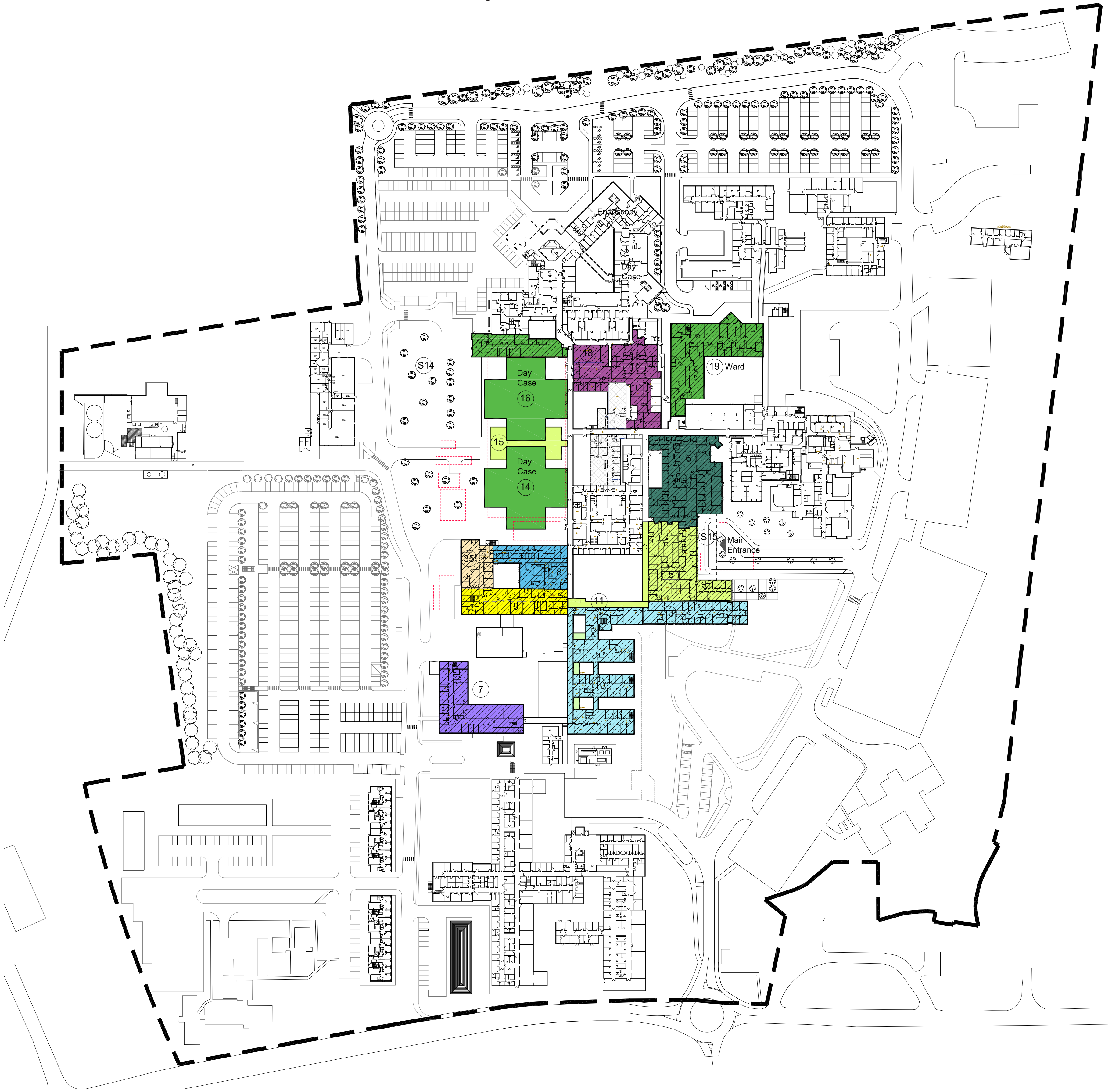
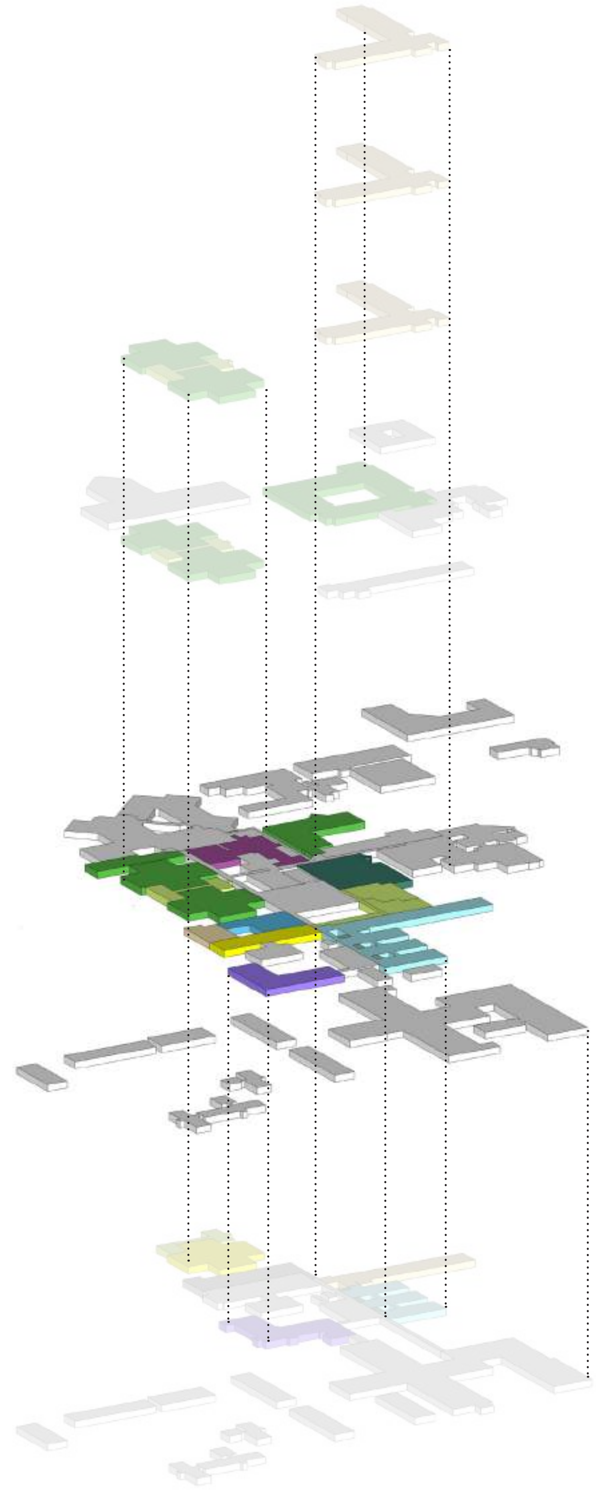
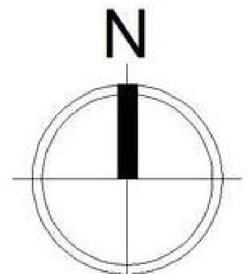




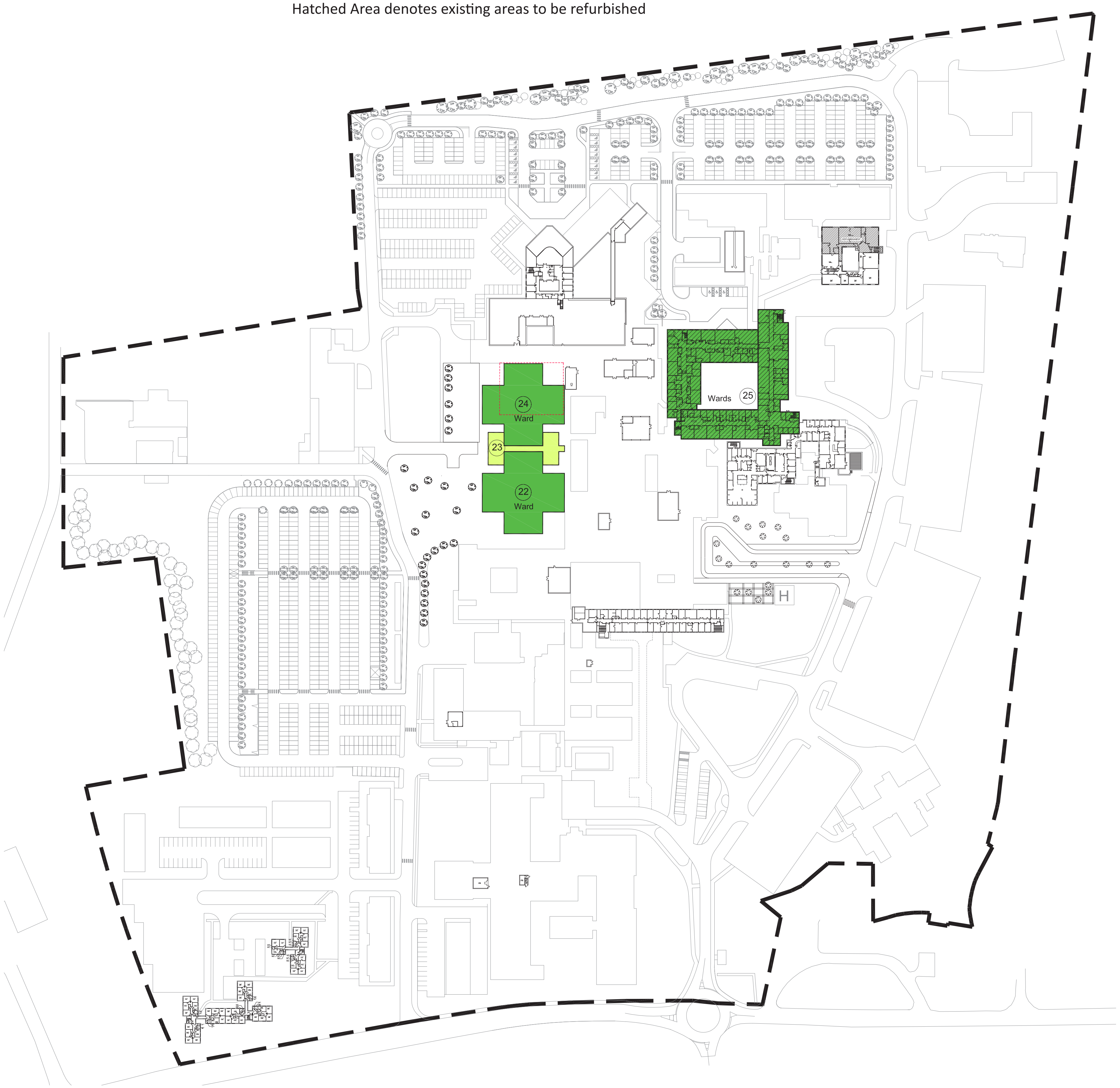
OPTION B - 3D MASSING

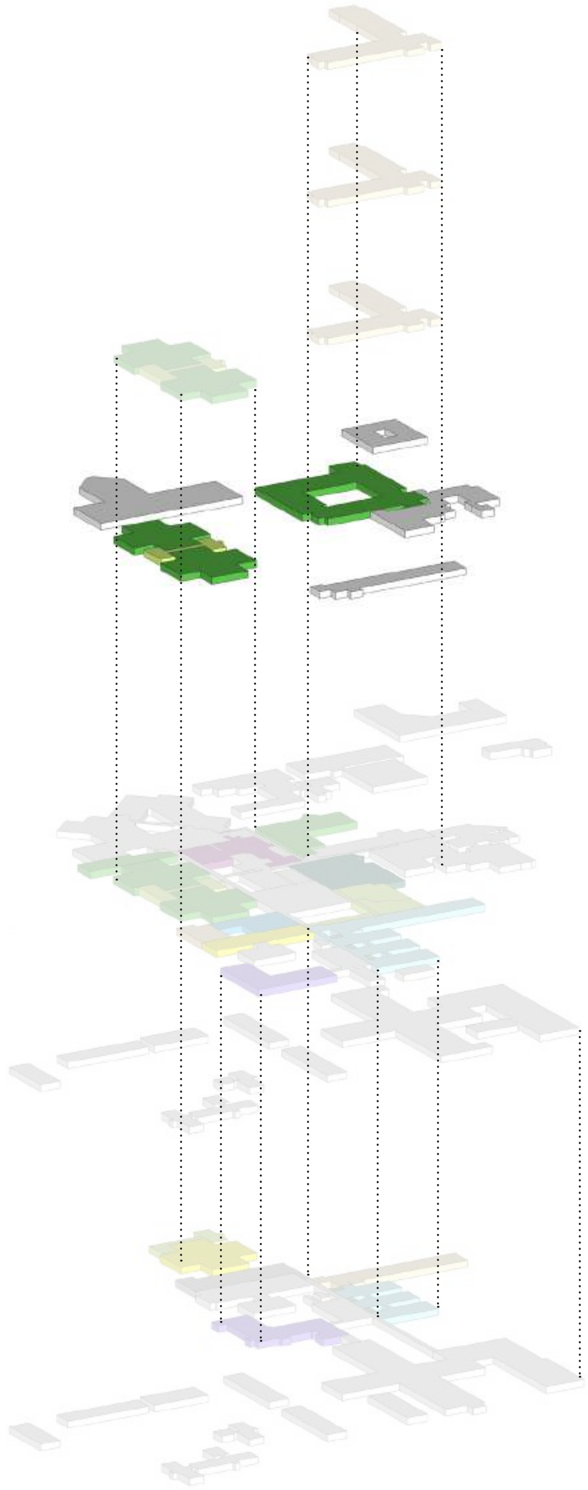


OPTION B LEVEL 2 PLAN

- WARD
- OUTPATIENTS
- THEATRES
- MLU/FERTILITY
- FRACTURE CLINIC
- STORES
- CIRCULATION
- OFFICE / ADMIN
- UCC
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished





OPTION B - 3D MASSING

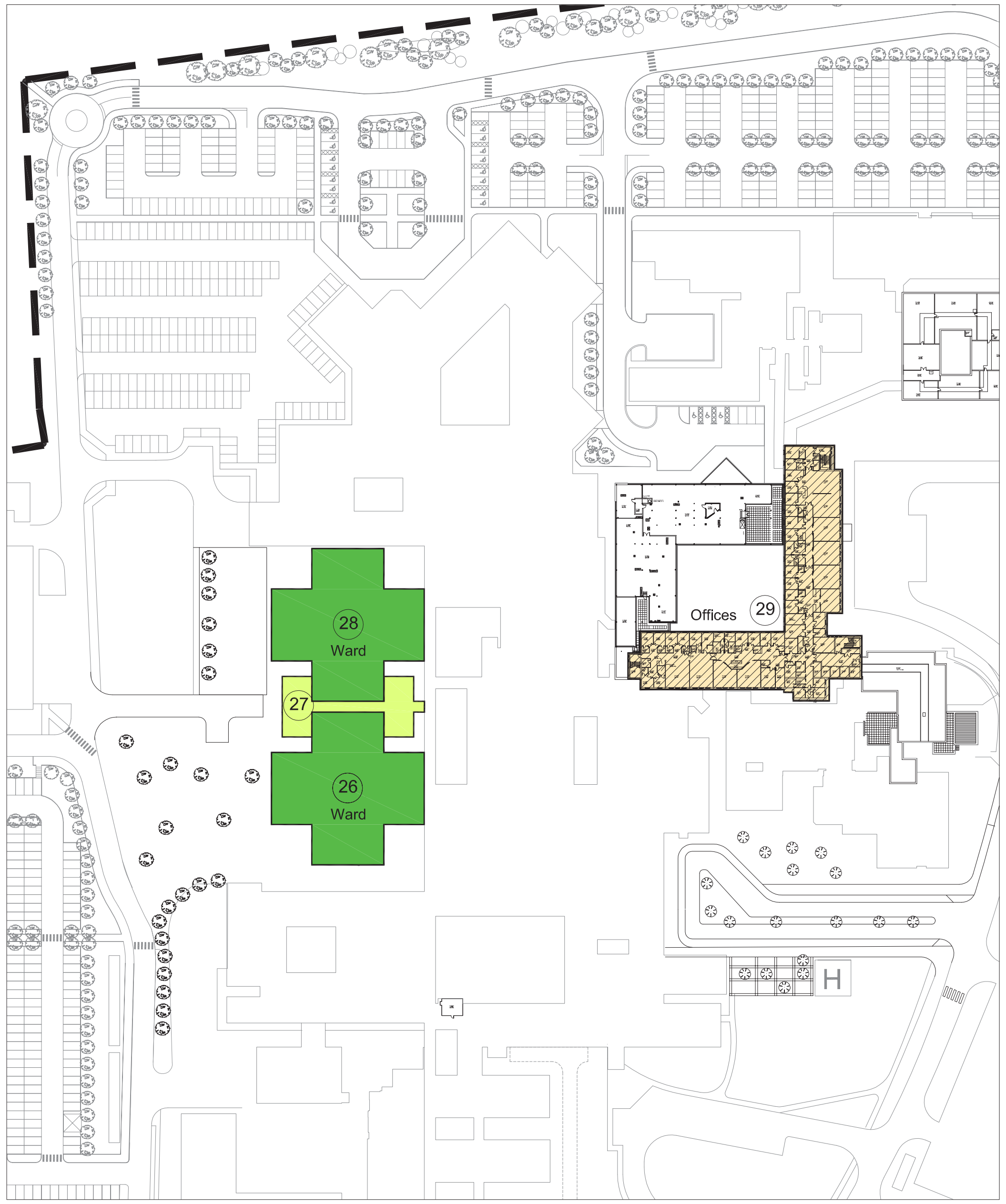
N

Make It Happen
We Value Respect
Together We Achieve

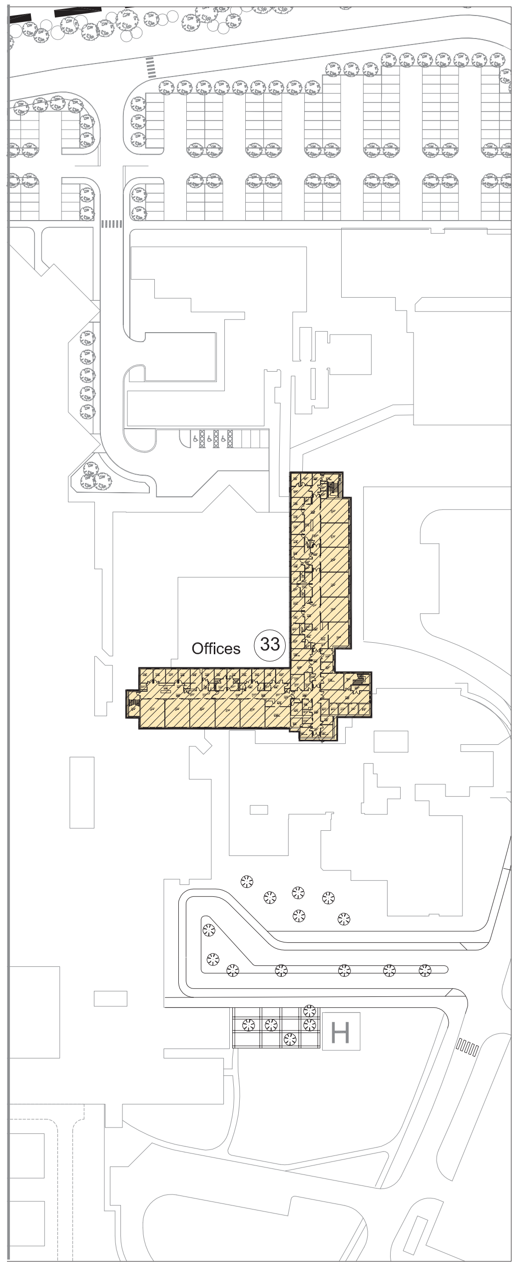
OPTION B LEVEL 3,4,5 PLAN

- WARD
- OUTPATIENTS
- THEATRES
- MLU/FERTILITY
- FRACTURE CLINIC
- STORES
- CIRCULATION
- OFFICE / ADMIN
- UCC
- PATHOLOGY LABS
- DEMOLITION

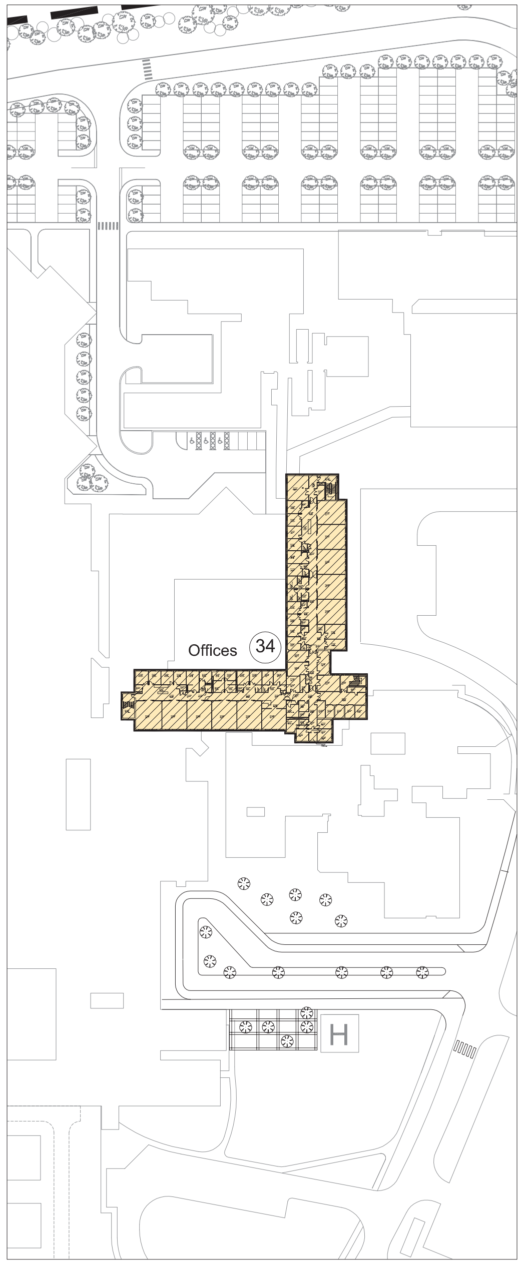
N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



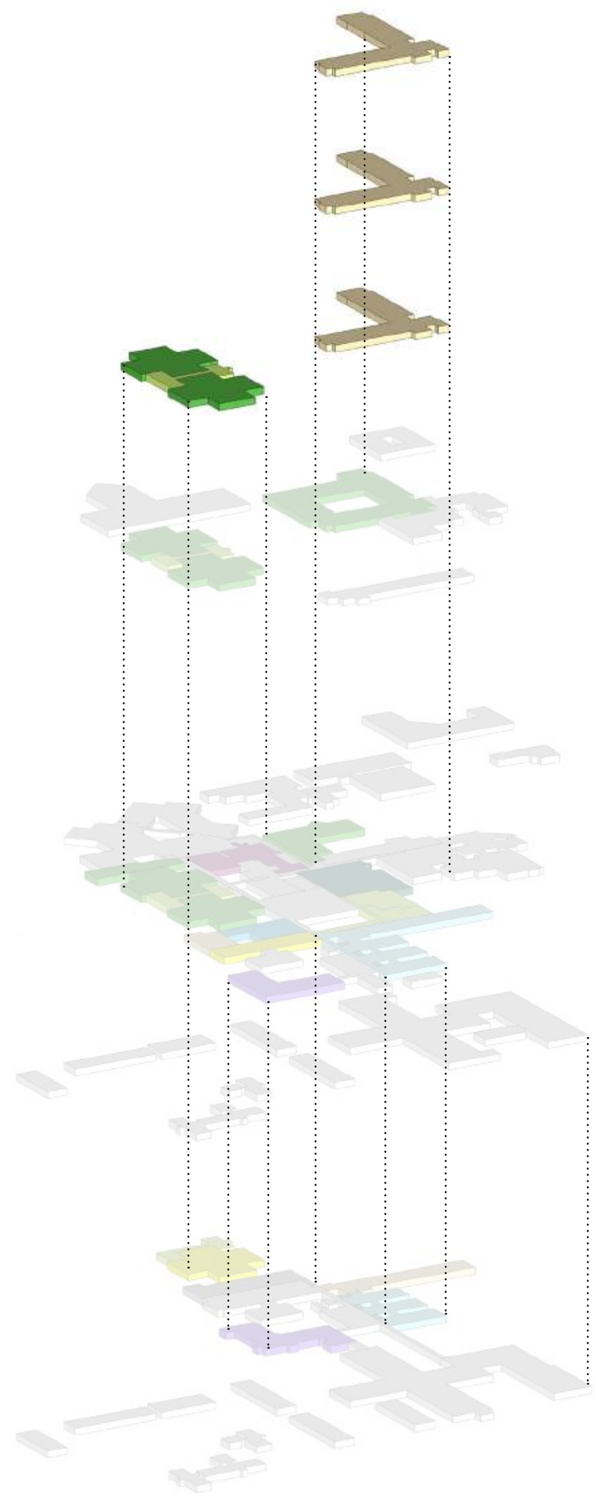
LEVEL 3



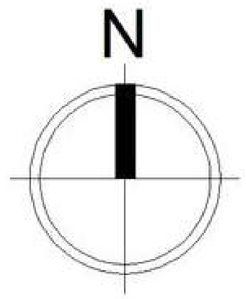
LEVEL 4



LEVEL 5



OPTION B - 3D MASSING



OPTION B - RSH_ACCOMMODATION SCHEDULE

- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

Option B - RSH The Planned Care Site

Area Ref	Description	Floor Level	SSP Baseline					Estates Implications					Backlog					Current Use	Notes
			New Build	Refurb				New Build	Refurb				New Build	Refurb					
				Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		
1	Path Lab	0 (Ground)													1220				
2	Stores	0 (Ground)										980						Rehab & Staff Gym	
3	Outpatients Clinic	0													920			Admin Offices	
3a	MLU	0	1300																FCHS Funded
3b	Circulation	0	345																
4	Outpatients Clinic	0													1220			Outpatient Clinic	
5	Main Entrance/ Retail	1 (Ground)					1300												Include for area of raised roof & New Roofligfhts
6	UCC	1 (Ground)					1450											Escalation Ward & H&N Theatres	
7	Path Lab	1													950			Path Lab	
8	Fracture Clinic	1														670		Inpatient Ward & Fertility	
9	Fertility	1														720		Inpatient Ward & Fertility	
10	Admin/ Offices	1													1825			Outpatient Clinic	
11	Circulation	1									135								
13	Outpatient Clinic	1 (Ground)														615		Outpatient Clinic	
14	Day Case	1											1288						
15	Circulation	1											328						
16	Day Case	1											1288						
17	Day Case	1															500	Stores	
18	Theatres	1														1193		Theatres	
19	Ward	1													1288			Ward	Existing Ward Block
22	Ward	2											1288						
23	Circulation	2											328						
24	Ward	2											1288						
25	Ward	2													3780			Ward	
26	Ward	3											1288						
27	Circulation	3											328						
28	Ward	3											1288						
35	Admin/ Offices	1														395		Inpatient Ward & Fertility	

	Demolitions																		
S1	Pharmacy External Stores							65											
S5	Catering & Stores							3300											
S6	Plant							380											
S9	Former Shropdoc							230											Temporary Modular Building
S8	Plant/ Store							20											
S10	Former Finance							225											Temporary Modular Building

	Abnormals		
S2	Service Yard Canopy	20 Linear Metres	10.5m wide
S3	Service Yard	550 m2	
S4	Retaining wall	21 linear metres	
S7	Entrance Canopy	12 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S11	New Road & re-alignment of junction	50 linear metres	New Vehicle route to MLU transfer entrance; assume 5500mm cariageway with 2000mm footpath to one side
S12	Retaining wall	125 linear metres	
S13	General Landscaping	1950	Assume 60% Soft Landscaping- 40% Hard Landscaping
S13a	General Landscaping	1750	Assume 60% Soft Landscaping- 40% Hard Landscaping
S14	Entrance Canopy	35 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S15	Feature Landscaping	3250	Landscaped Plaza and shared surface vehicle route
	Subteranean Service Duct		MEP Engineers to advise of scope and specification
	New Helipad		Requirement at Warm site tbc
	Breakthrough to existing buildings		
	Vertical Circulation Cores	3 new additional vertical circulation to Outpatients	If ward block is demolished then 1 No. new Vertical Circulation Core will be required to serve the Lingen Davis Centre and
	Buildings for Services Infrastructure	TO BE ADVISED	

OPTION B - RSH_ESTATES BACKLOG IMPACT

SUSTAINABLE SERVICES PROGRAMME

BACKLOG

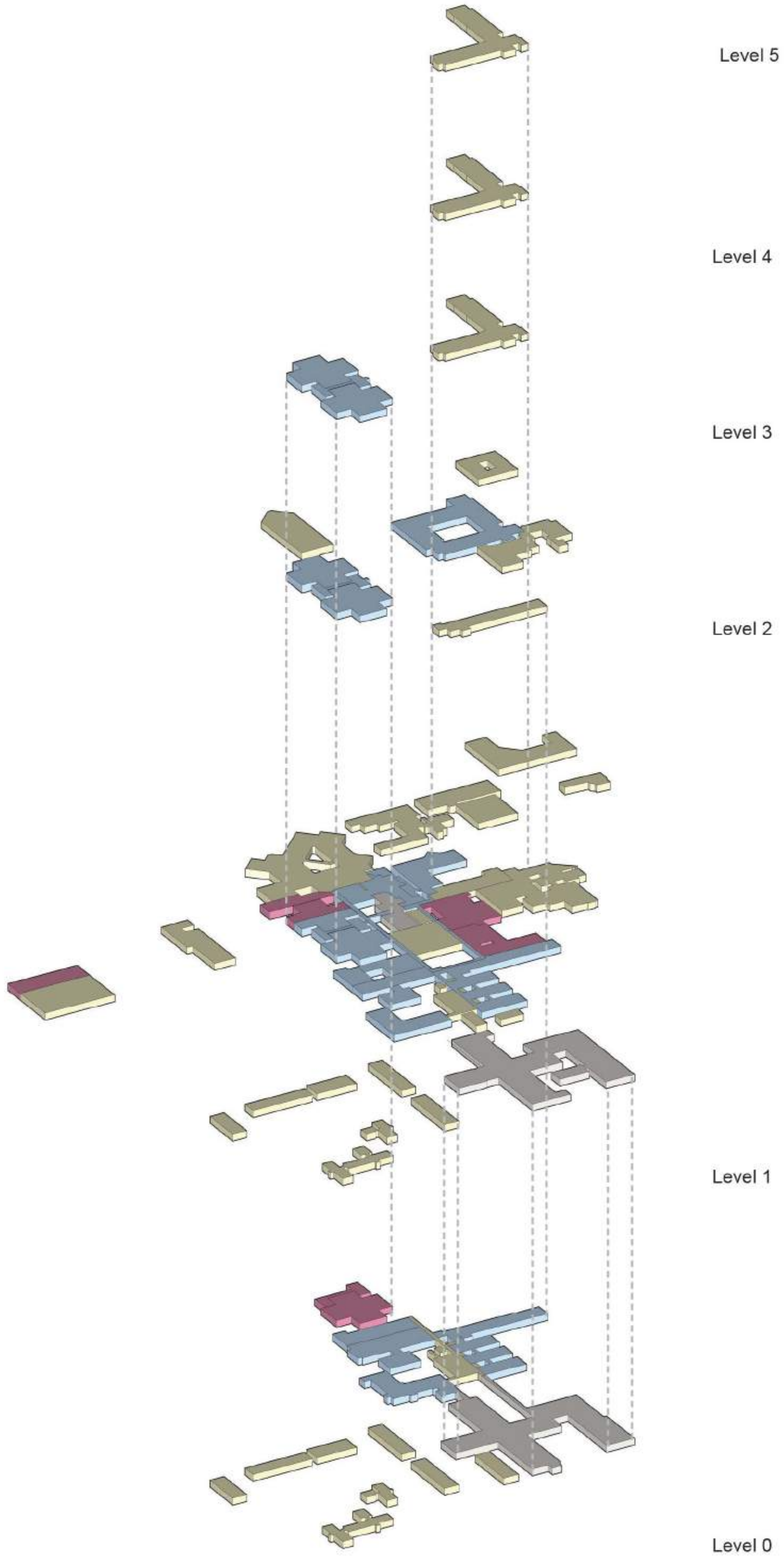
RESIDUAL BACKLOG

EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.



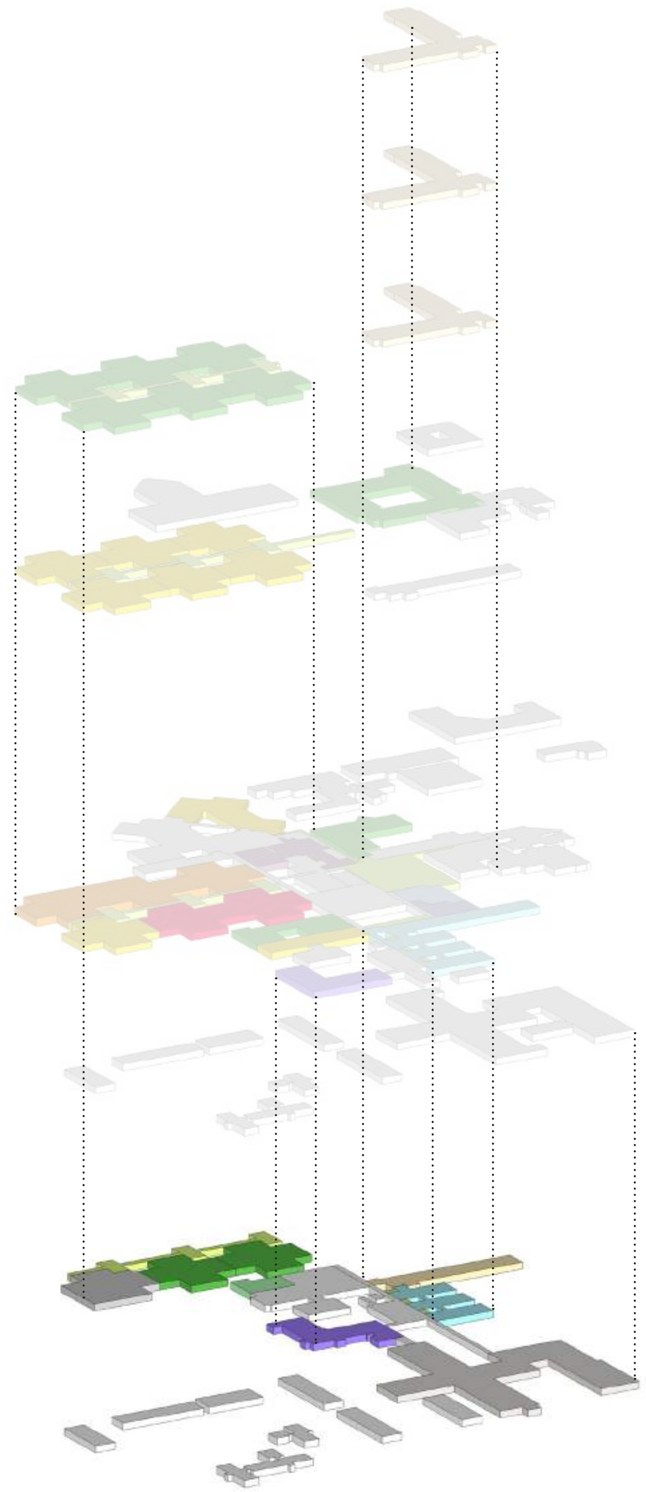
2.8 OPTION C1
RSH_EMERGENCY SITE
PRH_PLANNED CARE SITE

RSH_OPTION C1 LEVELS 0-5
RSH_ACCOMMODATION SCHEDULE
RSH_SITE WIDE IMPACTS PLAN
RSH_ESTATES BACKLOG IMPACT
PRH_OPTION C1 LEVELS 1-2
PRH_ACCOMMODATION SCHEDULE
PRH_ESTATES BACKLOG IMPACT

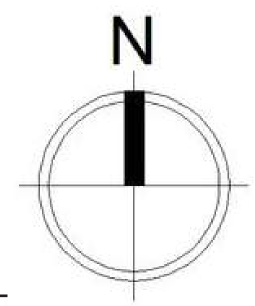
OPTION C1 LEVEL 0 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- MLU / MATERNITY / W+C
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



OPTION C1 - 3D MASSING



OPTION C1 LEVEL 1 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- MLU / MATERNITY / W+C
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

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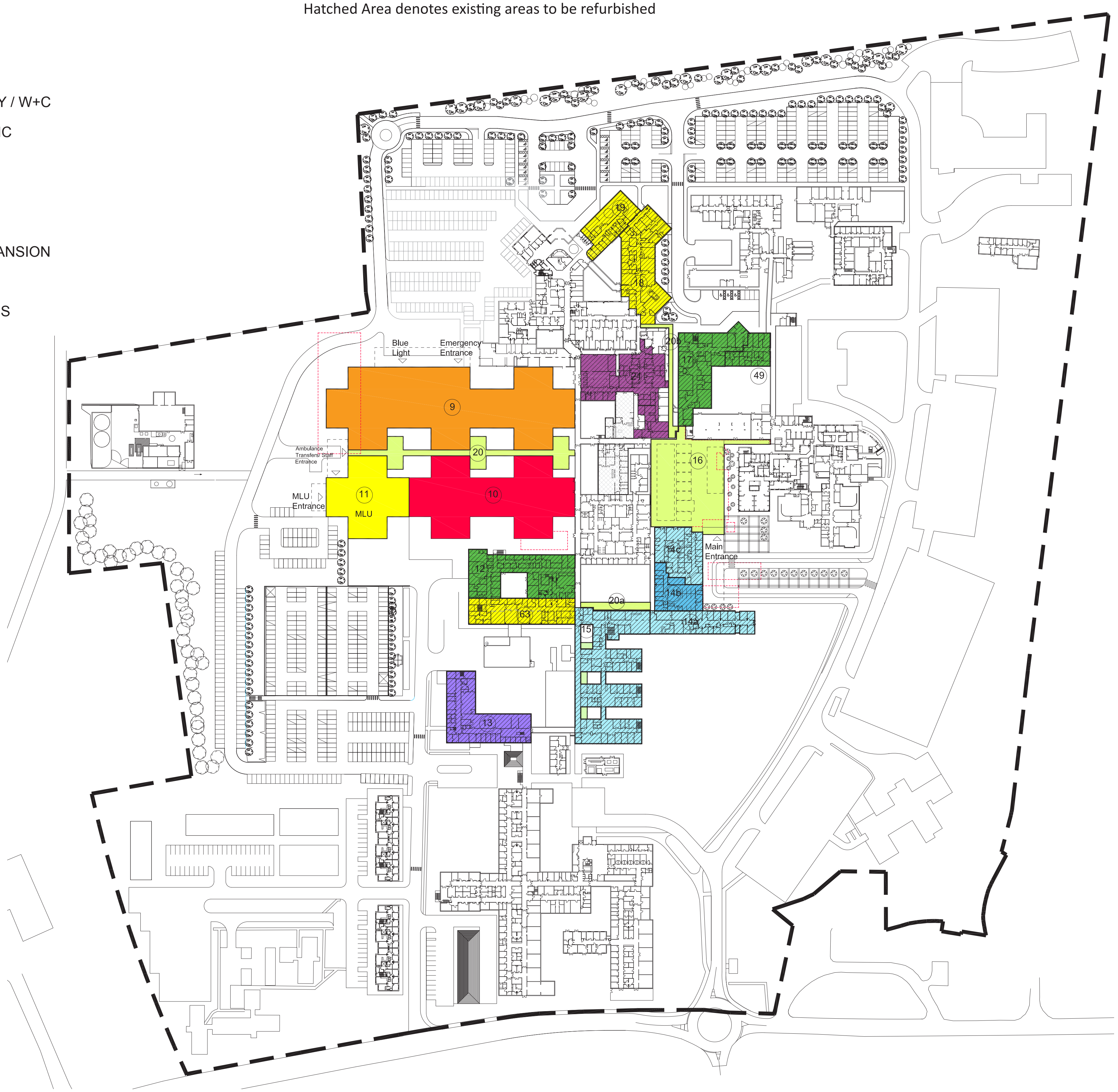

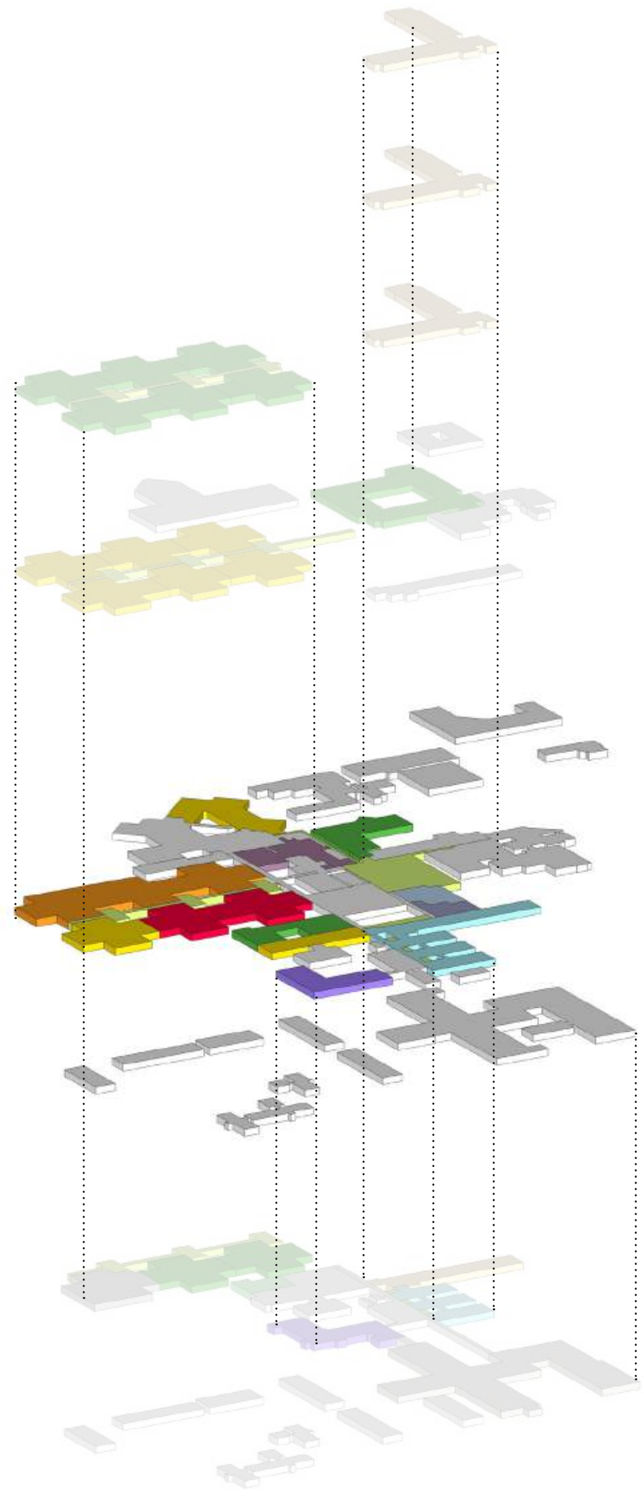

OPTION C1 - 3D MASSING

N

OPTION C1 LEVEL 2 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- MLU / MATERNITY / W+C
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
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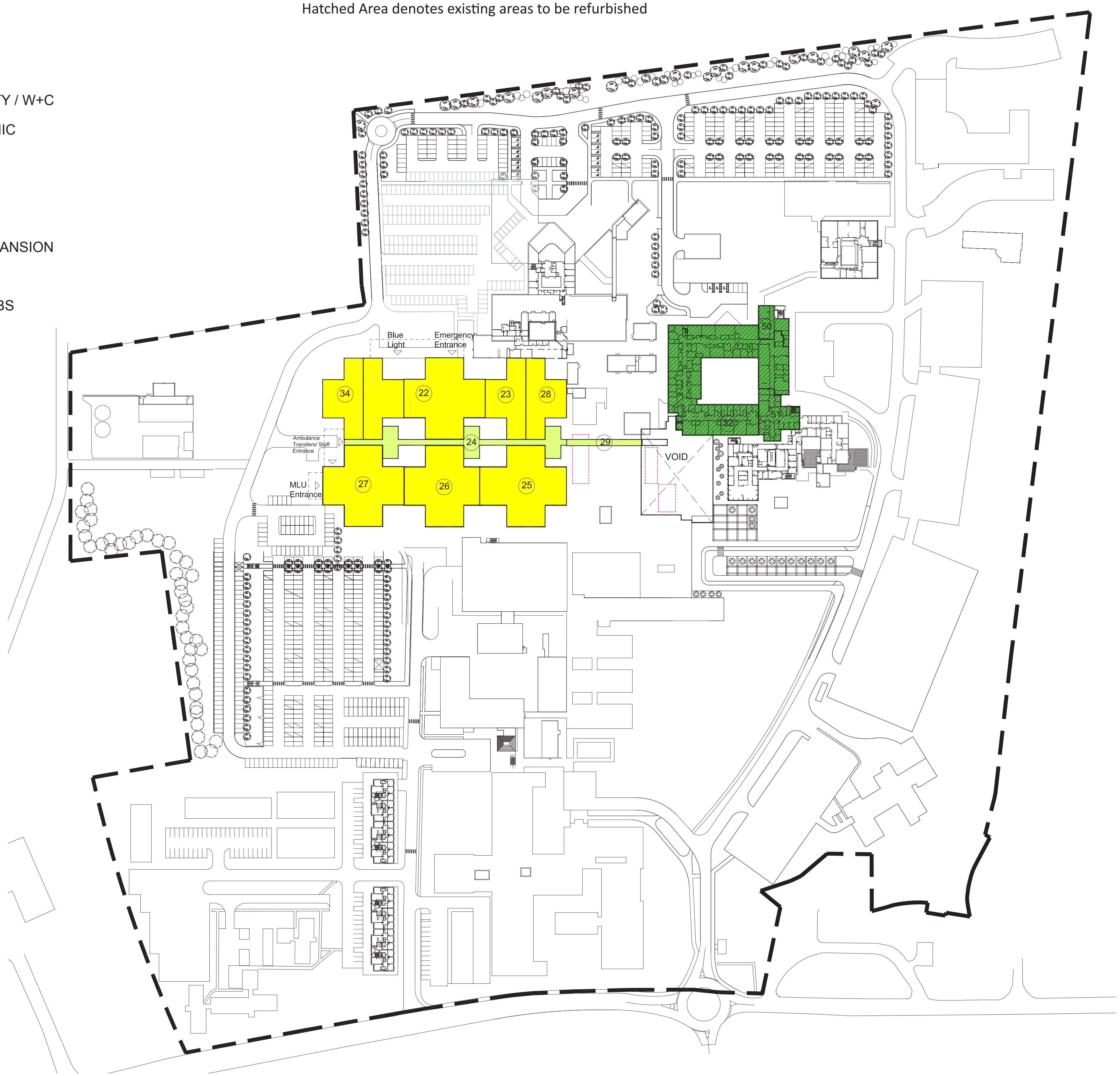
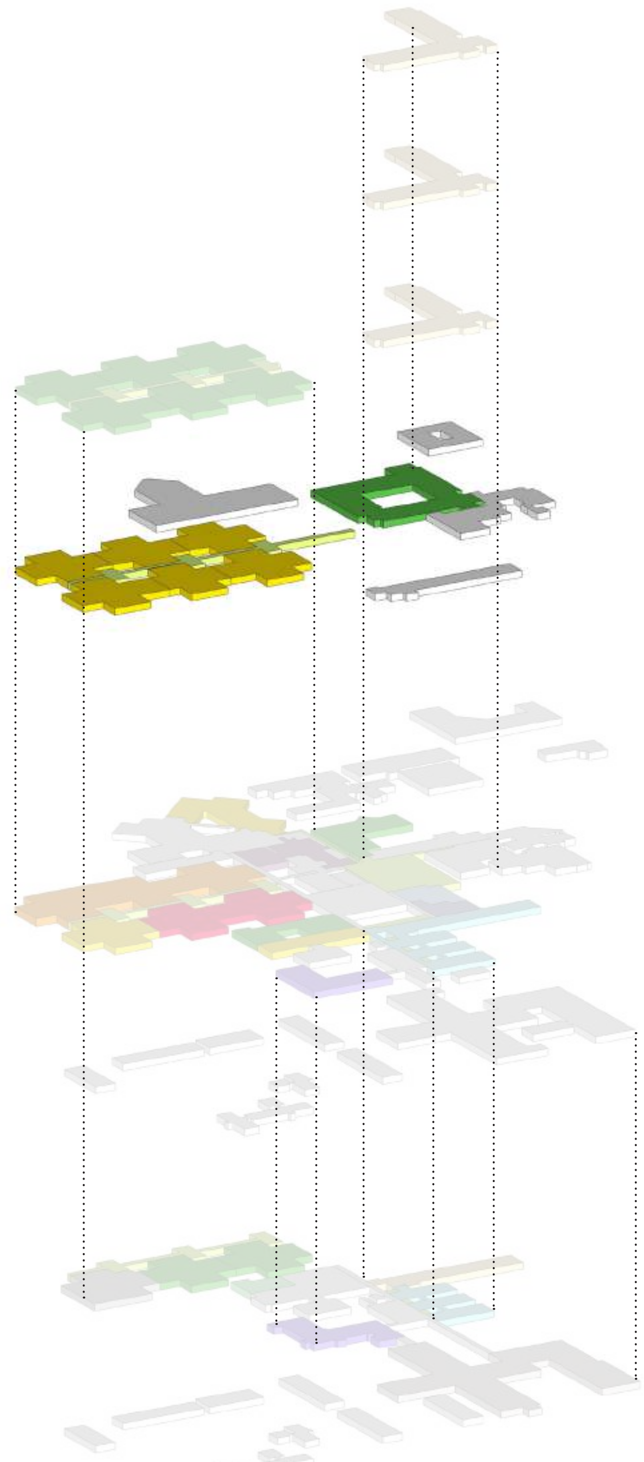




OPTION C1 - 3D MASSING

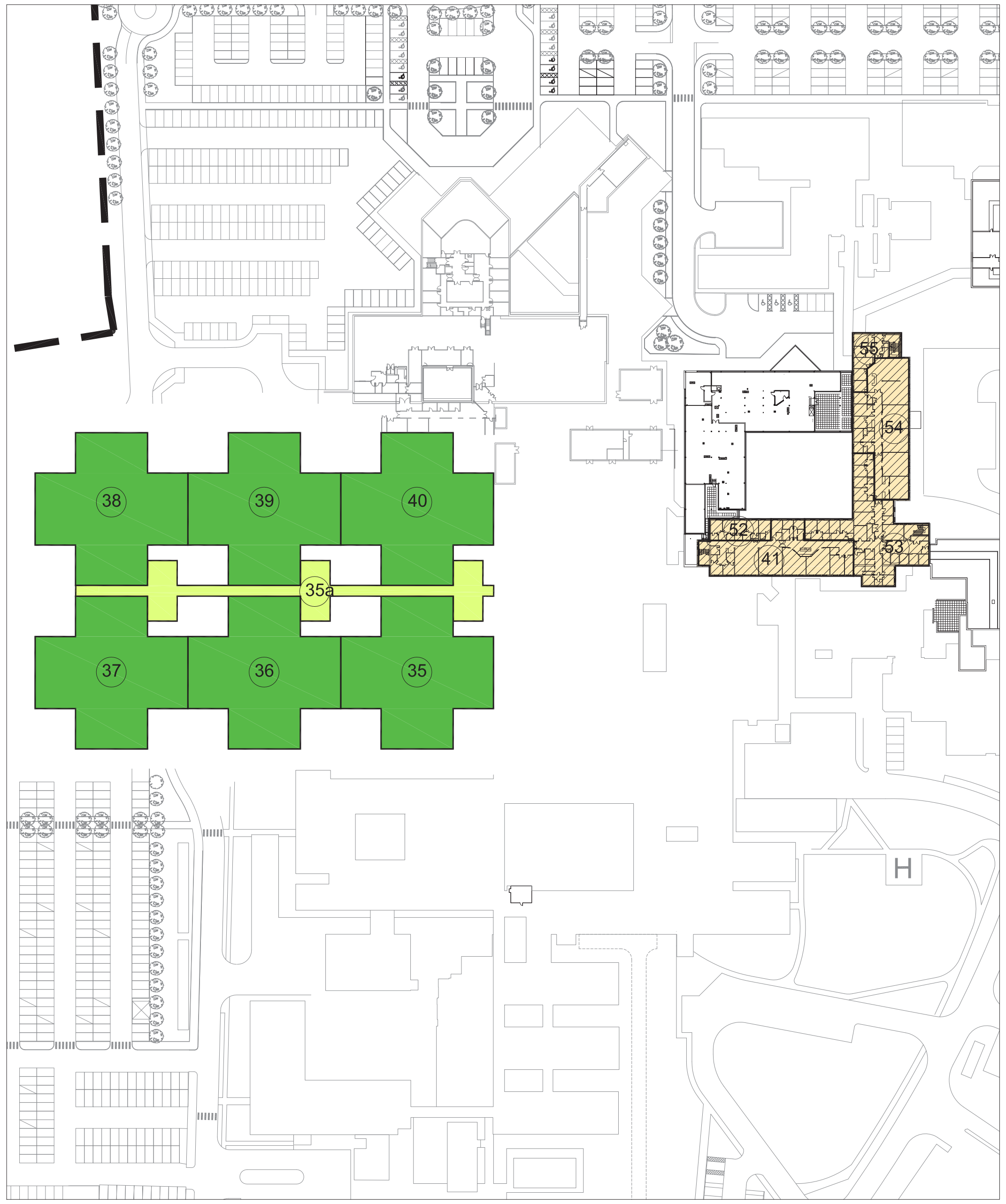
N

Make it Happen We Value Respect Together We Achieve

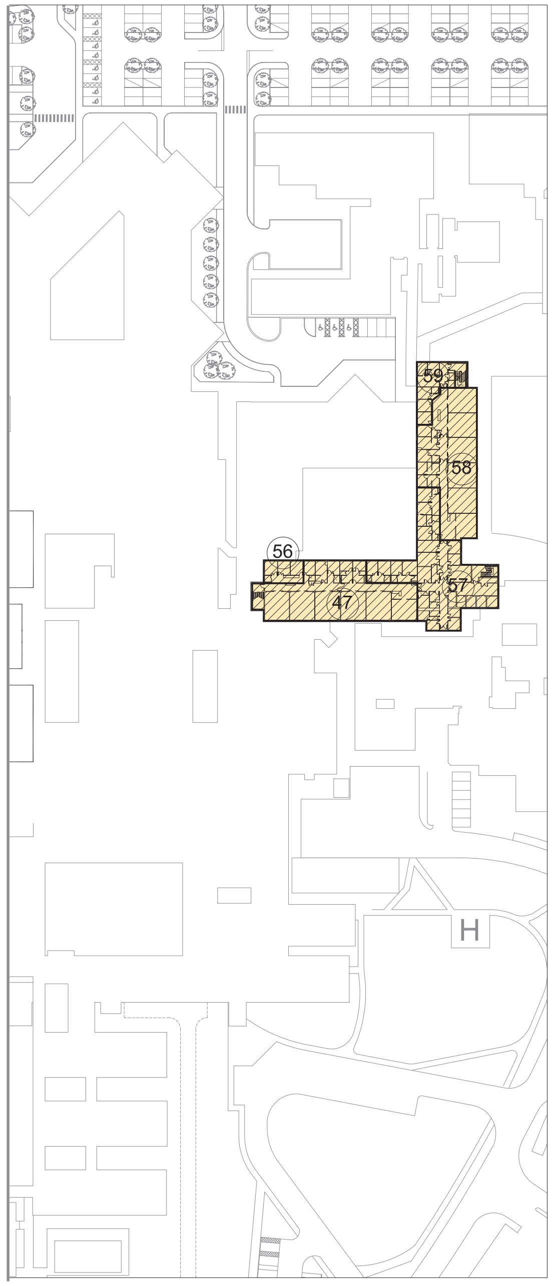
OPTION C1 LEVEL 3,4,5 PLANS

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- MLU / MATERNITY / W+C
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS

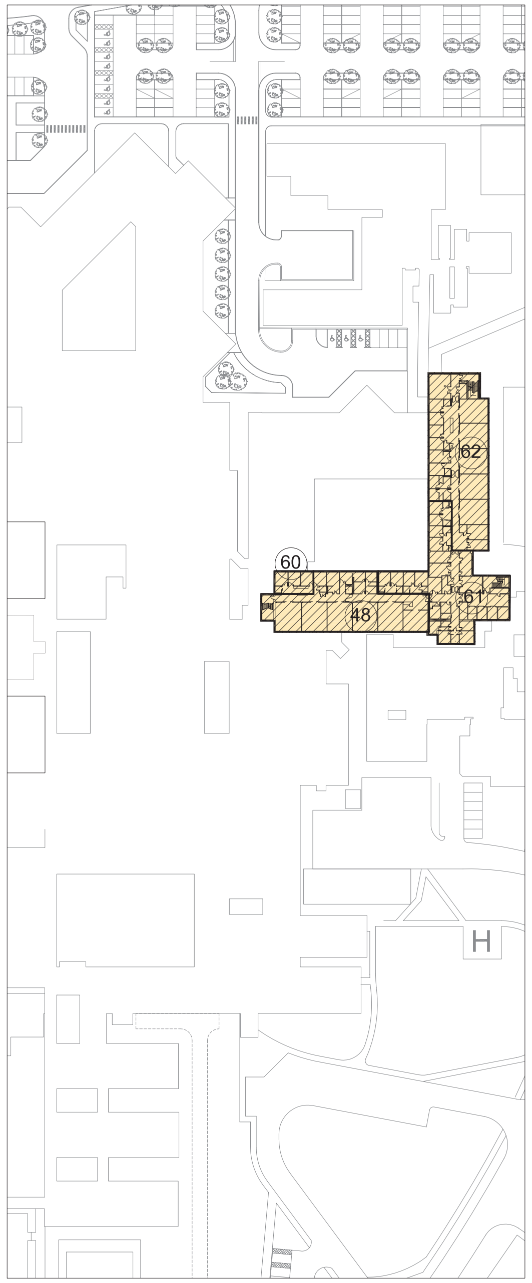
N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



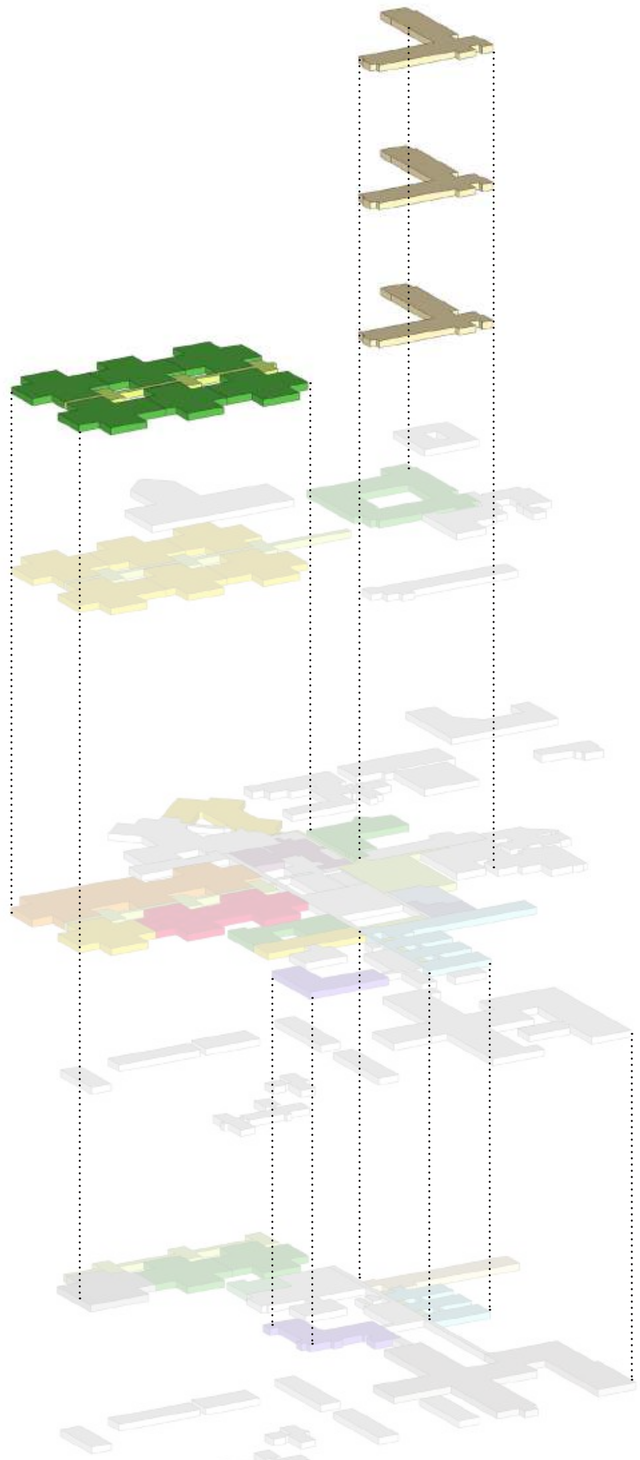
LEVEL 3



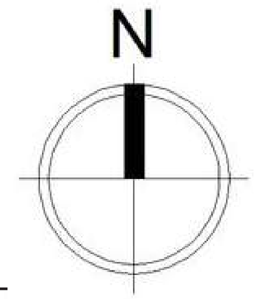
LEVEL 4



LEVEL 5



OPTION C1 - 3D MASSING



OPTION C1 - RSH_ACCOMMODATION SCHEDULE

- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

Option C1- RSH Emergency Site

			SSP Baseline					Estates Implications					Backlog						
Area Ref	Description	Floor Level	New Build	Refurb				New Build	Refurb				New Build	Refurb				Current Use	Notes
				Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		
1	Stores	0						1460											
2	Ward	0	1288																
3	Ward	0	1288																
4	Pharmacy Expansion	0					390											Rehab & Staff Gym	
5	Staff Welfare/ Offices	0													920			Admin Offices	
6	Outpatients Dept	0													1220			Outpatient Clinic	
7	Pathology Lab	0													1220				
8	Circulation	0	645																
9	Emergency Department UCC AEC/ CDU Discharge Lounge	1	3770																
10	Critical Care Unit	1	2290																
11	MLU	1	1150																FCHS Funded; SHP schedule requires inclusion of Antenatal clinic & EPAS
12	Inpatient Ward	1				1065												Ward & Fertility	
13	Pathology Lab	1													950			Path Lab	
14a	Outpatients	1													630			Admin/ Offices	
14b	Fracture Clinic	1 (Ground)													430				
14c	Outpatients	1 (Ground)													600				Rating reduced to medium/light
15	Outpatients	1													1825			Outpatient Clinic	1567 scheduled by SHP
16	Main Entrance & Retail	1 (Ground)	1817																Double Height Space
17	Ward	1 (Ground)													990			Ward	Existing Ward Block
18	Gynae, EPAS & GATU	1 (Ground)			1000														Internal reconfiguration, but of a good quality recent building with good envelope & infrastructure; GATU may move to 'Oscopy Suite' on the warm site. To be ammended to a different use.
19	W&C Support & Training	1 (Ground)			500														Internal reconfiguration, but of a good quality recent building with good envelope & infrastructure. To be ammended to a different use.
20	Circulation	1	655																
20a	Circulation	1						132											
20b	Circulation	1 (Ground)						160											
21	Theatres	1 (Ground)														1193			
22	Paediatric Inpatients & Oncology	2	1800																
23	POPD	2	477																
24	Circulation	2	687																
25	Delivery/ Theatres	2	1300																
26	Neonatal	2	1176																
27	Antenatal/ Post Natal	2	1703																
28	Transitional Care	2	500																Area to be confirmed from SHP/TT discussions
29	Circulation	2	130																
32	Ward	2													2365			Ward	Existing Ward Block
34	CAU	2	425																Current Provision Indicated- To be uplifted to take account of single site facility
35	Inpatient Ward	3											1288						
35a	Circulation	3											652						
36	Inpatient Ward	3											1288						
37	Inpatient Ward	3											1288						
38	Inpatient Ward	3											1288						
39	Inpatient Ward	3											1288						
40	Inpatient Ward	3											1288						
41	Admin/ Offices	3														475		Ward	Existing Ward Block
47	Admin/ Offices	4														515		Ward	Existing Ward Block
48	Admin/ Offices	5														525		Ward	Existing Ward Block
49	Ward	1													290			Ward	Existing Ward Block
50	Ward	2													220			Ward	Existing Ward Block
51	Ward	2													415			Ward	Existing Ward Block
52	Admin/ Offices	3													105			Ward	Existing Ward Block
53	Admin/ Offices	3													540			Ward	Existing Ward Block
54	Admin/ Offices	3														495		Ward	Existing Ward Block
55	Admin/ Offices	3													140			Ward	Existing Ward Block
56	Admin/ Offices	4													65			Ward	Existing Ward Block
57	Admin/ Offices	4													535			Ward	Existing Ward Block
58	Admin/ Offices	4														490		Ward	Existing Ward Block
59	Admin/ Offices	4													130			Ward	Existing Ward Block
60	Admin/ Offices	5													60			Ward	Existing Ward Block
61	Admin/ Offices	5													545			Ward	Existing Ward Block
62	Admin/ Offices	5														625		Ward	Existing Ward Block
63	Fertility	1														720		Ward	Existing Ward 32

	Demolitions																		
S5	Generator & Housing							300											
S16	Estates							1200											
S17	Admin							200											
S19	Former Shropdoc							230											Temporary Modular Building
S21	Planr/ Store							20											
S22	Escalation Ward & H&N							1700											
	Catering & Stores							3300											

	Abnormals		
S1	General Landscaping	1350	Assume 60% Hard Landscaping- 40% Soft Landscaping
S2	Service Yard Canopy	330 sq m	Metal Canopy with Sedum Roof
S3	Service Yard	1140	
S4	Road Re-alignment	12 Linear metres	Assume 6000mm wide carriageway with 2000mm footpath to one side
S6	MSCP	4 storeys (8 No. half decks @77 spaces) = 539 spaces	2 No. Vertical Circulation Cores; 2 No. 13 Person passenger lifts; Split deck Car Park
S7	Road Re-alignment	Realigning kerb radii	
S8	General Landscaping & Car Parking	5000	Assume 80% hard Landscaping 20% Soft Landscaping; 2 No. roadways and 52 No. Car Parking spaces at Grade
S9	Entrance Canopy		8m Wide Feature Glass & Steel Architectural Quality Canopies
S10	Entrance Canopy	19.5 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S11	Entrance Canopy	48 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S12	General Landscaping	900	Internal Courtyard- Assume
S13	Road Re-alignment	150 linear metres	Assume 6000mm wide carriageway with 2000mm footpath to one side
S14	Subteranean Service Duct		MEP Engineers to advise of scope and specification
S15	New bluelight access round and roundabout modifications		In principle only- use of the open grassed area not negotiated; Assume 150 linear m new road 6000mm wide carriageway with 2000mm wide footpath; modifications to levels with associated banking; modification to existing roundabout; streetlights and junction to access road from Redwood Centre
S18	Feature Landscaping	3250	Landscaped Plaza and shared surface vehicle route
S20	Entrance Canopy	38 Linear Metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S23	Childrens Sky garden Play area	250	Rooftop Playarea, with 2m high glazed wall to open edge
S24	General Landscaping	1500	Assume 80% hard Landscaping 20% Soft Landscaping; Vehicle drop-off area
S25	Retaining wall	4740m	Retaining wall approx 4m high- partally external, partially within the building envelope
S26	New Helipad		In principle use of the open grassed area not yet negotiated
S27	Breakthrough to existing buildings	3 No.	
S28	General Landscaping	1500	Assume 80% hard Landscaping 20% Soft Landscaping; Vehicle drop off area
	Vertical Circulation Cores	8 No. Vertical Circulation Cores 3 No. Bed Lifts; 5 No. 17P Passenger Lifts; 4 No. Goods Lifts 2 No. escalators 3 Additional Virtical Circulation Cores to Outpatients	If ward block is demolished then 1 No. new Vertical Circulation Core will be required to serve the Lingen Davis Centre and ward
	Buildings for Services Infrastructure	TO BE ADVISED	

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OPTION C1 - RSH_SITE WIDE IMPACTS

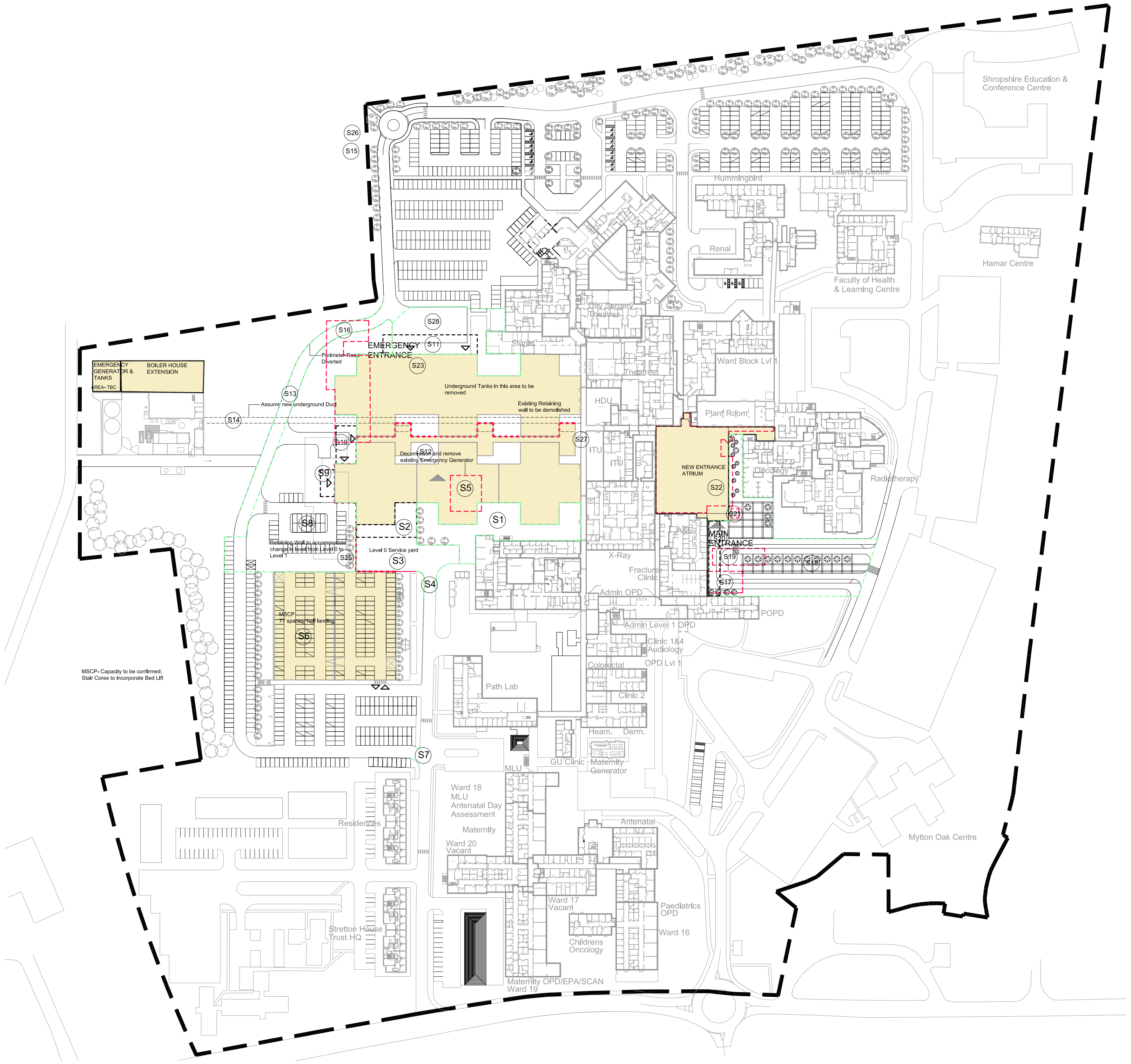
ABNORMALS

DEMOLITIONS

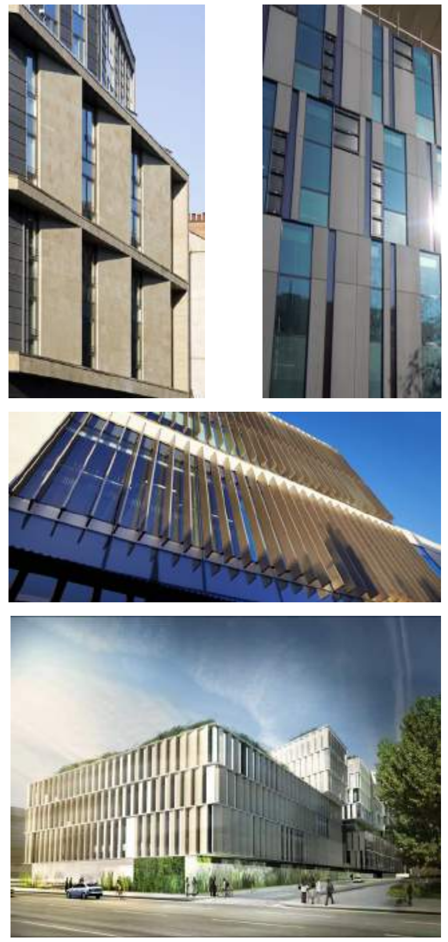
NEW BUILD

S1 - General Landscaping
S2 - Service Yard Canopy
S3 - Service Yard
S4 - Road Re-alignement
S6 - Multi-Storey Car Park
S7 - Road Re-alignement
S8 - General Landscaping & Car Parking
S9 - Entrance Canopy
S10 - Entrance Canopy
S11 - Entrance Canopy
S12 - General Landscaping
S13 - Road Re-alignement
S14 - Subterranean Service Duct
S18 - Feature Landscaping
S20 - Entrance Canopy
S23 - Childrens Sky Garden Play Area
S24 - General Landscaping
S25 - Retaining Wall
S26 - New Helipad
S27 - Breakthrough to existing buildings
S28 - General Landscaping

N



2. Multi-storey Car Park
Cladded in green walls, timber battens, zinc cladding panels



1. Feature Landscaping
Courtyards, soft and hard landscaping, tree boulevards, wild flowers, signage

3. Building Facade Treatments
Repeatable Elevations, concrete, zinc, timber, glazing

OPTION C1 - RSH_ESTATES BACKLOG IMPACT

SUSTAINABLE SERVICES PROGRAMME

BACKLOG

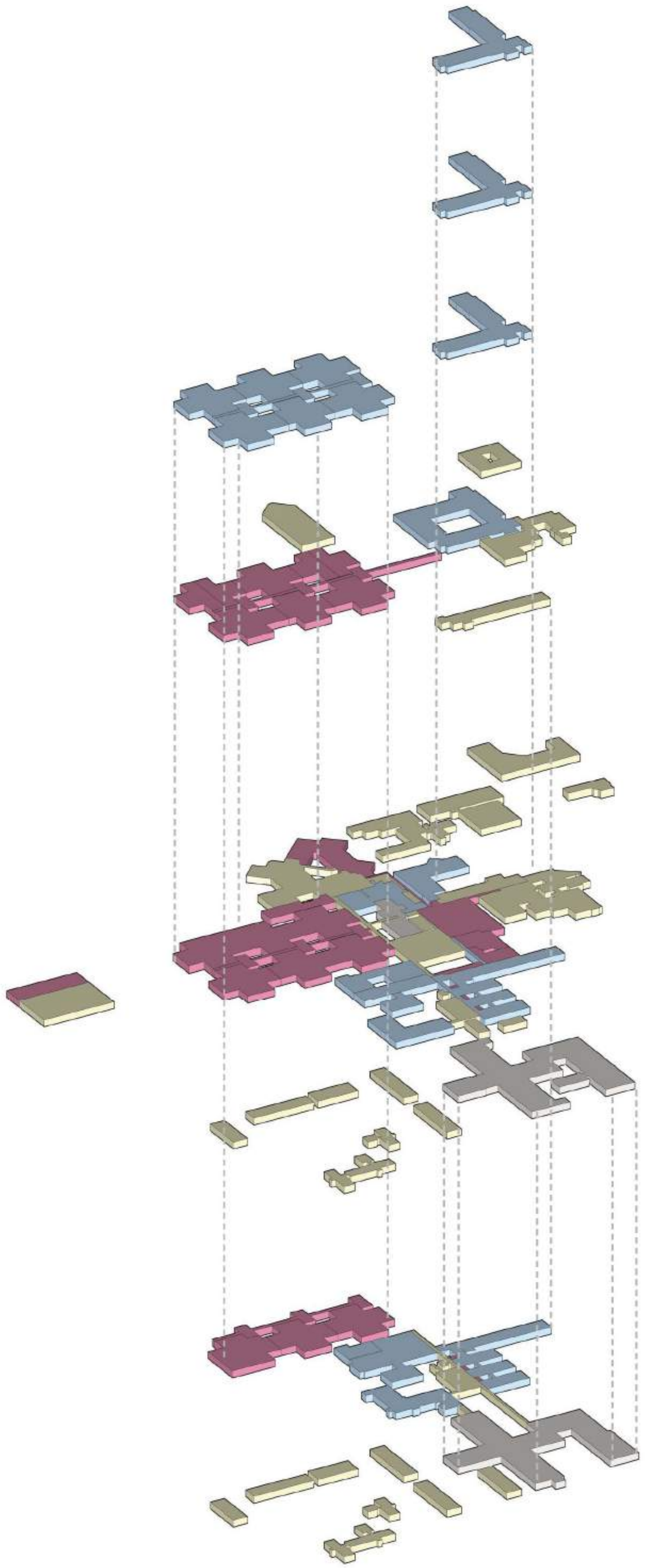
RESIDUAL BACKLOG

EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.



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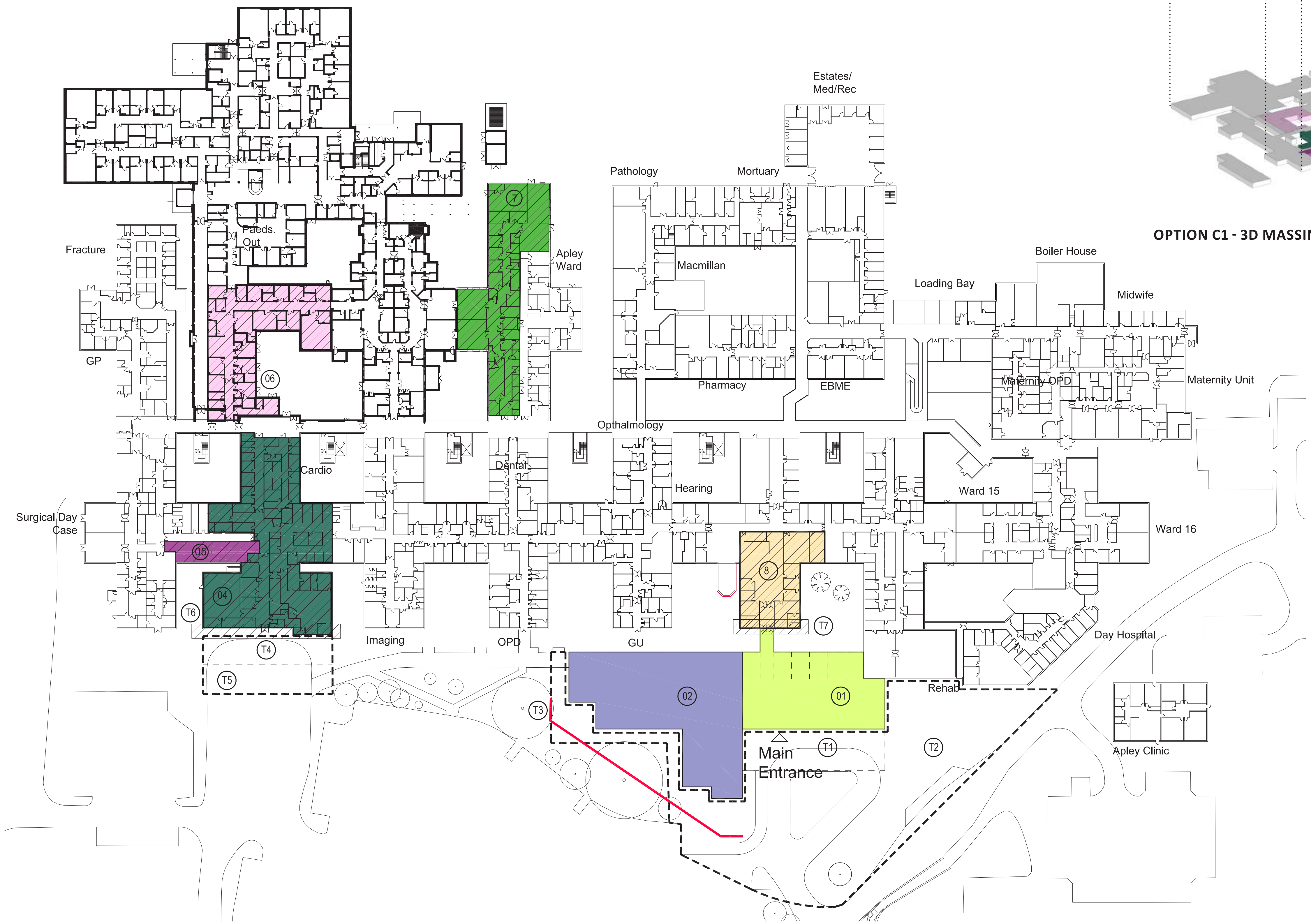
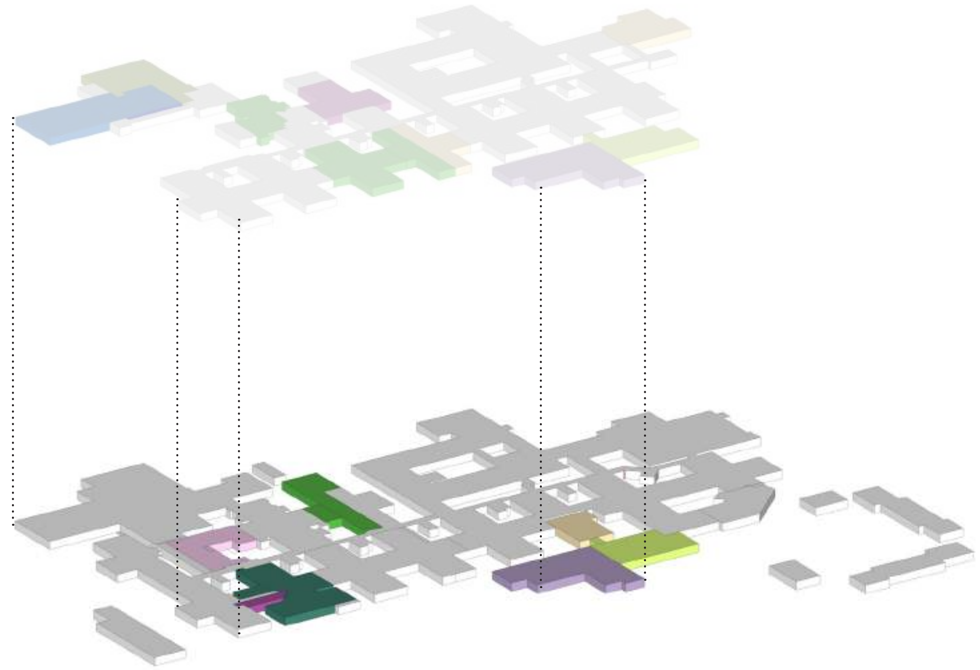
OPTION C1 LEVEL 1 PLAN

- WARD
- THEATRES
- UCC
- CIRCULATION
- OFFICE / ADMIN
- DAYCASE
- BREAST CLINIC
- OSCOPY SUITE
- CHEMOTHERAPY DAY CASE CENTRE

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished





OPTION C1 - 3D MASSING

OPTION C1 LEVEL 2 PLAN

- WARD
- THEATRES
- UCC
- CIRCULATION
- OFFICE / ADMIN
- DAYCASE
- BREAST CLINIC
- OSCOPY SUITE
- CHEMOTHERAPY DAY CASE CENTRE

N.B Numbers refer to Accommodation Schedule.
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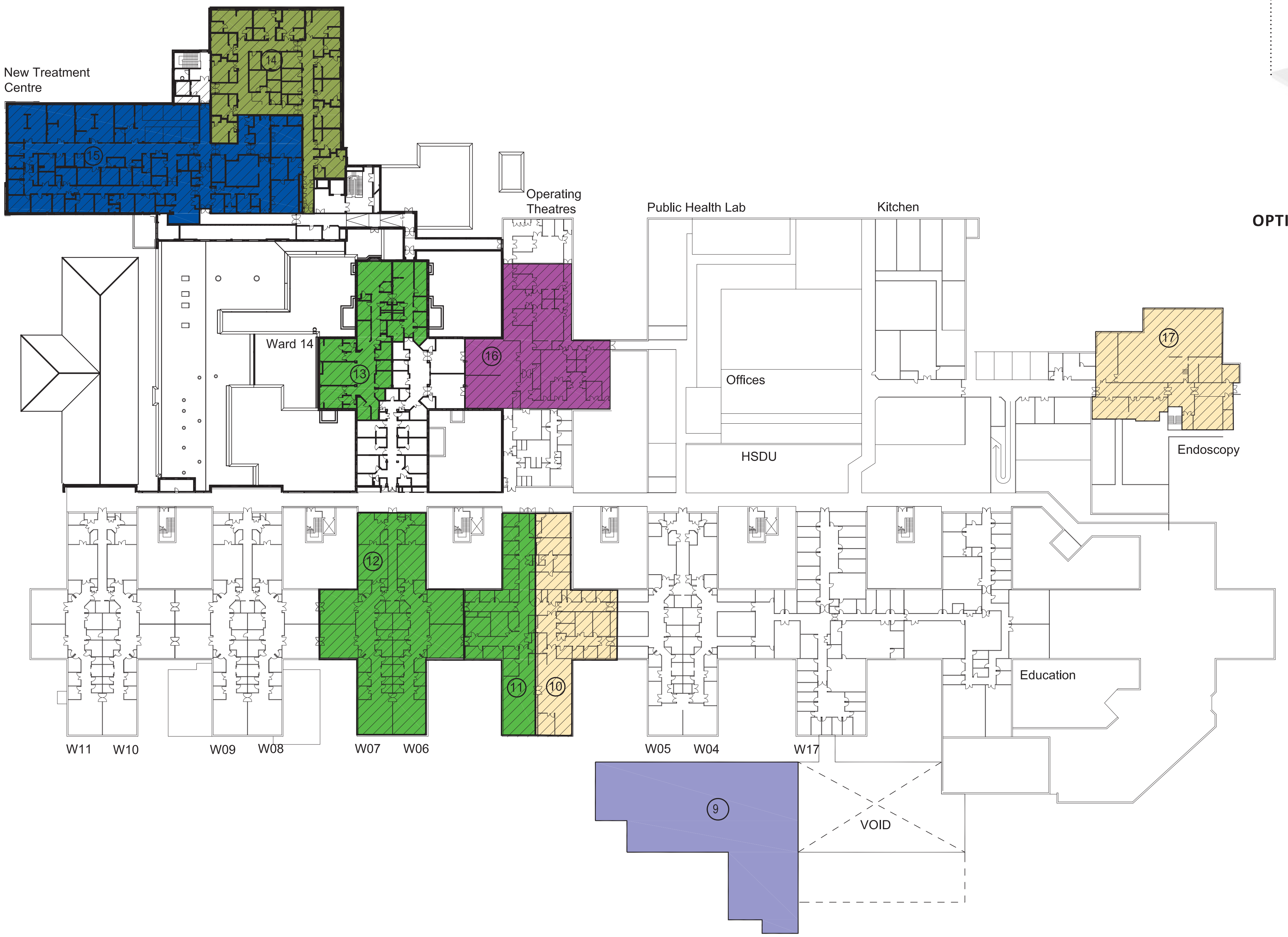
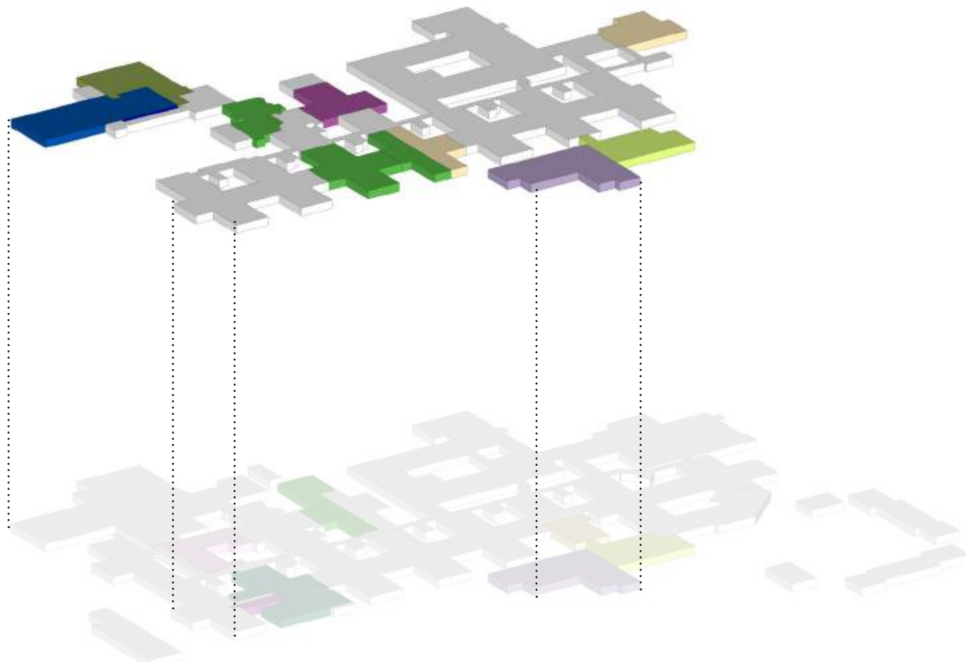
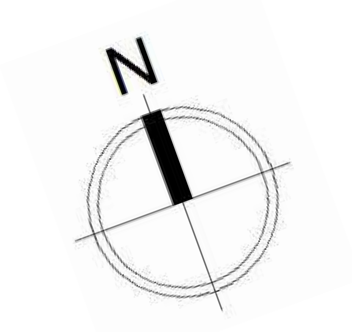




OPTION C1 - 3D MASSING



- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

C1-PRH Planned Care Site

To be read in conjunction with RSH Planned Care Site

			SSP Baseline					Estates Implications					Backlog						
Area Ref	Description	Floor Level	New Build	Refurb				New Build	Refurb				New Build	Refurb				Current Use	Notes
				Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		
1	Main Entrance & Retail	01 (Ground)	1850																Double Height Space
2	Centre of Excellence (eg Cancer Services)	01 (Ground)	1100																
4	UCC	01 (Ground)				1200													
5	Daycase	01 (Ground)														120		A&E	
6	Breast	01 (Ground)			730													Paediatric Oncology	Within 2014 completed building- so refurb associated with re-planning only- not upgrade
7	Inpatient Ward	01 (Ground)													765			IP Ward	
8	Admin/ Offices	01 (Ground)								445									
9	Chemotherapy Daycase	2	1100																
10	Inpatient Ward	2														500		IP Ward	
11	Inpatient Ward	2														500		IP Ward	
12	Inpatient Ward	2														1000		IP Ward	
13	Inpatient Ward	2			530													GATU	Within 2014 completed building- so refurb associated with re-planning only- not upgrade
14	Oscopy Suite	2			900														
15	Daycase & Daycase Theatres	2			1530														Within 2014 completed building- so refurb associated with re-planning only- not upgrade
16	Theatres	2														750		Theatres	
17	Admin/ Offices	2													700			Endoscopy	

	Demolitions						
	Existing A&E Canopy						

	Abnormals		
	Vertical Circulation Cores	1 No. Vertical Circulation Cores 2 No. 17P Passenger Lifts;	
T1	Entrance Canopy		10.5m Wide Feature Glass & Steel Architectural Quality Canopies
T2	Feature Landscaping	3200 m2	drop-off
T3	Retaining wall	Approx 65 linear metres	
T4	Entrance Canopy		10.5m Wide Feature Glass & Steel Architectural Quality Canopies
T5	General Landscaping around UCC	500 m2	
	Buildings for Services Infrastructure	To be advised	
	Breakthroughs to existing buildings	1 No.	

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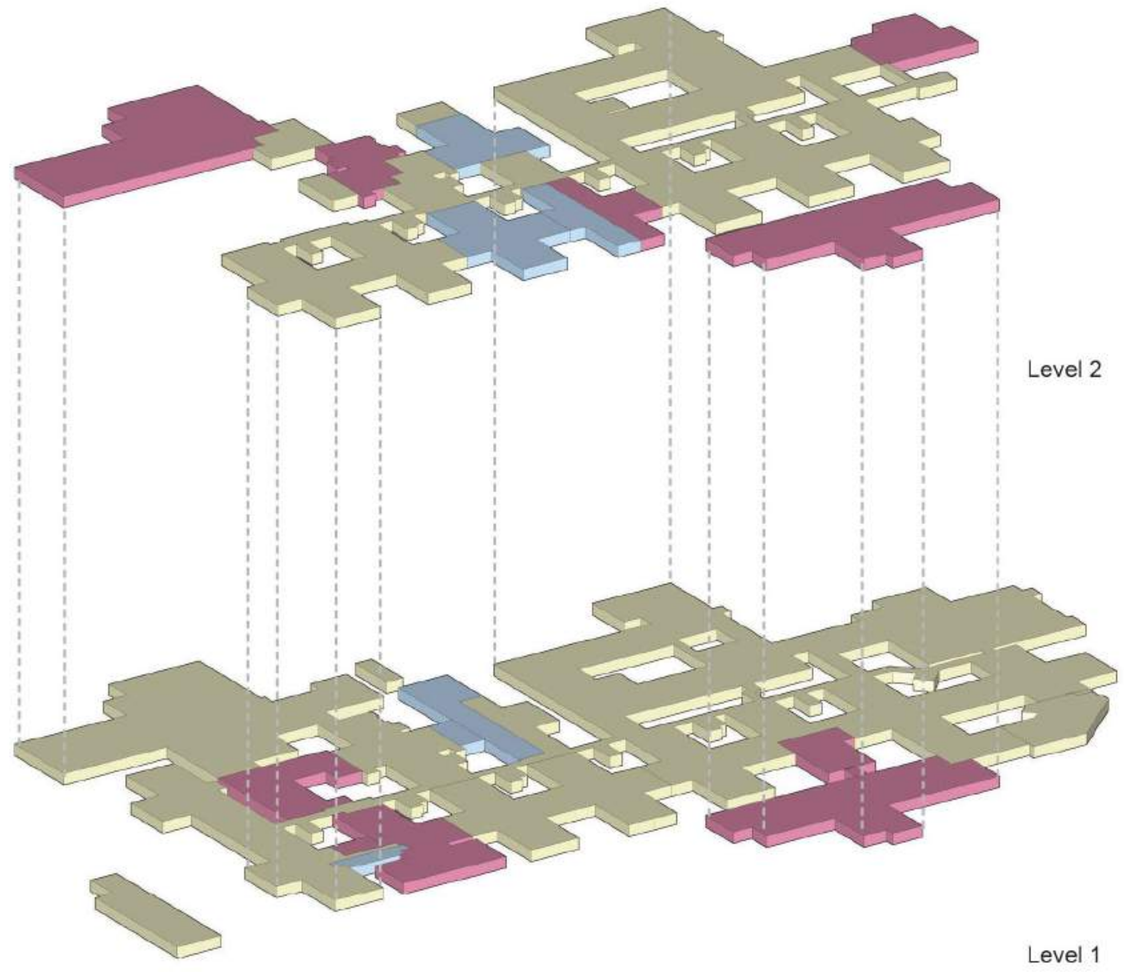
OPTION C1 - PRH_ESTATES BACKLOG IMPACT

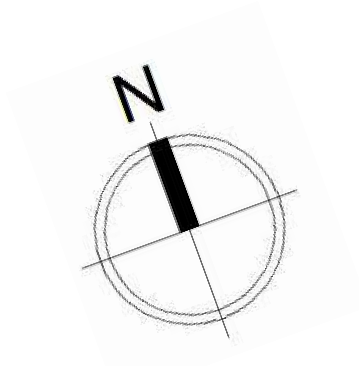
- SUSTAINABLE SERVICES PROGRAMME
- BACKLOG
- RESIDUAL BACKLOG
- EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.





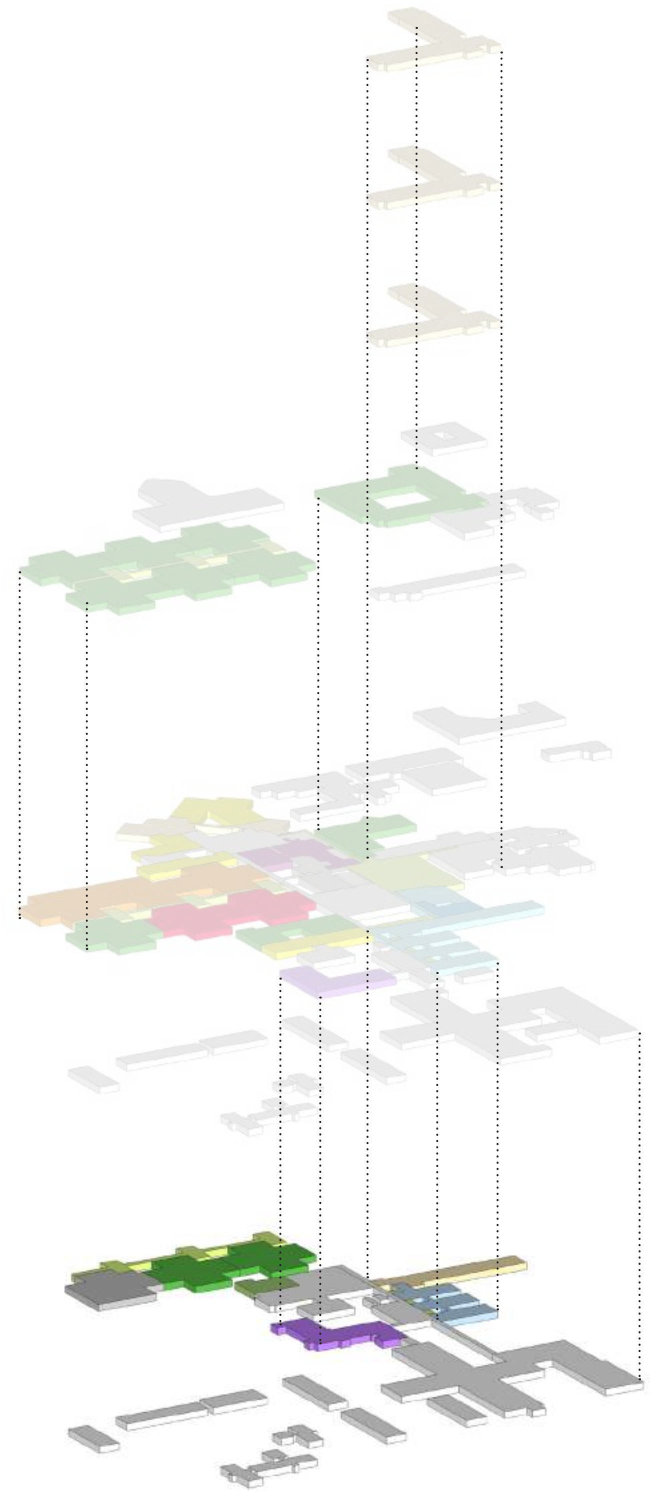
2.9 OPTION C2
RSH_EMERGENCY SITE
PRH_PLANNED CARE SITE WITH WOMENS AND CHILDRENS

RSH_OPTION C2 LEVELS 0-5
RSH_ACCOMMODATION SCHEDULE
RSH_SITE WIDE IMPACTS PLAN
RSH_ESTATES BACKLOG IMPACT
PRH_OPTION C2 LEVELS 1-2
PRH_ACCOMMODATION SCHEDULE
PRH_SITE WIDE IMPACTS PLAN
PRH_ESTATES BACKLOG IMPACT

OPTION C2 LEVEL 0 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



OPTION C2 - 3D MASSING

OPTION C2 LEVEL 1 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

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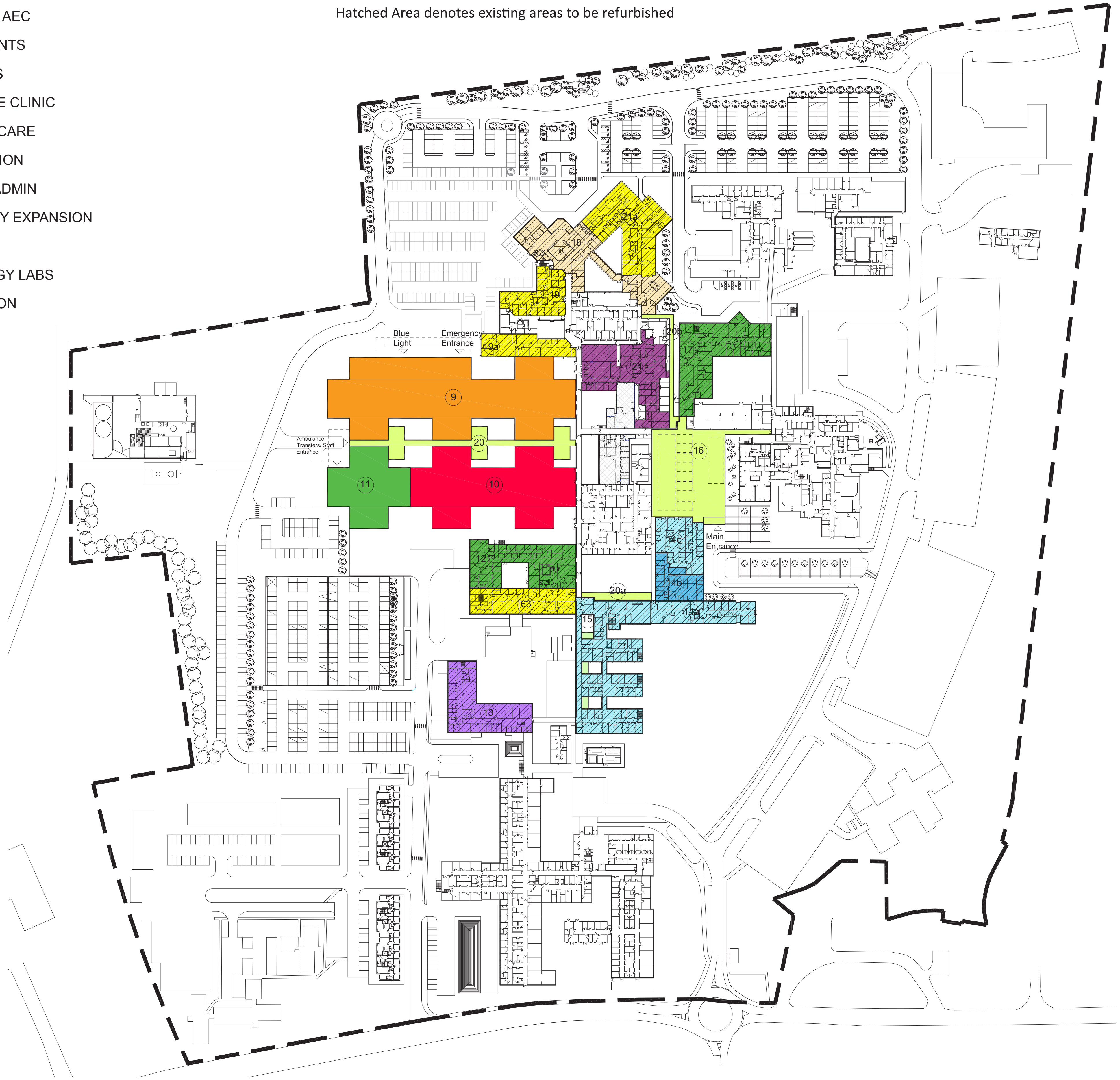
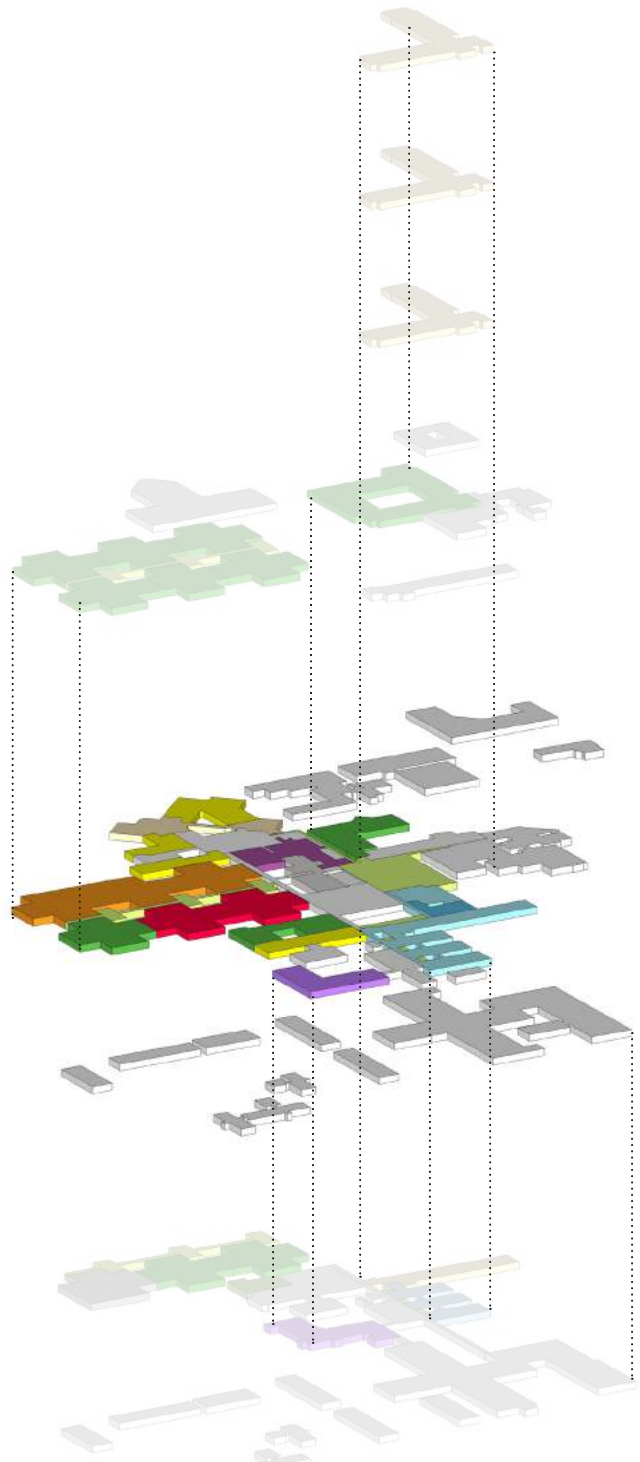
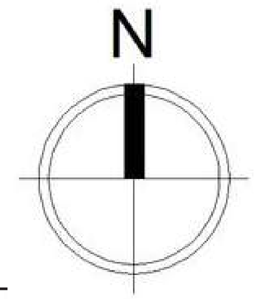




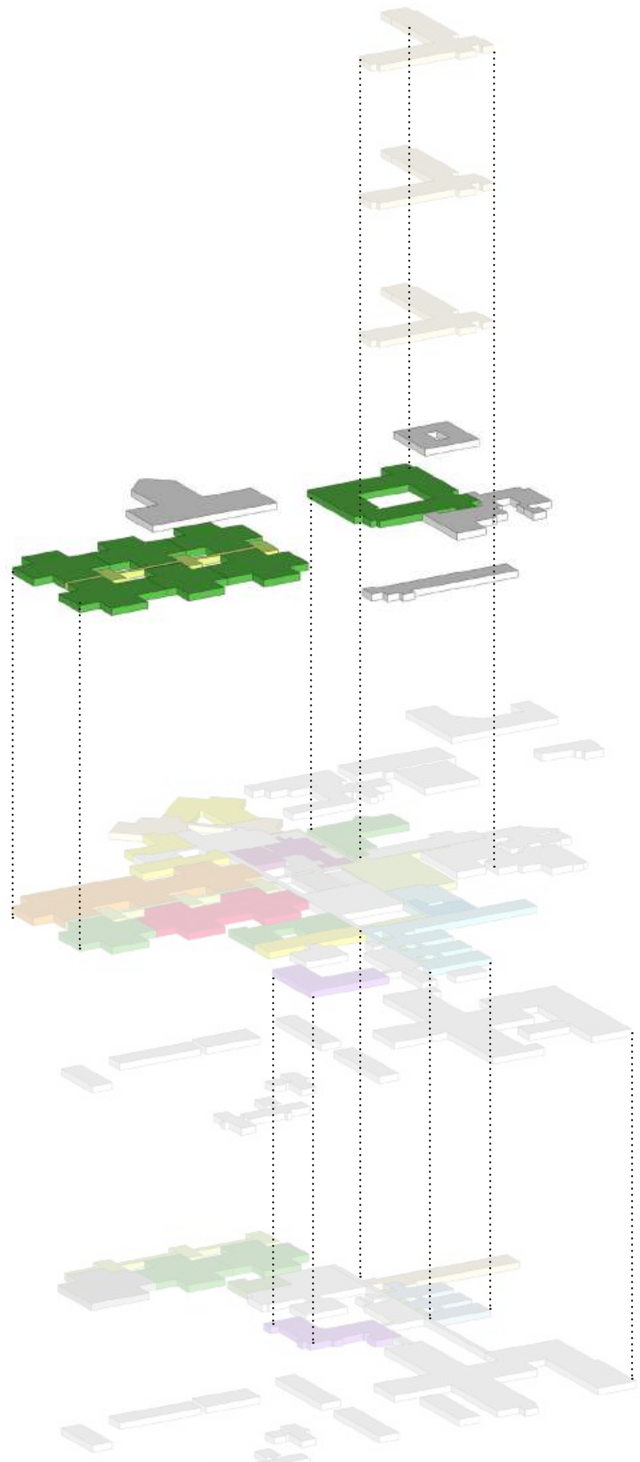
OPTION C2 - 3D MASSING



OPTION C2 LEVEL 2 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished

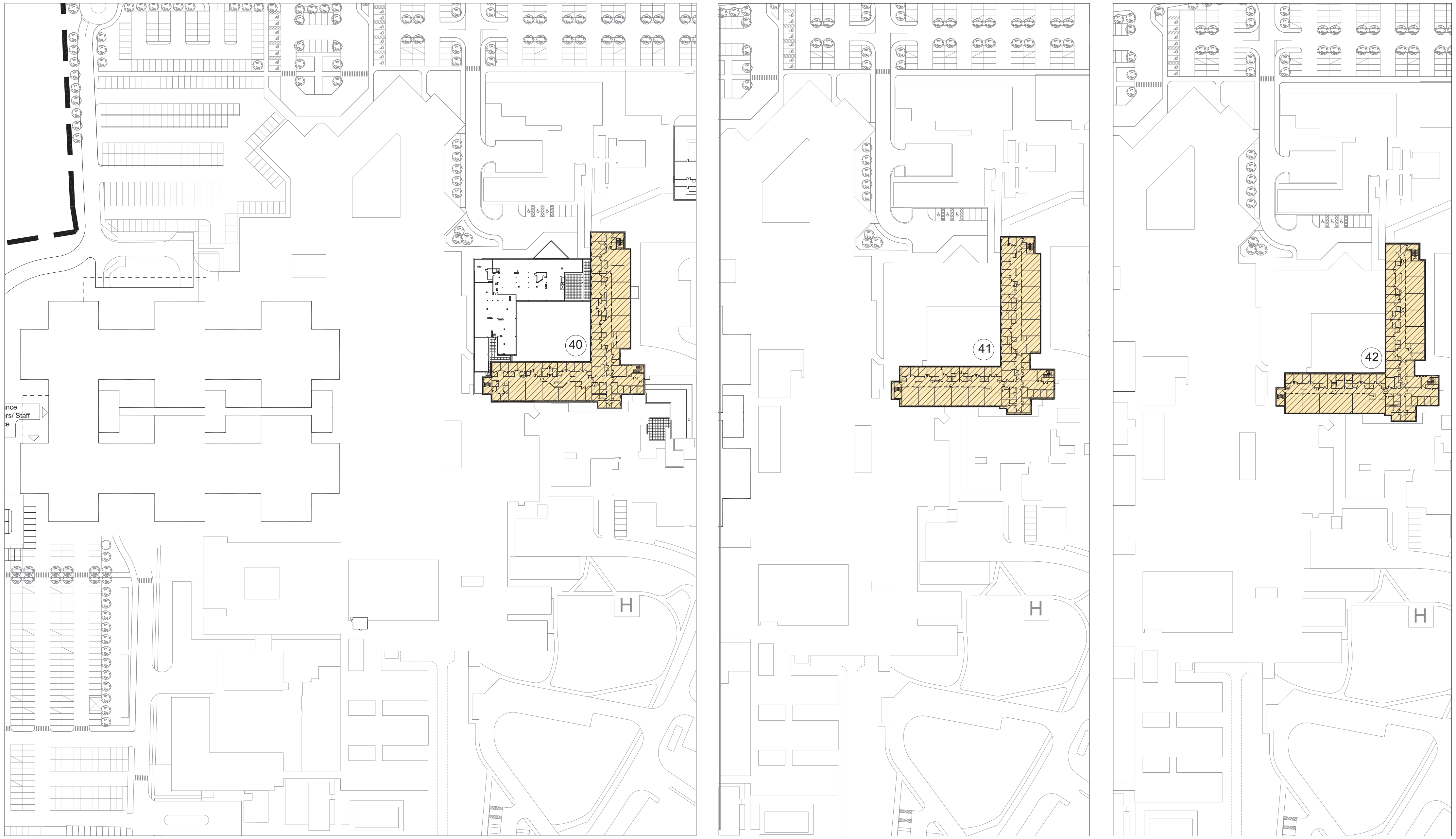


OPTION C2 - 3D MASSING

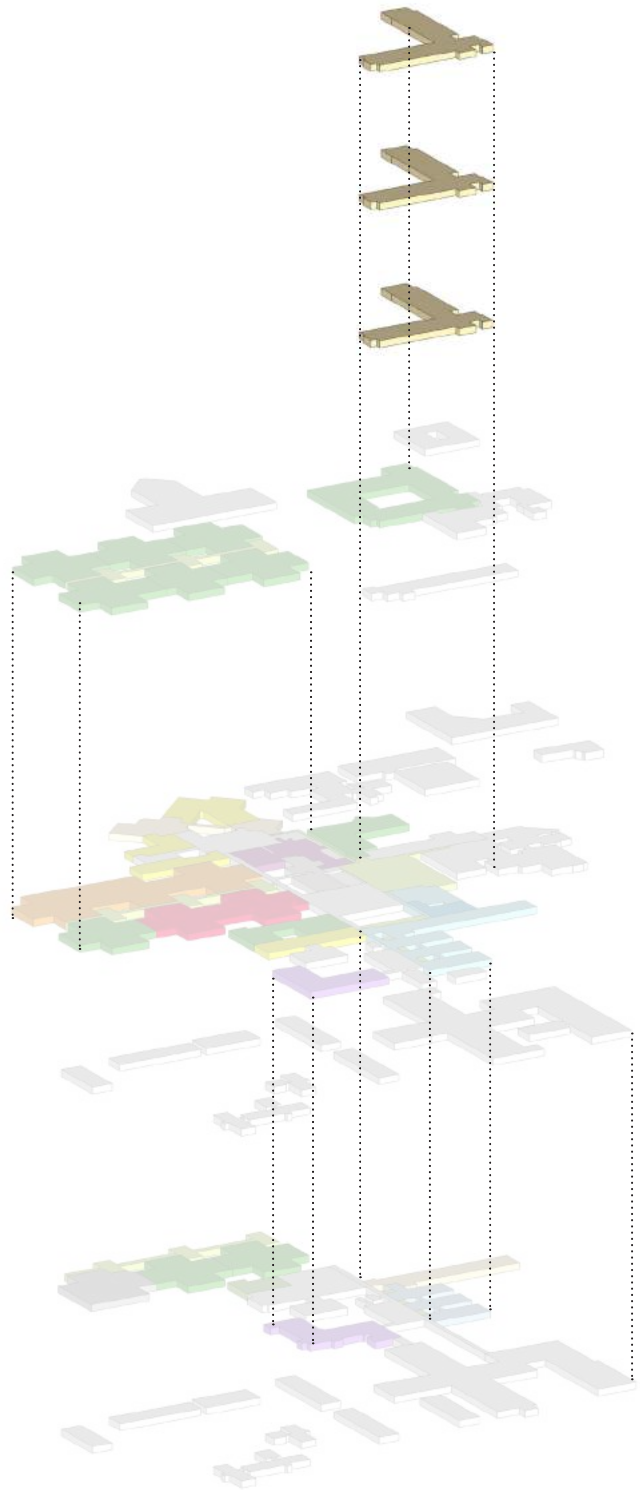
OPTION C2 LEVEL 3-5 PLAN

- WARD
- ED / UCC / AEC
- OUTPATIENTS
- THEATRES
- FRACTURE CLINIC
- CRITICAL CARE
- CIRCULATION
- OFFICE / ADMIN
- PHARMACY EXPANSION
- STORES
- PATHOLOGY LABS
- DEMOLITION

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



LEVEL 3 LEVEL 4 LEVEL 5



OPTION C2 - 3D MASSING

N

- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

C2 - RSH Emergency Site

Area Ref	Description	Floor Level	SSP Baseline					Estates Implications					Backlog					Current Use	Notes
			New Build	Refurb				New Build	Refurb				New Build	Refurb					
				Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		
1	Stores	0						1460											
2	Ward- Short Stay	0	1288																
3	Ward- Short Stay	0	1288																
4	Pharmacy Expansion	0					390											Rehab & Staff Gym	Are Rehab Facilities being provided on both sites?
5	Staff Welfare/ Offices	0													920			Admin Offices	
6	Admin/ Offices	0													1220			Outpatient Clinic	
7	Pathology Lab	0													1220				
8	Circulation	0	645																
9	Emergency Department	1	3770																
	UCC																		
	AEC/ CDU																		
	Discharge Lounge																		
10	Critical Care Unit	1	2290																
11	Ward	1	1288																
12	Inpatient Ward	1				1065												Ward & Fertility	
13	Pathology Lab	1													950			Path Lab	
14a	Outpatients	1													630			Admin/ Offices	
14b	Fracture Clinic	1 (Ground)													430				
14c	Outpatients	1 (Ground)													600				
15	Outpatients	1													1825			Outpatient Clinic	
16	Main Entrance & Retail	1 (Ground)	1817																Double Height Space
17	Ward	1 (Ground)													1288			Ward	Existing Ward Block
18	Admin, Welfare & Catering	1 (Ground)			1250													Admin & atrium	Internal reconfiguration, but of a good quality recent building with good envelope & infrastructure;
19	Paediatric Inpatient Ward	1 (Ground)				560												Breast Clinic	Internal reconfiguration, but of a good quality recent building with good envelope & infrastructure
19a	CAU	1 (Ground)					500											Loading Bay	
20	Circulation	1	655																
20a	Circulation	1						132											
20b	Circulation	1 (Ground)						160											
21	Theatres	1 (Ground)														1193			
21a	MLU	1 (Ground)				1150												Endoscopy	FCHS Funded- Antenatal & EPAS
22	Inpatient Ward	2											1288						
23	Inpatient Ward	2											1288						
24	Inpatient Ward	2											1288						
25	Circulation	2											688						
26	Inpatient Ward	2											1288						
27	Inpatient Ward	2											1288						
28	Inpatient Ward	2											1288						
32	Ward	2													3050			Ward	Existing Ward Block
40	Admin/ Offices	3														1800		Ward	Existing Ward Block
41	Admin/ Offices	4														1800		Ward	Existing Ward Block
42	Admin/ Offices	5														1800		Ward	Existing Ward Block

	Demolitions																		
S5	Generator & Housing							300											
S16	Estates							1200											
S17	Admin							200											
S19	Former Shropdoc							230											Temporary Modular Building
S21	Plant/ Store							20											
S22	Escalation Ward & H&N							1700											
	Catering & Stores							3300											

	Abnormals		
S1	General Landscaping	1350	Assume 60% Hard Landscaping- 40% Soft Landscaping
S2	Service Yard Canopy	330 sq m	Metal Canopy with Sedum Roof
S3	Service Yard	1140	
S4	Road Re-alignment		
S6	MSCP	4 storeys (8 No. half decks @77 spaces) = 539 spaces	2 No. Vertical Circulation Cores; 2 No. 13 Person passenger lifts; Split deck Car Park
S7	Road Re-alignment		
S8	General Landscaping & Car Parking	5000	Assume 80% hard Landscaping 20% Soft Landscaping; 2 No. roadways and 52 No. Car Parking spaces at Grade
S9	Entrance Canopy		8m Wide Feature Glass & Steel Architectural Quality Canopies
S10	Entrance Canopy	19.5 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S11	Entrance Canopy	48 linear metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S12	General Landscaping	900	Internal Courtyard- Assume
S13	Road Re-alignment		
S14	Subteranean Service Duct		MEP Engineers to advise of scope and specification
S15	New bluelight access round and roundabout modifications		In principle use of the open grassed area not negotiated
S18	Feature Landscaping	3250	Landscaped Plaza and shared surface vehicle route
S20	Entrance Canopy	38 Linear Metres	10.5m Wide Feature Glass & Steel Architectural Quality Canopies
S23	Childrens Play area	150	
S23a	Childrens Play area	120	
S24	General Landscaping	1500	Assume 80% hard Landscaping 20% Soft Landscaping; Vehicle drop-off area
S25	Retaining wall	4740m	Retaining wall approx 4m high- partally external, partially within the building envelope
S26	New Helipad		In principle use of the open grassed area not yet negotiated
S27	Breakthrough to existing buildings	3 No.	
S28	General Landscaping	1500	Assume 80% hard Landscaping 20% Soft Landscaping; Vehicle drop off area
	Vertical Circulation Cores	8 No. Vertical Circulation Cores 3 No. Bed Lifts; 5 No. 17P Passenger Lifts; 4 No. Goods Lifts 2 No. escalators	If ward block is demolished then 1 No. new Vertical Circulation Core will be required to serve the Lingen Davis Centre and ward
	Buildings for Services Infrastructure	TO BE ADVISED	

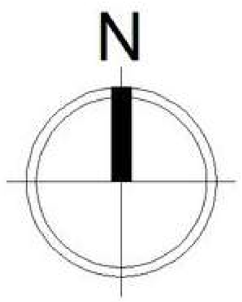
OPTION C2 - RSH_SITE WIDE IMPACTS PLAN

ABNORMALS

DEMOLITIONS

NEW BUILD

S1 - General Landscaping
S2 - Service Yard Canopy
S3 - Service Yard
S4 - Road Re-alignement
S6 - Multi-Storey Car Park
S7 - Road Re-alignement
S8 - General Landscaping & Car Parking
S9 - Entrance Canopy
S10 - Entrance Canopy
S11 - Entrance Canopy
S12 - General Landscaping
S13 - Road Re-alignement
S14 - Subterranean Service Duct
S18 - Feature Landscaping
S20 - Entrance Canopy
S23 - Childrens Sky Garden Play Area
S24 - General Landscaping
S25 - Retaining Wall
S26 - New Helipad
S27 - Breakthrough to existing buildings
S28 - General Landscaping



2. Multi-storey Car Park
Cladded in green walls, timber battens, zinc cladding panels

3. Building Facade Treatments
Repeatable Elevations, concrete, zinc, timber, glazing

1. Feature Landscaping
Courtyards, soft and hard landscaping, tree boulevards, wild flowers, signage

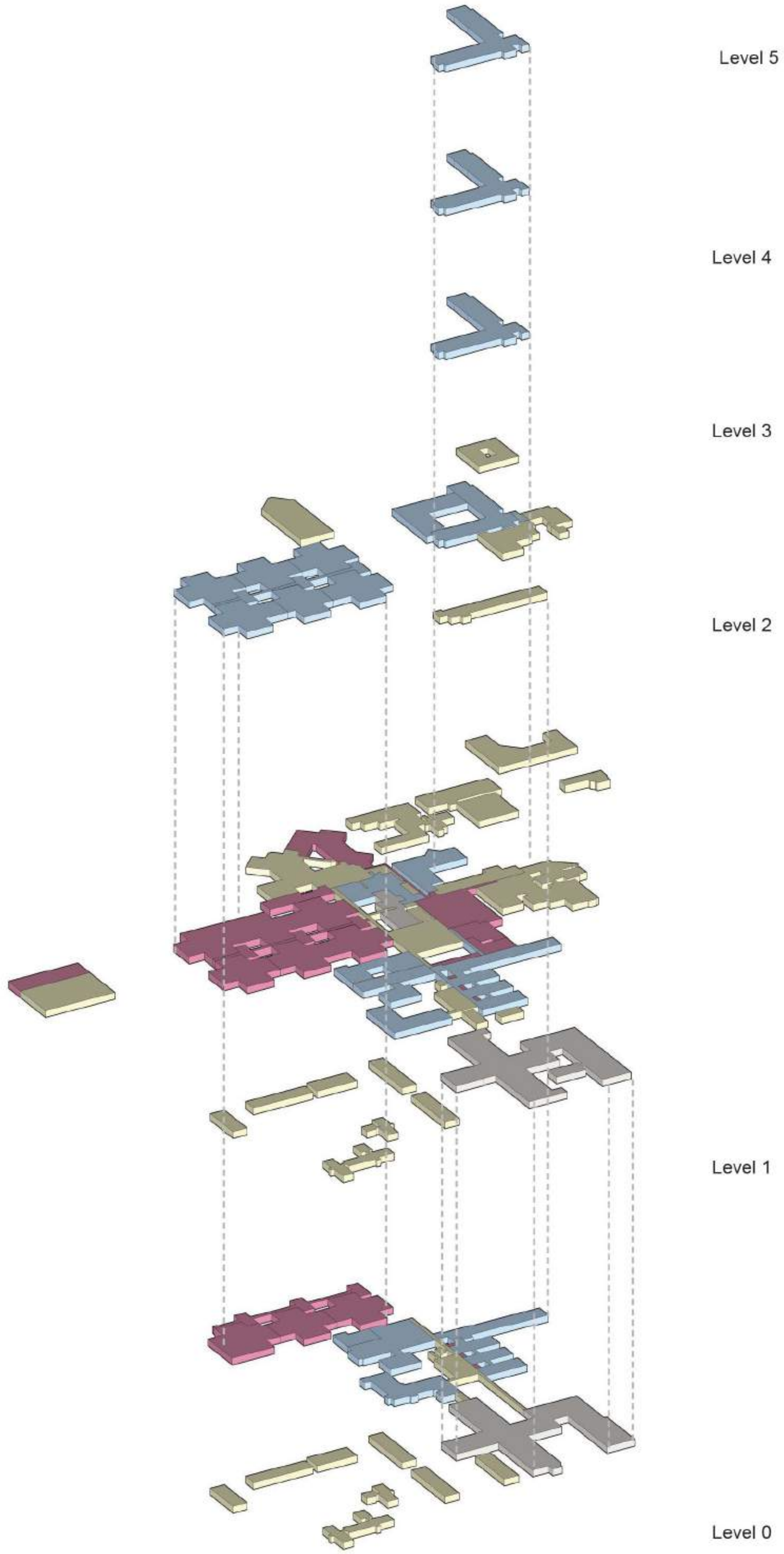
OPTION C2 - RSH_ESTATES BACKLOG IMPACT

- SUSTAINABLE SERVICES PROGRAMME
- BACKLOG
- RESIDUAL BACKLOG
- EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

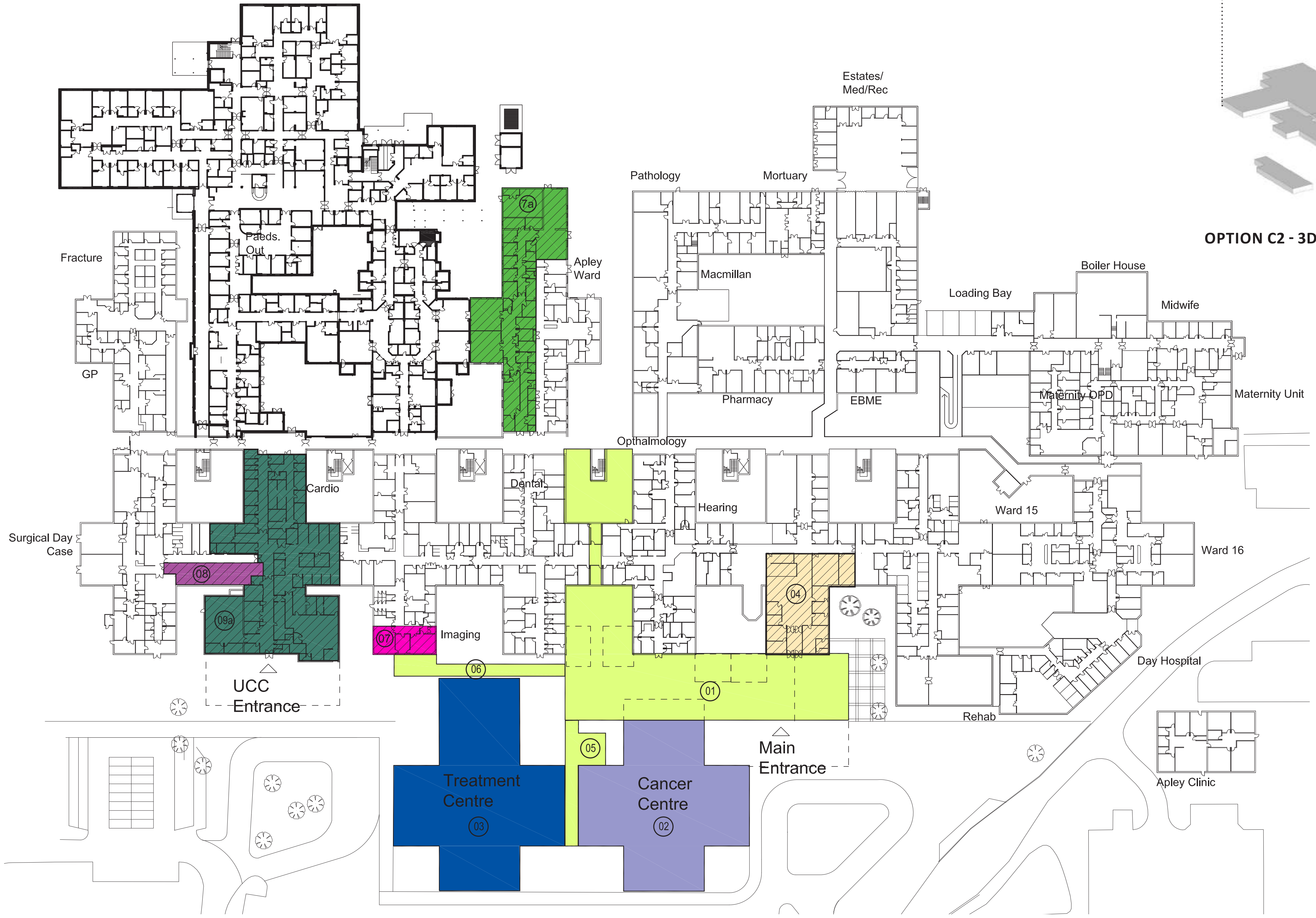
The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.

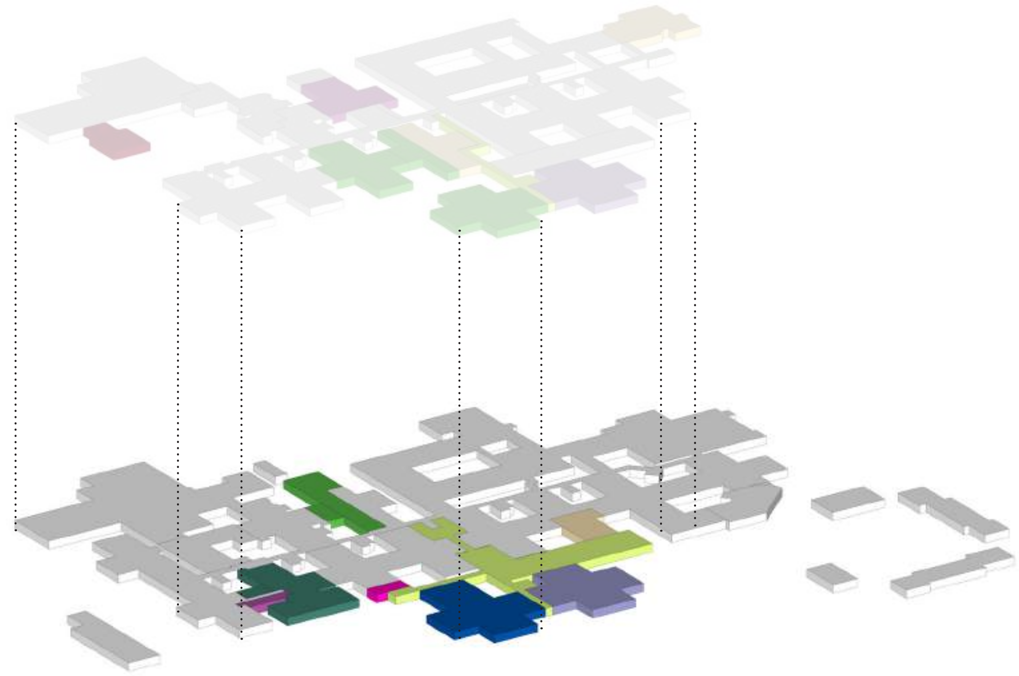


OPTION C2 LEVEL 1 PLAN

- WARD
- THEATRES
- UCC
- CIRCULATION
- OFFICE / ADMIN
- IMAGING
- TREATMENT CENTRE
- TRANSITIONAL CARE
- CHEMOTHERAPY DAY CASE CENTRE

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



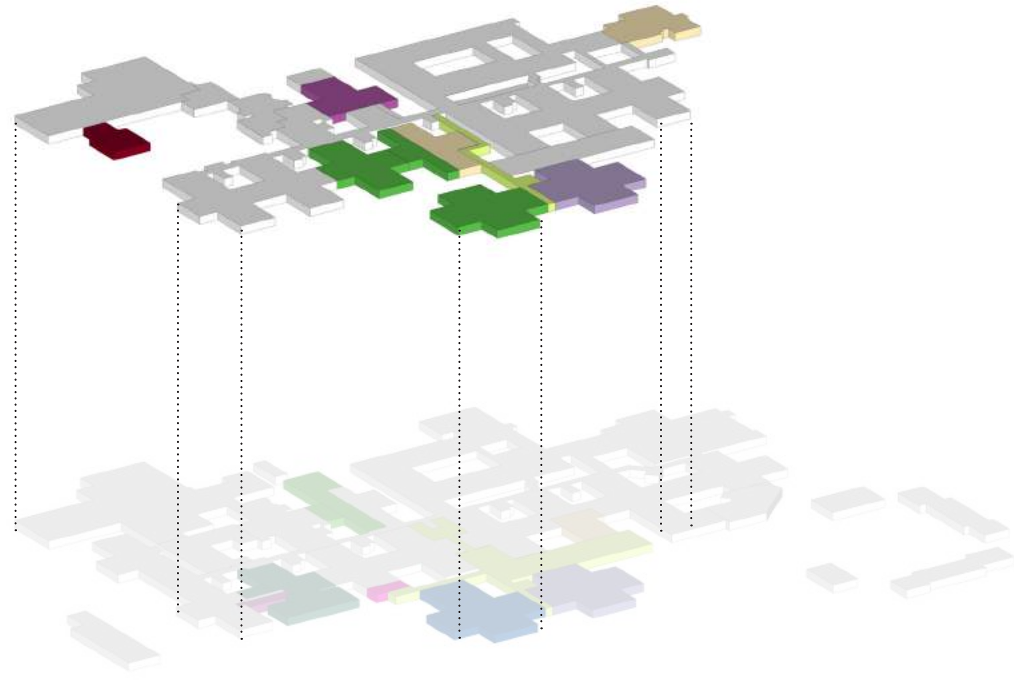


OPTION C2 - 3D MASSING

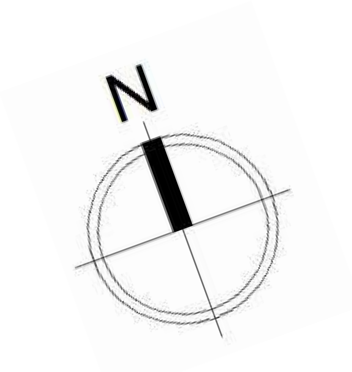
OPTION C2 LEVEL 2 PLAN

- WARD
- THEATRES
- UCC
- CIRCULATION
- OFFICE / ADMIN
- IMAGING
- TREATMENT CENTRE
- TRANSITIONAL CARE
- CHEMOTHERAPY DAY CASE CENTRE

N.B Numbers refer to Accommodation Schedule.
Solid Colour denotes New Build
Hatched Area denotes existing areas to be refurbished



OPTION C2 - 3D MASSING



- OBC Schedules for Costing.
- Numbers that don't run numerically have been omitted following the development of the plans.
- For Temporary Works refer to Phasing Strategy.

Option C2 - PRH Planned Care Site

To be read in conjunction with RSH Emergency Care Site

Area Ref	Description	Floor Level	SSP Baseline					Estates Implications					Backlog					Current Use	Notes
			New Build	Refurb				New Build	Refurb				New Build	Refurb					
				Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		Refresh	Light	Medium	Heavy		
1	Main Entrance & Retail	01 (Ground)	1850															Admin	1850 overall- comprising 1567m2 scheduled + 283m2 additional circulation. Double Height Space
2	Centre of Excellence (eg Cancer Services)	01 (Ground)	1100																
3	Chemotherapy Daycase	01 (Ground)	1500																
4	Admin/ Offices	01 (Ground)								445									
5	Circulation	01 (Ground)	155																
6	Circulation	01 (Ground)	150																
7	Imaging	01 (Ground)									115								Reconfiguration to accommdate breakthrough from new ED
7a	Inpatient Ward	01 (Ground)														765			
8	Day Surgery	01 (Ground)														120			
9a	UCC	01 (Ground)				1200													
12	Inpatient Ward	2	1355																
13	Circulation	2	380																
14	Centre of Excellence (eg Cancer Services)	2	1100																
15	Day Case Ward	2				500												CCU	
16	Day Case Ward	2				500												CCU	
16a	Day Case Ward	2				500													
17	Inpatient Ward	2													500				
18	Theatres	2														750			
19	Admin/ Offices	2														700		Endoscopy	
20	Transitional Care	2	500																

	Demolitions	
	Existing A&E Canopy	

	Abnormals		
T1	MSCP	3 Storeys Flat plate- 516 Cars	Assume 22 sq m/ car 2 No. Vertical Circulation Cores; 2 No. 13 Person passenger lifts
	Vertical Circulation Cores	4 No. Bed Lifts; 4 No. 17P Passenger Lifts; 2 No. Goods Lifts	
T6	Feature Landscaping	3200 m2	Assume 80% Hard Landscaping- 20% Soft Landscaping
T7	Entrance Canopy	1 No. @ 35 linear Metres;	12m Wide Feature Glass & Steel Architectural Quality Canopies
T8	Bridge Link	45 Linear Metres	
T9	ETFE Roof over existing Outpatients		
T10	Entrance Canopy	1 No. @ 35 linear Metres;	12m Wide Feature Glass & Steel Architectural Quality Canopies
T11	General Landscaping	4295 m2	Assume 80% Hard Landscaping- 20% Soft Landscaping
T12	Retaining wall		
T19	New Pedestrian Crossing	1 No.	
T20	Breakthroughs to existing buildings		
T21	Breakthroughs to existing buildings		
T22	Breakthroughs to existing buildings		
T25	Service Yard Canopy	330 sq m	Metal Canopy with Sedum Roof
T26	MSCP	3 Storey Flat Plate- 234 m 2	2 No. Vertical Circulation Cores; 2 No. 13 Person passenger lifts
T27	Transitional Care	Remove existing roof and enchance existing structure. TBC by Capita	
	Buildings for Services Infrastructure	To be Advised	
	Removal of existing Melling Health Temporary Building	1 No.	
	Land Costs- Site acquisition outside Red Line Boundary	1 No.	

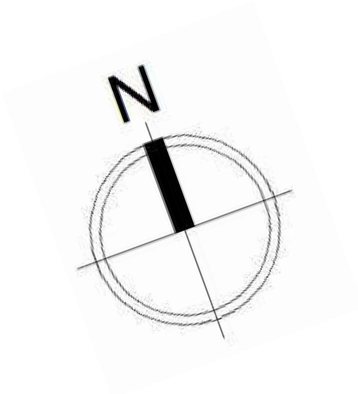
PRH OPTION C2 SITE WIDE IMPACTS

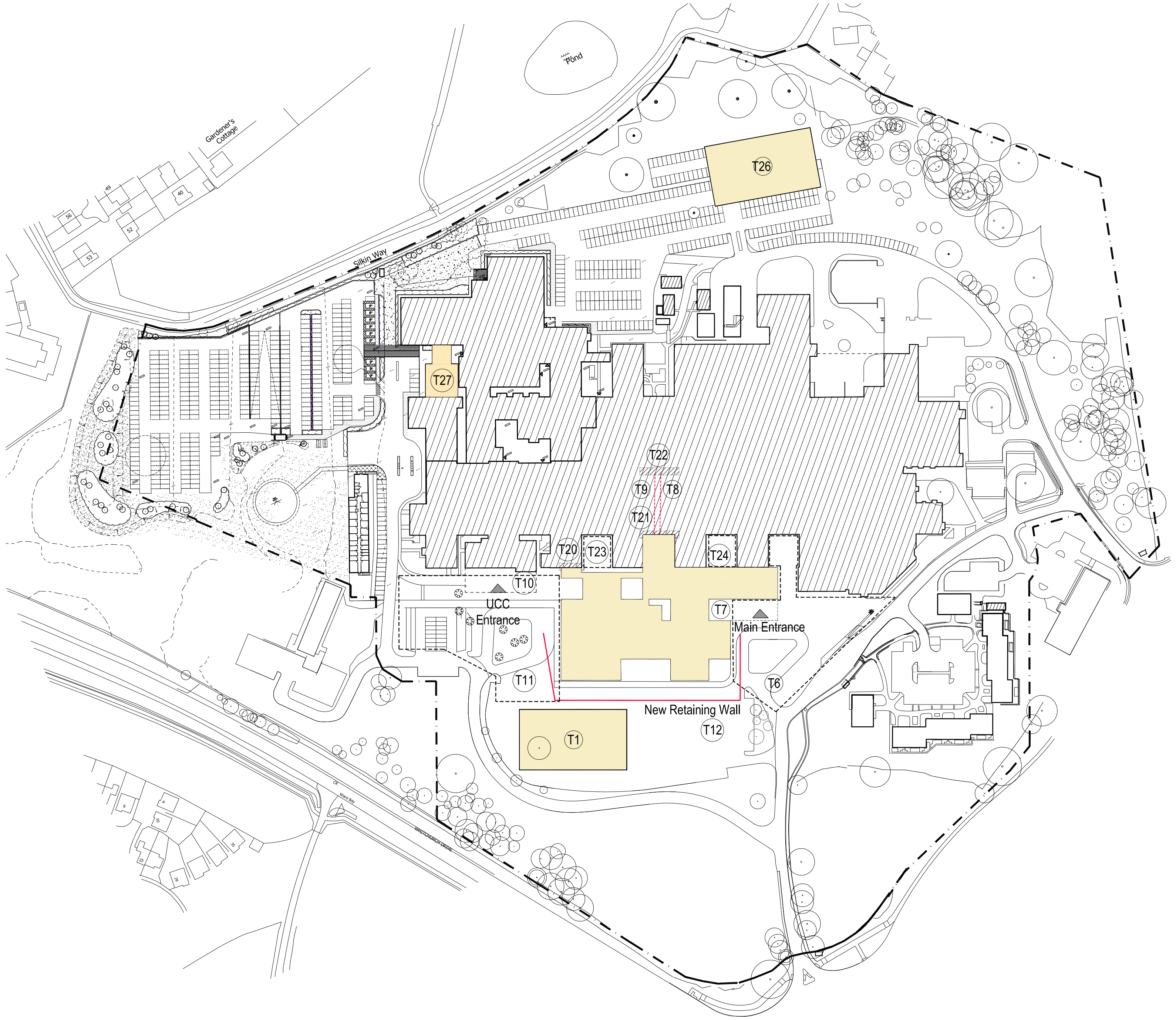
NEW LINK TO EXISTING CORRIDOR

RETAINING WALL

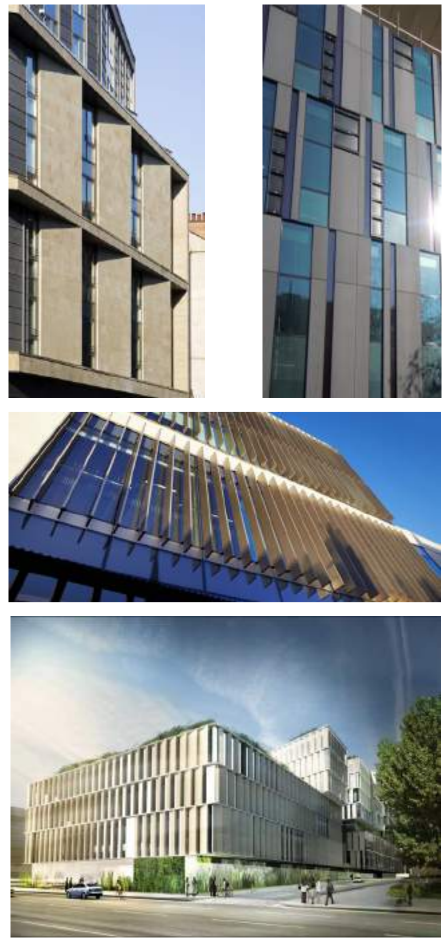
NEW BUILD

T1 - Multi-storey Car Park
T6 - Feature Landscaping
T7 - Entrance Canopy
T8 - Bridge Link
T9 - ETFE Roof over existing Outpatients
T10 - Entrance Canopy
T11 - General Landscaping
T12 - Retaining Wall
T19 - New Pedestrian Crossing
T20 - Breakthrough to existing buildings
T21 - Breakthrough to existing buildings
T22 - Breakthrough to existing buildings
T25 - Service Yard Canopy
T26 - Multi-storey Car Park
T27 - Transitional Care





2. Multi-storey Car Park
Cladded in green walls, timber battens, zinc cladding panels



3. Building Facade Treatments
Repeatable Elevations, concrete, zinc, timber, glazing

1. Feature Landscaping
Courtyards, soft and hard landscaping, tree boulevards, wild flowers, signage

OPTION C2 - PRH_ESTATES BACKLOG IMPACT

SUSTAINABLE SERVICES PROGRAMME

BACKLOG

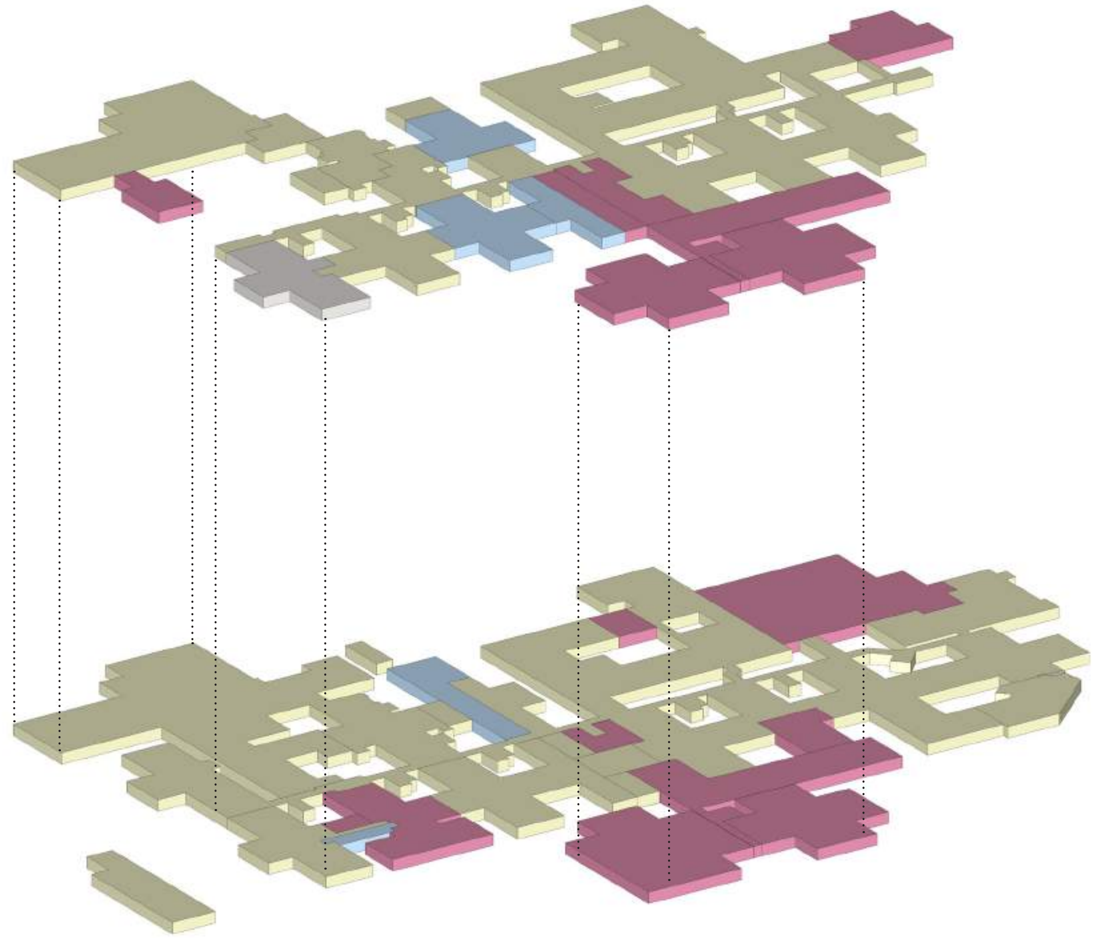
RESIDUAL BACKLOG

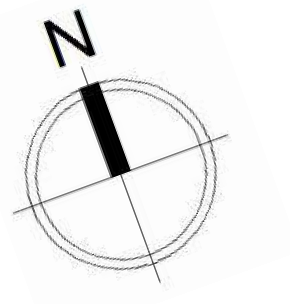
EMPTY

The definition of the Sustainable Services Programme baseline scope of work considers three specific issues:

- Firstly, the Service Drivers and their specific geographic disposition by defining what services are to be delivered via the Acute Care site and the Planned Care site;
- Secondly, the impact of specific 'Estates Drivers' - where pragmatic decisions have been taken about retaining existing good quality facilities that can be managed via specific operational solutions, and;
- Finally, the need to integrate specific backlog concerns and case for change programmes

The diagrams below broadly categorise the elements of the scheme into core SSP works and backlog work, and identify the amount of residual backlog which would remain based on the assessments made within the 6 Facet Surveys.





SATH- Sustainable Services Programme
AHR-SCH-008 Phasing Strategy

OPTION B- PRH Emergency; RSH Planned Care

Phase	Princess Royal Hospital: Construction Activities	Princess Royal Hospital: Temporary Accommodation	Princess Royal Hospital: Departmental Moves – Out	Princess Royal Hospital: Departmental Moves – In	Princess Royal Hospital: Time Scale	Royal Shrewsbury Hospital: Construction Activities	Royal Shrewsbury Hospital: Temporary Accommodation	Royal Shrewsbury Hospital: Departmental Moves – Out	Royal Shrewsbury Hospital: Departmental Moves – In	Royal Shrewsbury Hospital: Time Scale
Phase 0 Enabling Works	Build new Retaining Wall Build new MSCP's Service Diversions Cut and Fill Services/Utilities	Off Site Car Parking Temporary Entrances Required				Refurb Cardio Rehab to Stores & Loading Bay Service Diversions Service Utilites		Cardio- Rehab		
Phase 1	Build new Clinical Support Accommodation, Emergency Portal Build new CCU, Wards and Entrance Refurbish Theatres (Phased) Build Transitional Care	Temporary Entrances Required	% Theatres			Demolish existing Catering & stores Construct new MLU and Ward Accommodation Refurb 67% of Outpatients Refurb Theatres (Phased) Refurb Loading Bay into Day Case Area Refurb Ward 32 & Fertility into Fracture Clinic, Fertility & Pharmacy. Fertility to be finished first.	Catering 67% of Outpatients	Catering Move to Temporary Facility Store and Loading Bay Move to Cardio Rehab % Theatres Fertility moves to other area of Ward 32 67% of Outpatients move to temporary accommodation	Stores move to new accommodation 67% of Outpatients move to temporary accommodation	
Phase 2	New Build Operational Refurb former Critical Care, IP Wards and A&E Educational Refurbishment & New Build Extension to Loading Bay & Existing Loading Bay works Mortuary Refurbishment		Endoscopy Day Surgery % Theatres % Loading Bay % Mortuary	ED/CCU/Wards Entrance & Retail Inpatient Accommodation % Theatres		Refurb Ward Block Refurb 33% of Outpatients Refurb Path Lab Form new Atrium Entrance, Retail, Catering, UCC	Catering 33% Outpatients Temporary Entrance Required	Fertility moves to other area of Ward 32 33% of Outpatients move to temporary accommodation %Path Lab	Day Case in former loading bay area Fertility moves to other area of Ward 32 67% of Outpatients move to refurbished Outpatients 33% of Outpatients move to temporary accommodation Inpatient Wards moves from ward block to new build accommodation % Theatres	

PHASING STRATEGY - OPTION B_3D

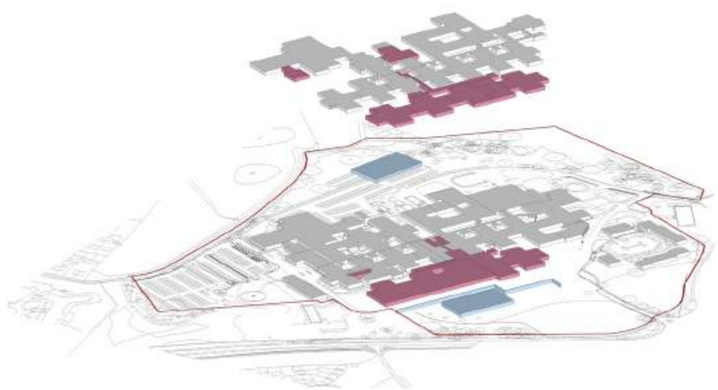
KEY
- Works completed in previous phases
- Building works in Current Phase

PRH - THE EMERGENCY SITE

PHASE 0 - ENABLING WORKS

- Build new Retaining Wall
- Build new MSCP's
- Service Diversions
- Cut and Fill
- Services/Utilities

PHASE 1



- Build new Clinical and Support Accommodation, Emergency Portal
- Build new CCU, Wards and Entrance
- Refurbish Theatres (Phased)
- Build Transitional Care

PHASE 2

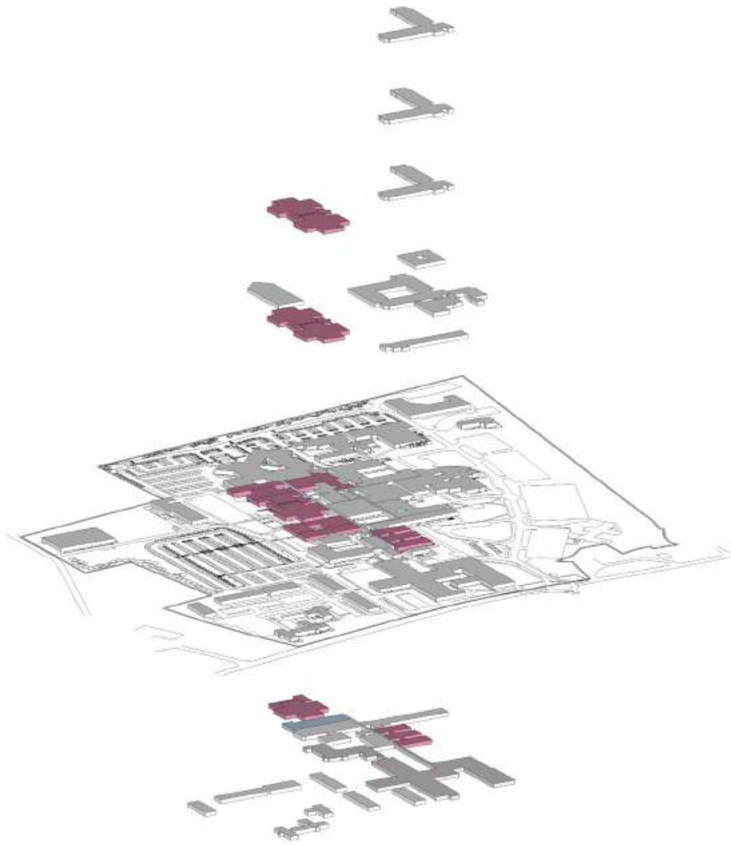
- New Build Operational
- Refurb former Critical Care, Wards and A&E
- Extension to Loading Bay
- Existing Loading Bay Works
- Mortuary Refurbishment
- Educational Refurbishment & New Build

RSH - THE PLANNED CARE SITE

PHASE 0 - ENABLING WORKS

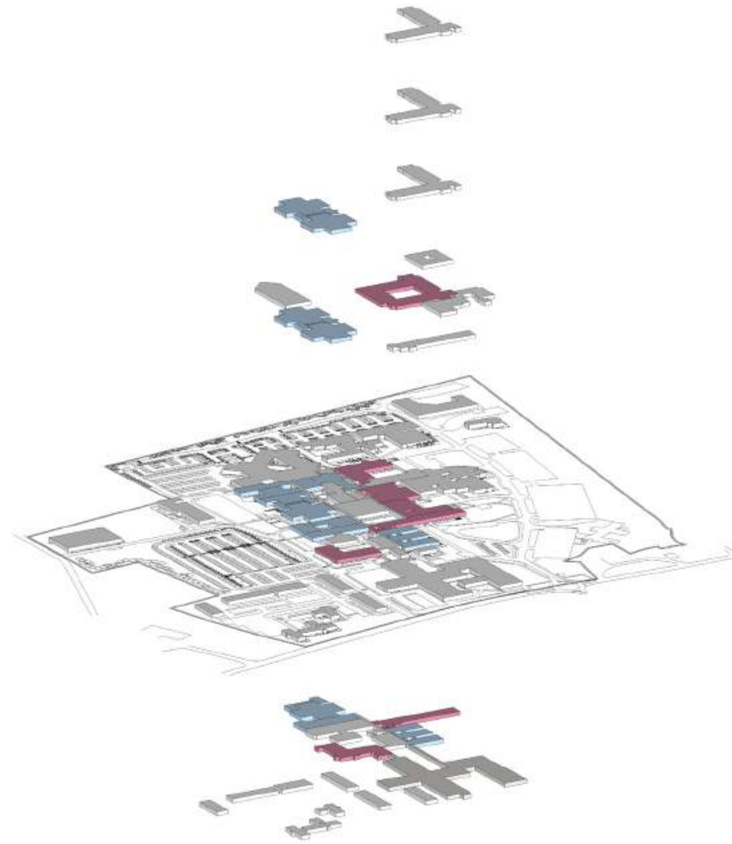
- Refurb Cardio Rehab to Stores & Loading Bay
- Service Diversions
- Services/Utilities

PHASE 1



- Demolish Catering & Stores
- Refurb 67% of Outpatients
- Refurb Theatres
- Refurb Loading Bay into Day Case Area
- Refurb Ward 32 & Fertility into Fracture Clinic, Fertility & Pharmacy
- Build new Wards

PHASE 2



- Refurb Ward Block
- Refurb 33% of Outpatients
- Refurb Path Lab
- Form new Atrium Entrance, Retail, Catering, UCC

SATH- Sustainable Services Programme

AHR-SCH-008 Phasing Strategy

OPTION C1- RSH Emergency; PRH Planned Care

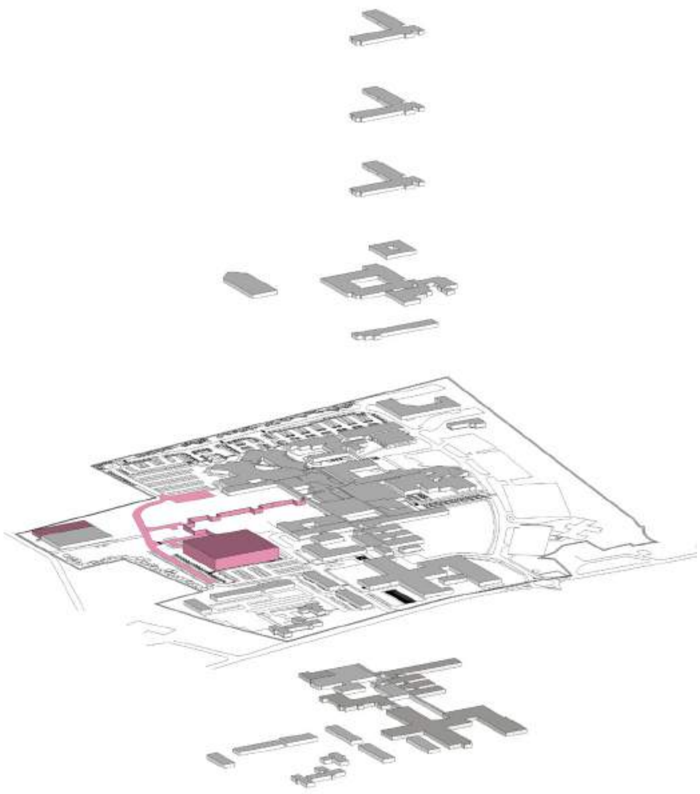
Phase	Princess Royal Hospital: Construction Activities	Princess Royal Hospital: Temporary Accommodation	Princess Royal Hospital: Departmental Moves Out	Princess Royal Hospital: Departmental Moves In	Royal Shrewsbury Hospital: Construction Activities	Royal Shrewsbury Hospital: Temporary Accommodation	Royal Shrewsbury Hospital: Departmental Moves Out	Royal Shrewsbury Hospital: Departmental Moves In
Phase 1	Build new retaining wall Service diversions Cut and Fill Service/Utilities	Temporary Entrance Off-Site Parking			Construct new MSCP Demolish Estates and Re-house Service Diversions Relocate Generator Boiler House Extension Service/Utilities & Duct Cut and Fill/Road Build new Retaining Wall Demolish Catering/Stores	Displaced Parking Estates Catering Stores (in MSCP)	Estates Catering Move to Temporary Facility Stores move to temp. location in MSCP	
Phase 2	Refurbish theatres Construct new Atrium & Entrance Construct new Centre of Excellence - Chemotherapy Day Case Centre		% Theatres	Atrium Entrance & Retail Centre of Excellence - Chemotheray Day Case Centre Theatres	Refurb Cardio Rehab to expansion of pharmacy Refurb 67% of OPD Service Yard and Stores Construct new ED, CCU, MLU, W&C and Wards	Catering 67% of Outpatients	Cardio- Rehab 67% of Outpatients to Temporary Accommodation	Cardio Rehab 67% of Outpatients to Temporary Accommodation Pharmacy expansion into former Cardio-Rehab Area
Phase 3	Refurb Neonatal & Delivery as Endoscopy and Day Surgery Refurb Children's Oncology as Breast Refurb A&E to UCC Refurb CCU Template Refurb Ward Template	UCC	W & C's to RSH CCU to RSH UCC to temporary accommodation Endoscopy to refurbished Neonatal & Delivery Suite	Endoscopy to refurbished Neonatal & Delivery Suite Breast to refurb Children's Oncology Day Surgery Refurbished Inpatients Ward	Refurb Theatres Refurb 33% of Outpatients Refurb Ward 32 & Fertility Refurb Ward Block Refurb Fracture Clinic and A&E Refurb Path Lab Form new atrium entrance, retail and catering.	Catering	% Theatres 33% of Outpatients to Temporary Accommodation Fertility moves to other area of Ward 32 Fracture Clinic into Ward 32 and fertility A&E changes into UCC Function moves into temporary accommodation Endoscopy to PRH Day Surgery to PRH Breast to PRH	% Theatres 33% of Outpatients to Temporary Accommodation 67% of Outpatients into refurbished Outpatients Fertility moves to other area of Ward 32 Offices inot the Ward Block Stores into new Build W&C's
Phase 4	Refurb Endoscopy to Offices		Gynae to RSH		Refurb of Treatment Centre			Fracture Clinic New Entrance Atrium Catering

PHASING STRATEGY - OPTION C1_3D

KEY
- Works completed in previous phases
- Building works in Current Phase

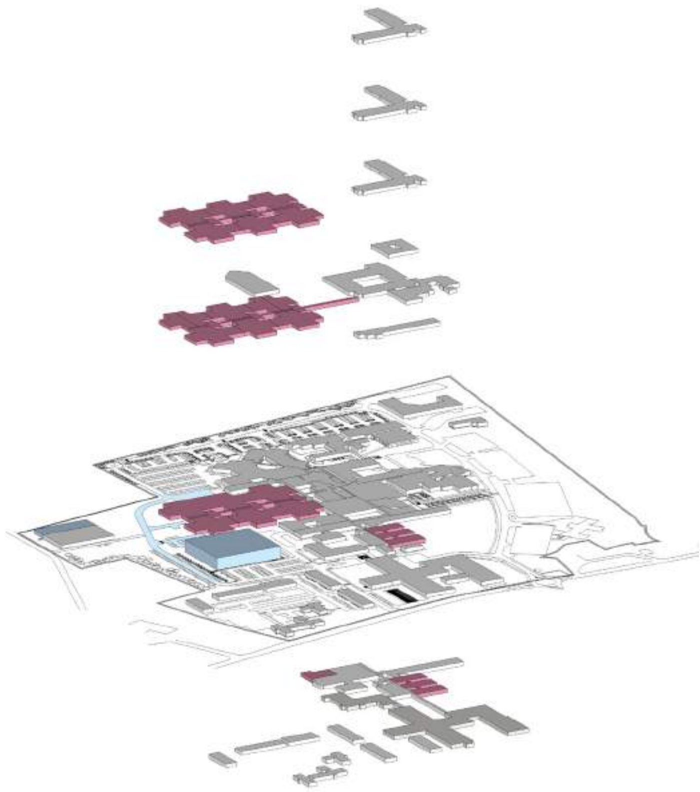
RSH - THE EMERGENCY SITE

PHASE 0 - ENABLING WORKS



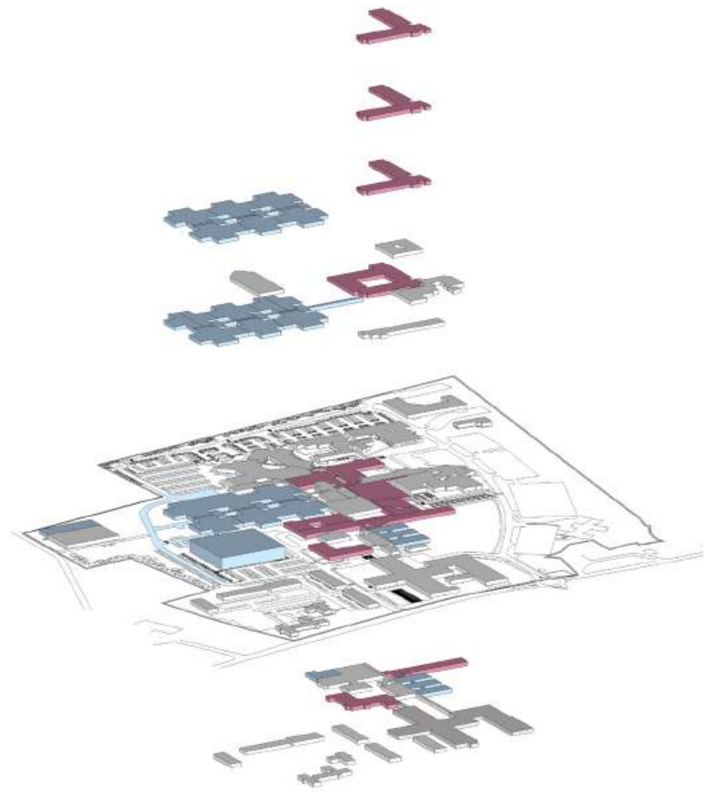
- Construct new MSCP
- Demolish Estates & Re-house
- Service Diversions
- Relocate Generator
- Boiler House Extension
- Service/Utilities & Duct
- Cut and Fill/Road
- Build new retaining wall
- Demolish Catering/Stores

PHASE 1



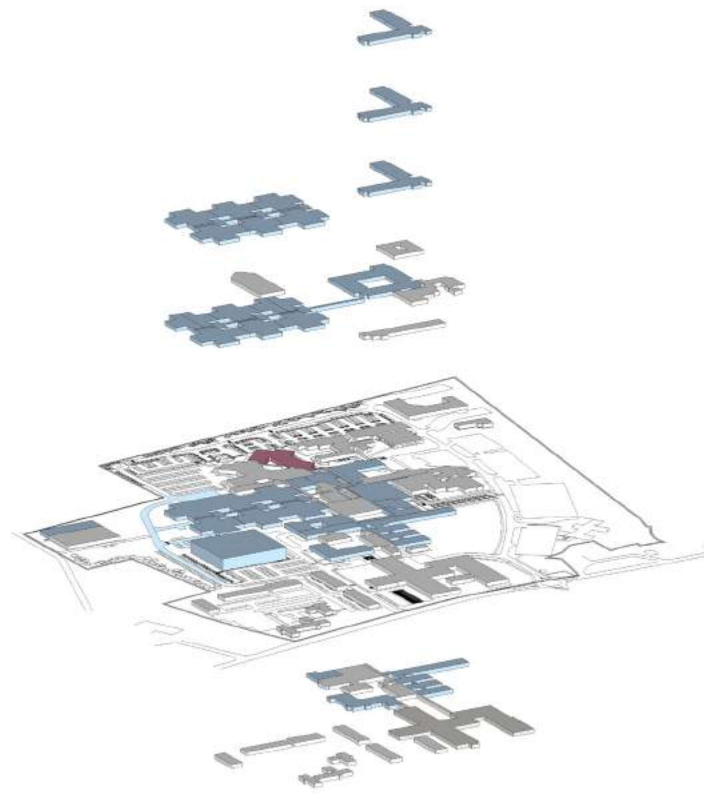
- Refurb Cardio-Rehab to expansion of Pharmacy
- Refurb 67% of OPD (in 2 phases)
- Service yard & Stores
- Construct new ED, CCU, MLU, W&C's and Wards

PHASE 2



- Refurb Theatres
- Refurb 33% of Outpatients
- Refurb Ward 32 & Fertility
- Rerfurb Ward Block
- Form new atrium entrance, retail and catering.
- Refurb Fracture Clinic and A&E
- Refurb Path Lab

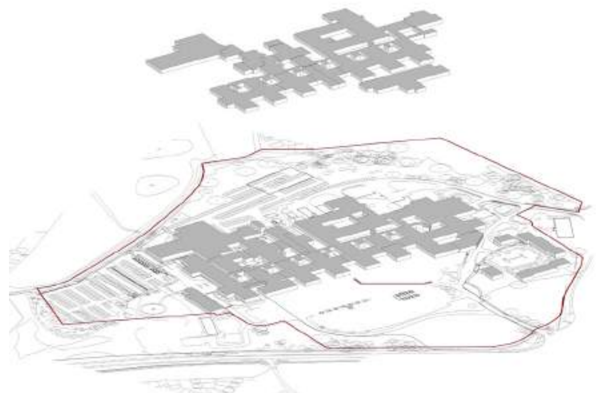
PHASE 3



- Refurb of Treatment Centre

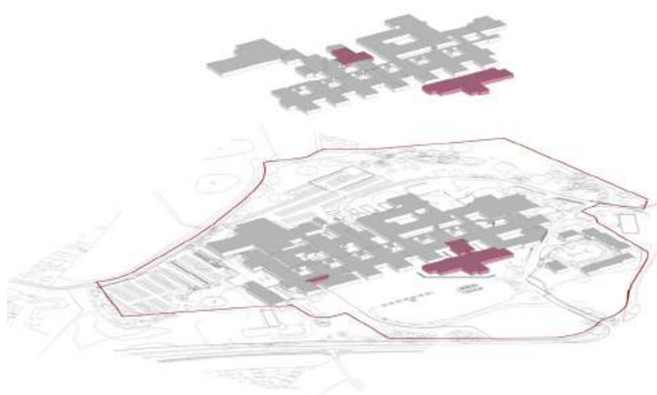
PRH - THE PLANNED CARE SITE

PHASE 0 - ENABLING WORKS



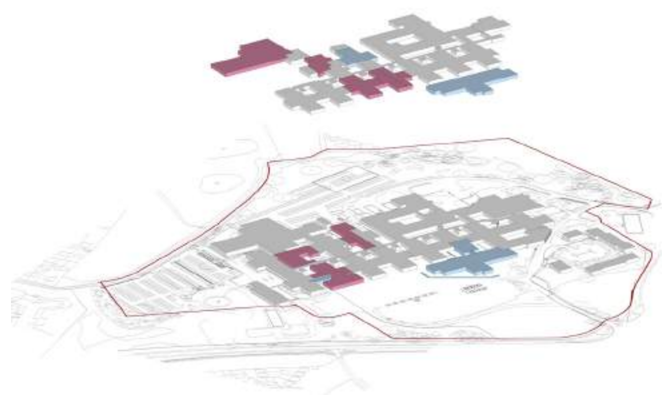
- Build new retaining wall
- Service diversions
- Cut and fill
- Services/Utilities

PHASE 1



- Refurb Theatres
- Construct new Atrium & Entrance
- Construct new Centre of Excellence - Chemotherapy Day Case Centre

PHASE 2



- Refurb Nenonatal & Delivery as Endoscopy & Day Surgery
- Refurb Children's Oncology as Breast
- Refurb A&E to UCC
- Refurb CCU template
- Refurb Ward template

PHASE 3

- Refurb Endoscopy to Offices

SATH- Sustainable Services Programme
AHR-SCH-008 Phasing Strategy

OPTION C2- RSH Emergency; PRH Planned Care

	Princess Royal Hospital				Royal Shrewsbury Hospital			
Phase	Construction Activities	Temporary Accommodation	Departmental Moves Out	Departmental Moves In	Construction Activities	Temporary Accommodation	Departmental Moves Out	Departmental Moves In
Phase 1	Build new retaining wall Service diversions Cut and Fill Service/Utilities Construct new MSCP	Temporary Entrance Off-Site Parking			Construct new MSCP Demolish Estates and Re-house Service Diversions Relocate Generator Boiler House Extension Service/Utilities & Duct Cut and Fill/Road Build new Retaining Wall Demolish Catering/Stores	Displaced Parking Estates Catering Stores (in MSCP)	Estates Catering Move to Temporary Facility Stores move to temp. location in MSCP	
Phase 2	Refurbish theatres Construct new Atrium & Entrance Construct new Centre of Excellence - Chemotherapy Day Case Centre Construct new Treatment Centre Build new Transitional Care	Temporary Entrance	% Theatres	Atrium Entrance & Retail Centre of Excellence - Chemotheray Day Case Centre Theatres	Refurb Cardio Rehab to expansion of pharmacy Refurb 67% of OPD Service Yard and Stores Construct new ED, CCU, MLU and Wards	Catering 67% of Outpatients	Cardio- Rehab 67% of Outpatients to Temporary Accommodation	Cardio Rehab 67% of Outpatients to Temporary Accommodation Pharmacy expansion into former Cardio-Rehab Area
Phase 3	Refurb A&E to UCC Refurb CCU Template Refurb Ward Template Imaging modifications	UCC	CCU to RSH UCC to temporary accommodation Endoscopy to new Treatment Centre	Endoscopy to treatment centre Breast to new treatment centre Day Surgery Refurbished Inpatients Ward	Refurb Theatres Refurb 33% of Outpatients Refurb Ward 32 & Fertility Refurb Ward Block Refurb Fracture Clinic and A&E Refurb Path Lab Form new atrium entrance, retail and catering.	Catering	% Theatres 33% of Outpatients to Temporary Accommodation Fertility moves to other area of Ward 32 Fracture Clinic into Ward 32 and fertility A&E changes into UCC Function moves into temporary accommodation Endoscopy to PRH Day Surgery to PRH Breast to PRH	% Theatres 33% of Outpatients to Temporary Accommodation 67% of Outpatients into refurbished Outpatients Fertility moves to other area of Ward 32 Offices inot the Ward Block Stores into new Build
Phase 4	Refurb Endoscopy to Offices				Refurb of Treatment Centre			Fracture Clinic New Entrance Atrium Catering

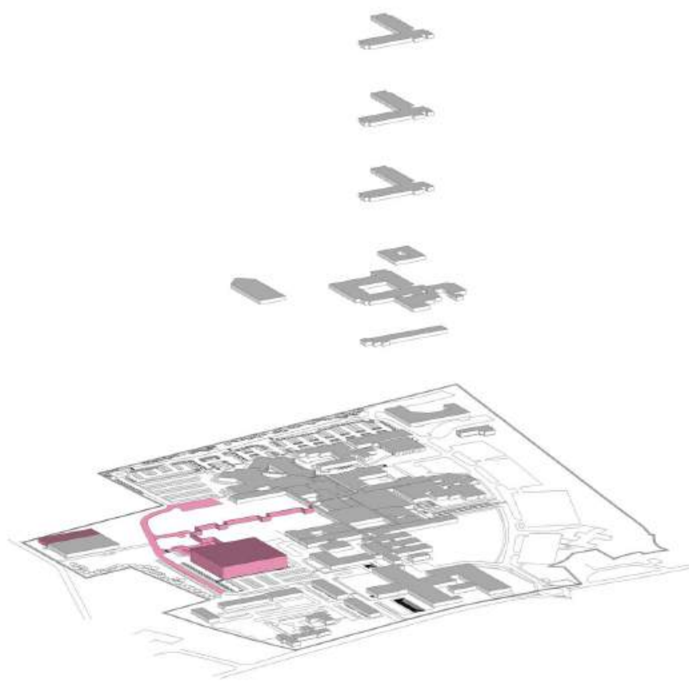
PHASING STRATEGY - OPTION C2_3D

KEY
- Works completed in previous phases
- Building works in Current Phase

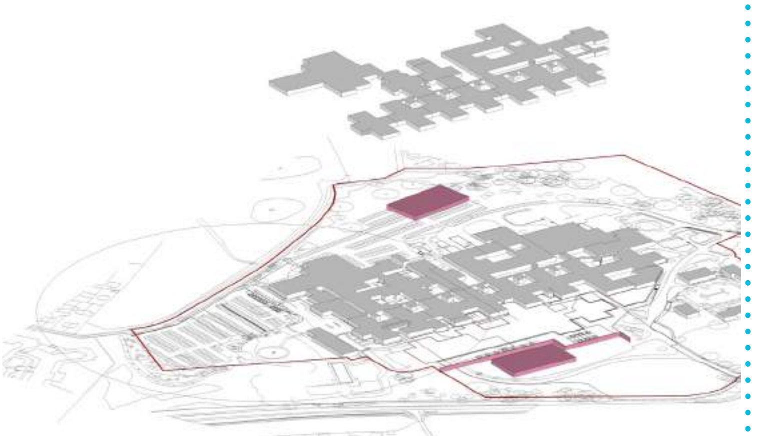
RSH - THE EMERGENCY SITE

PRH - THE PLANNED CARE SITE

PHASE 0 - ENABLING WORKS

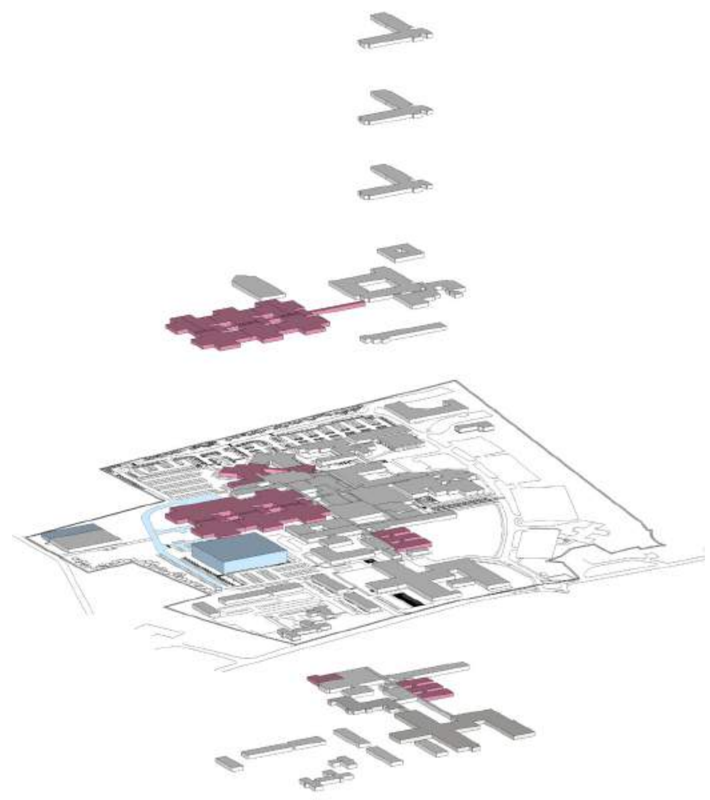


- Construct new MSCP
- Demolish Estates & Re-house
- Service Diversions
- Relocate Generator
- Boiler House Extension
- Service/Utilities & Duct
- Cut and Fill/Road
- Build new retaining wall
- Demolish Catering/Stores



- Build new MSCP's
- Build new retaining wall
- Service diversions
- Cut and fill
- Services/Utilities

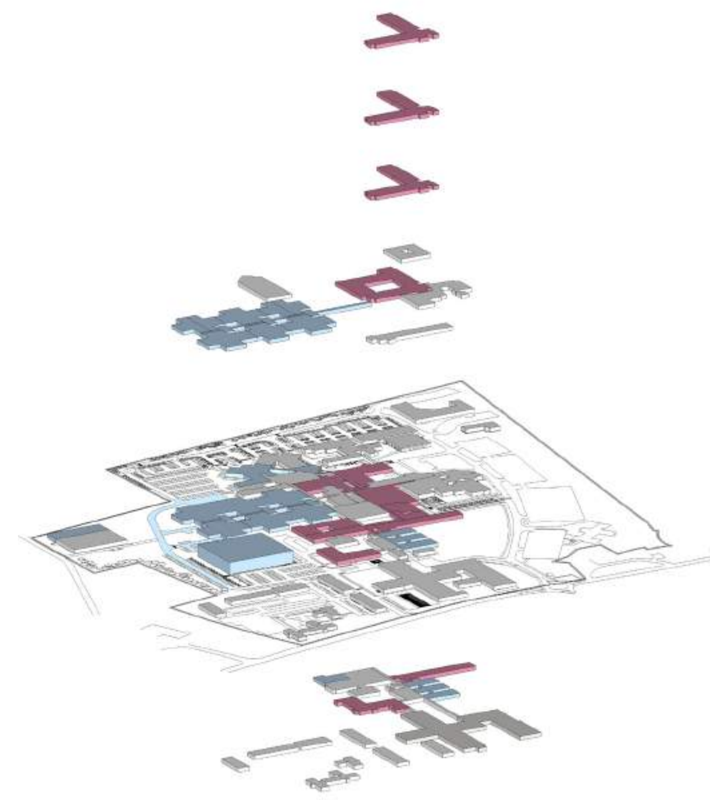
PHASE 1



- Refurb Cardio-Rehab to expansion of Pharmacy
- Refurb 67% of OPD (in 2 phases)
- Service yard & Stores
- Construct new ED, CCU, MLU and Wards
- Refurb part of Treatment Centre

- Refurb Theatres
- Construct new Atrium & Entrance
- Construct new Centre of Excellence - Chemotherapy Day Case Centre
- Construct new Treatment Centre
- Build new Transitional Care

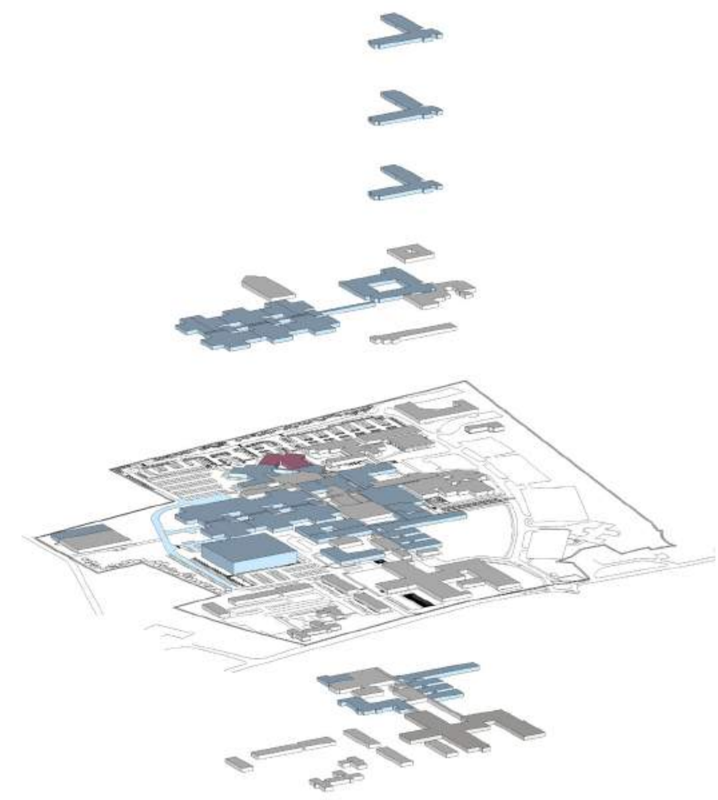
PHASE 2



- Refurb Theatres
- Refurb 33% of Outpatients
- Refurb Ward 32 & Fertility
- Rerfurb Ward Block
- Form new atrium entrance, retail and catering.
- Refurb Fracture Clinic and A&E
- Refurb Path Lab

- New Build Operational
- Refurb former Critical Care, Wards and A&E
- Imaging modifications

PHASE 3



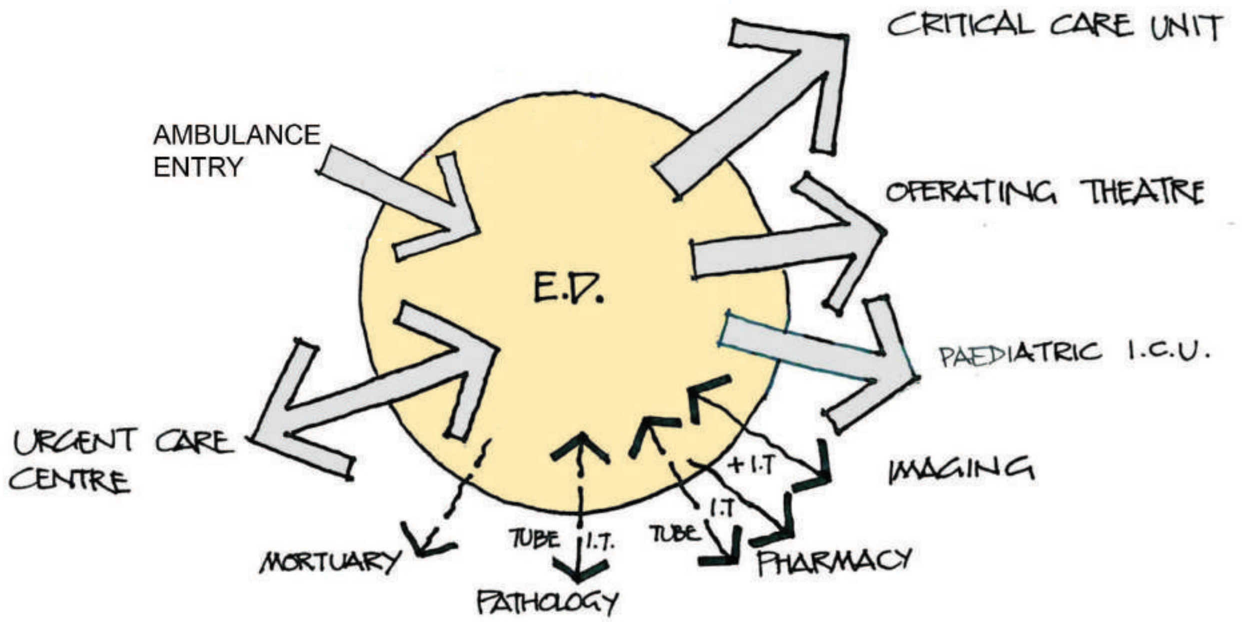
- Refurb of Treatment Centre

- Refurb Endoscopy to Offices

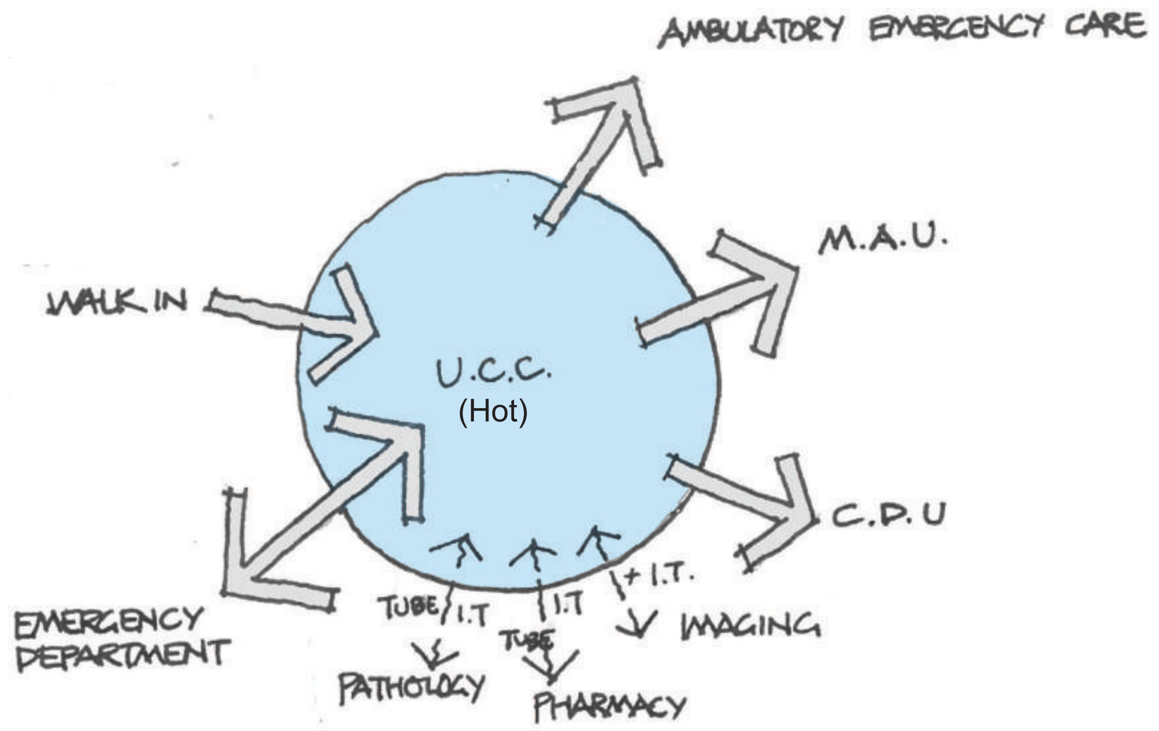
3.0 DEPARTMENTAL DESIGN

An integral part of the briefing process is to establish the functional relationships between the individual departments and other departments and functions within the hospital site and beyond. These relationships are not purely physical but can include Pneumatic Tubes, IT and other communications.
These studies which have been developed and reviewed with the Task & Finish Groups, inform process diagrams which capture flows and adjacencies and are the seeds of the 1 to 200 level departmental planning.

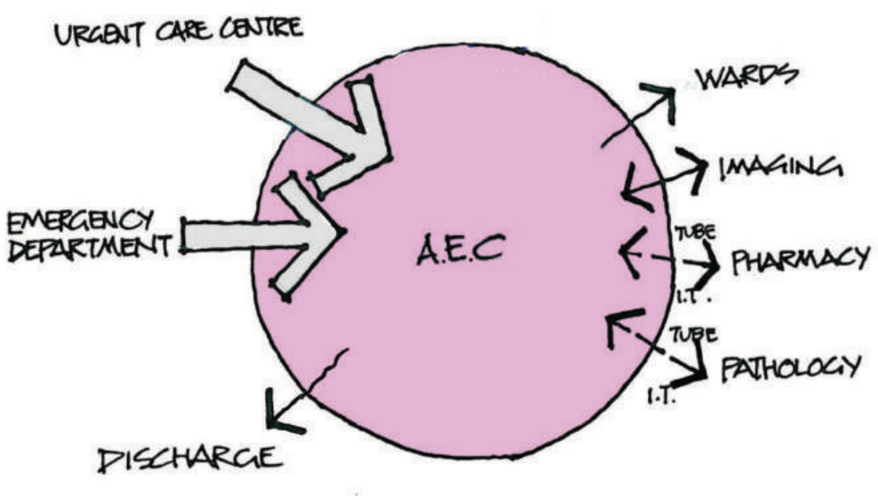
Emergency Department



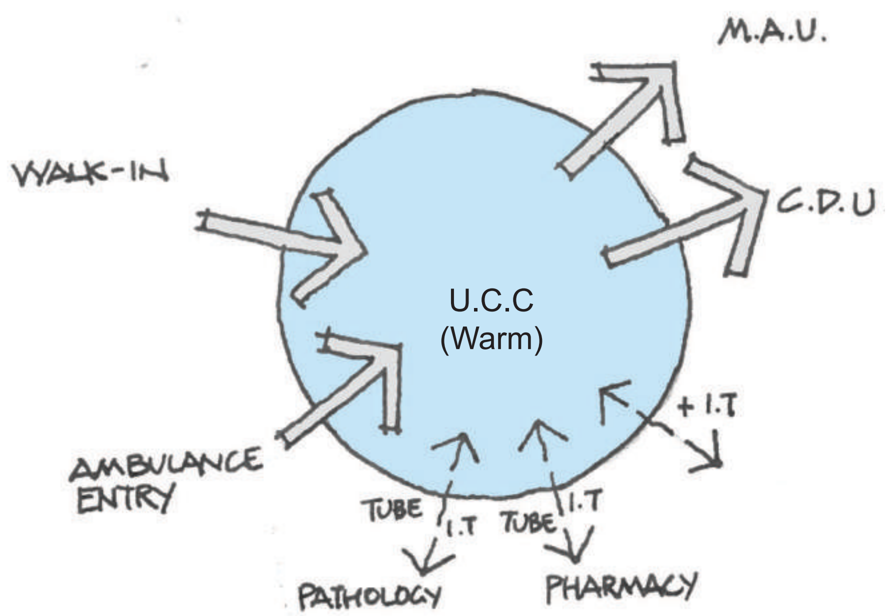
Urgent Care Centre - Emergency Site



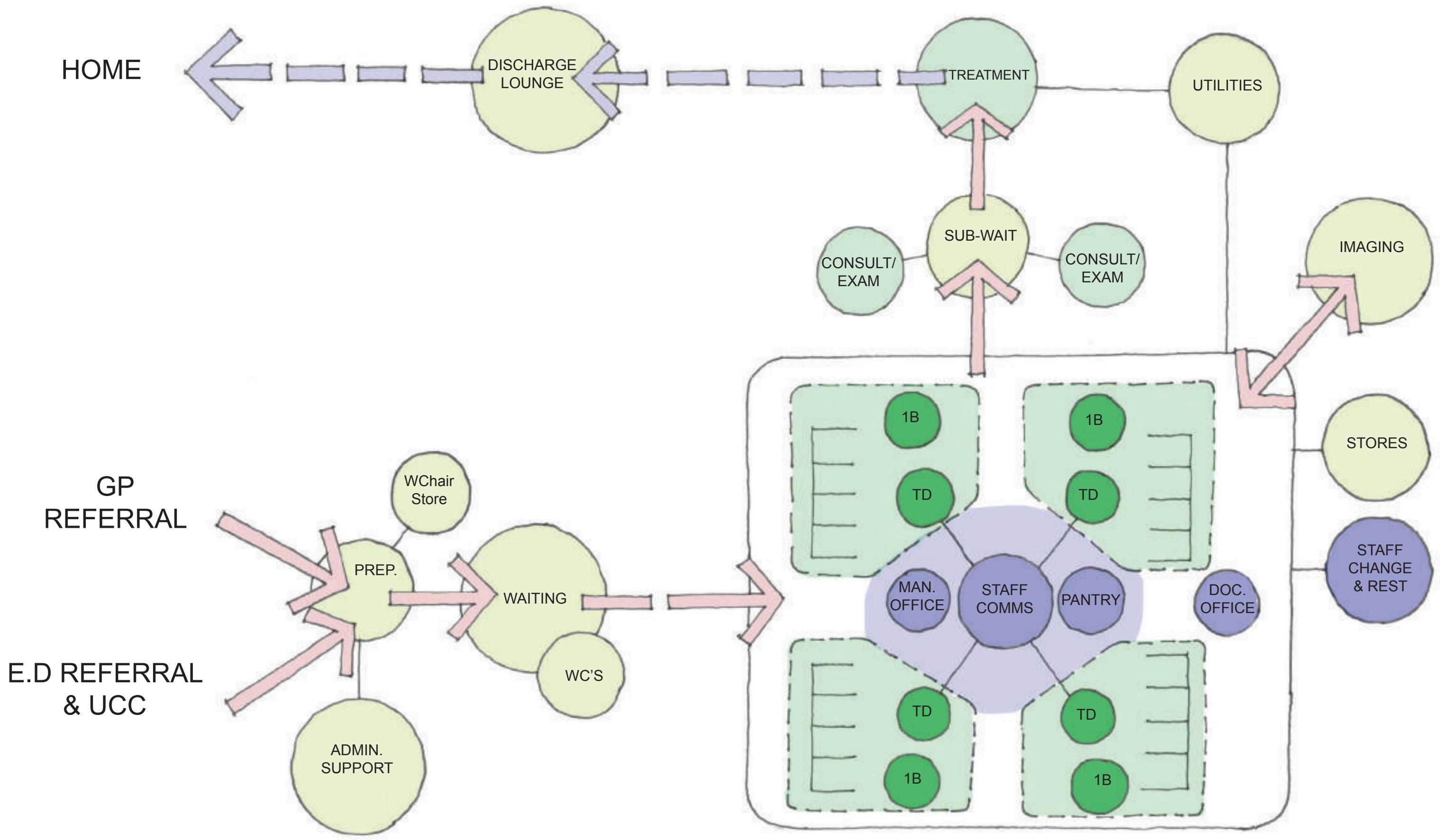
Ambulatory Urgent Care



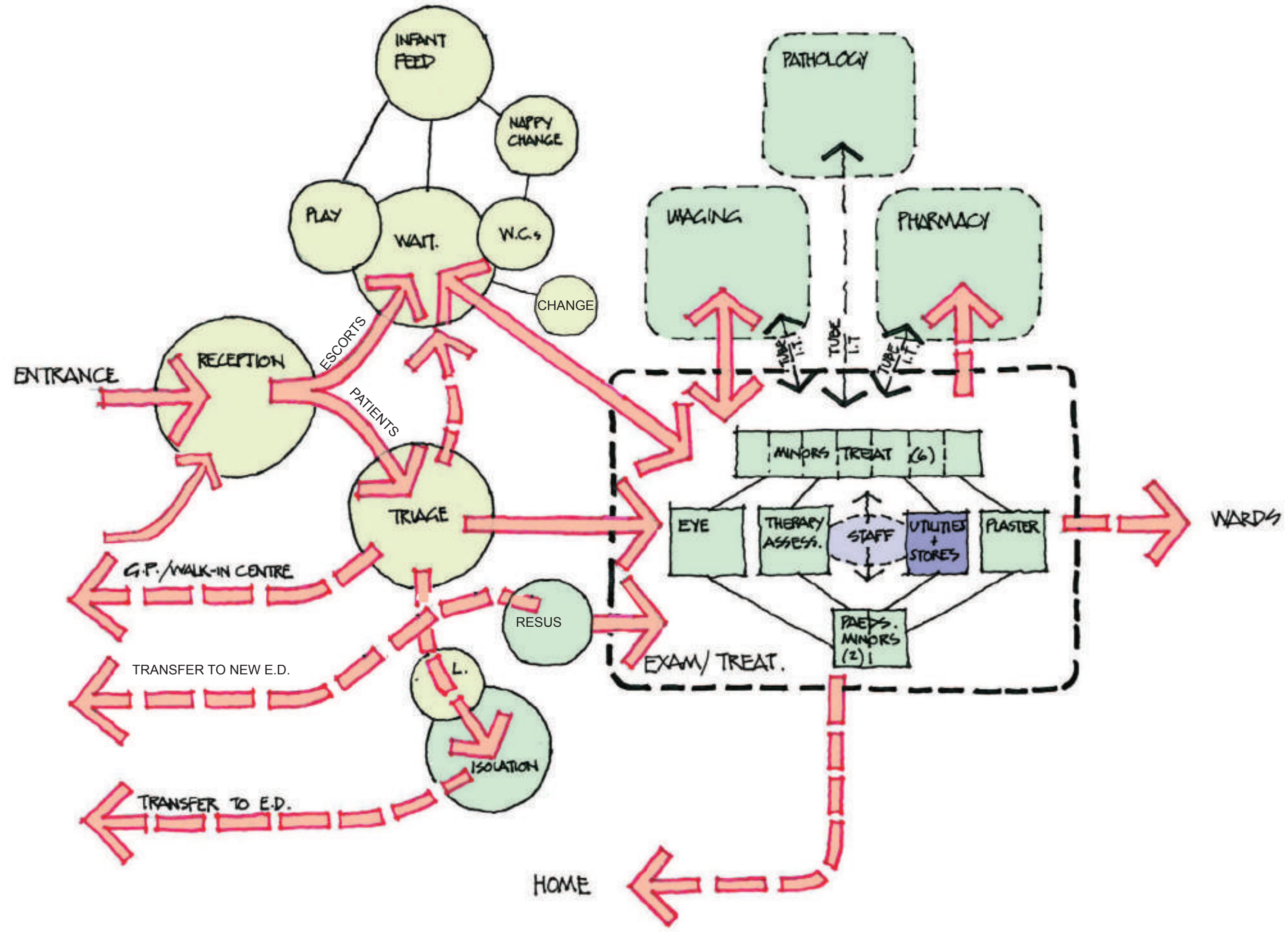
Urgent Care Centre - Planned Care Site



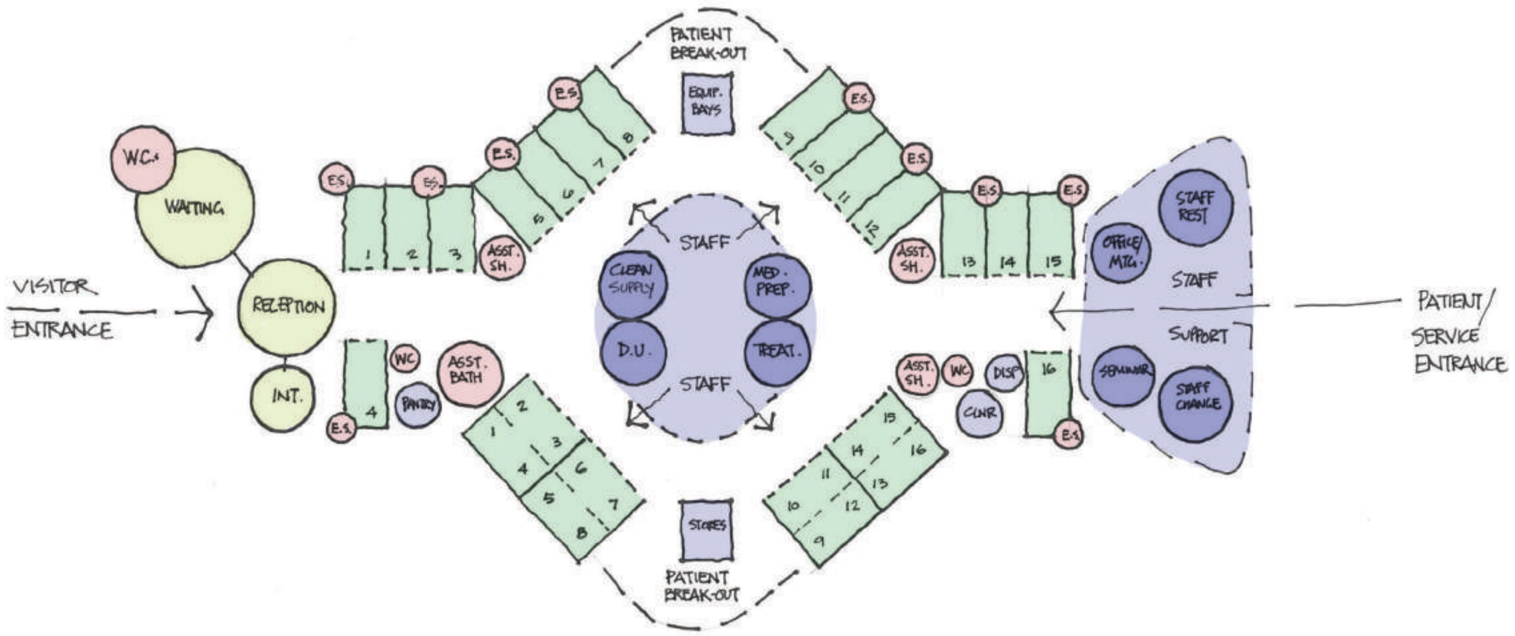
AEC Activity Diagram



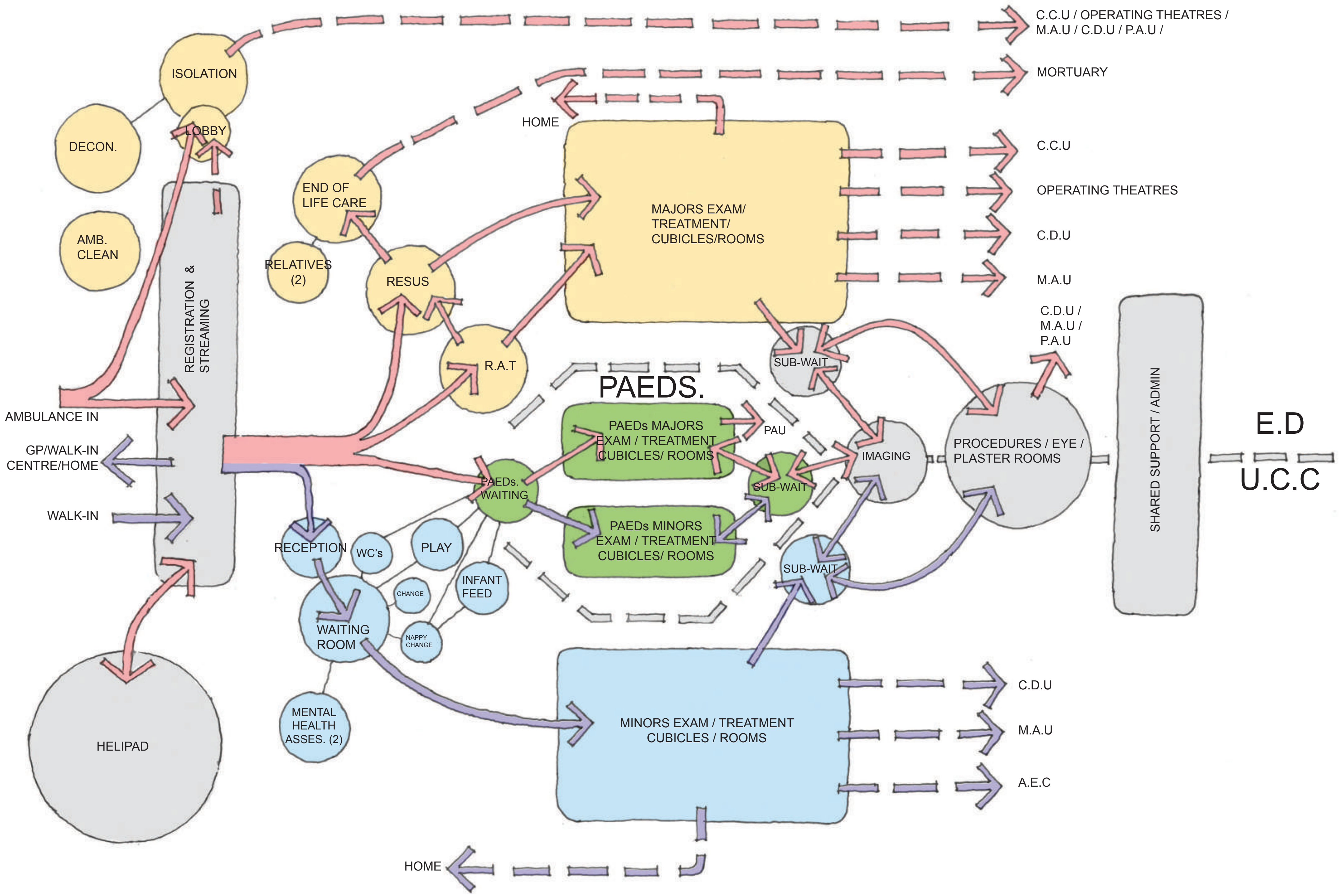
UCC Planned Care Site

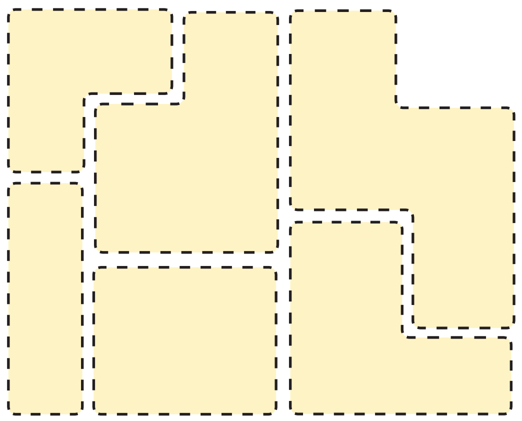


Acute Medical Ward Activity Diagram

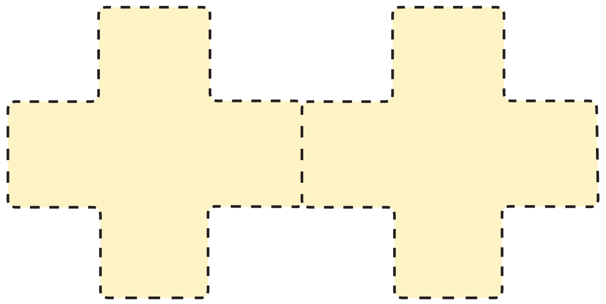


EMERGENCY DEPARTMENT & UCC Diagram





Organic
Building is designed around departmental layout



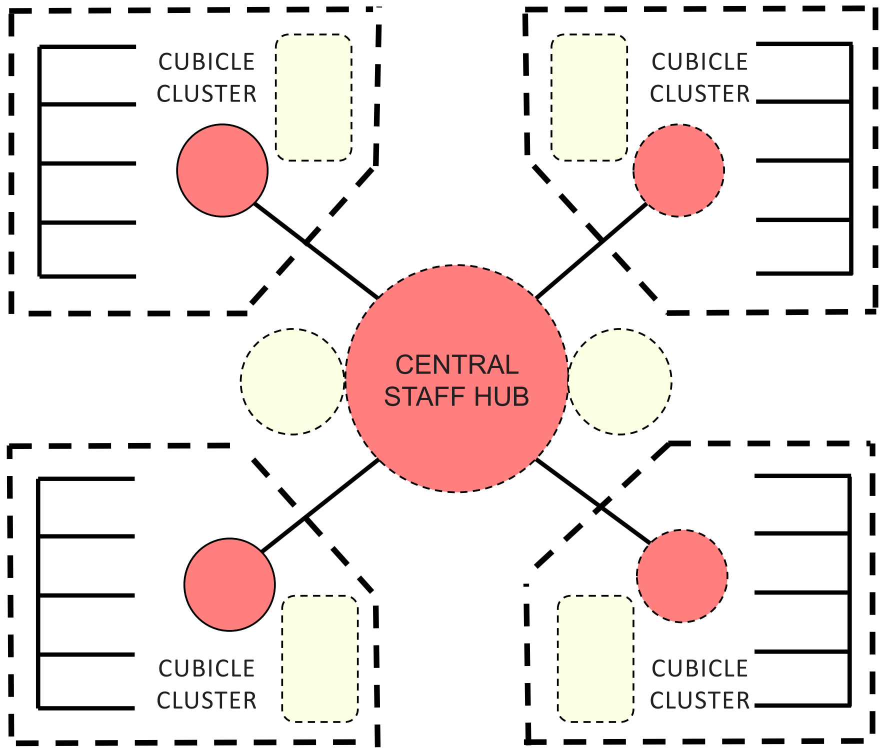
Structured
Departments are arranged within a fixed building envelope

1. Waiting Area

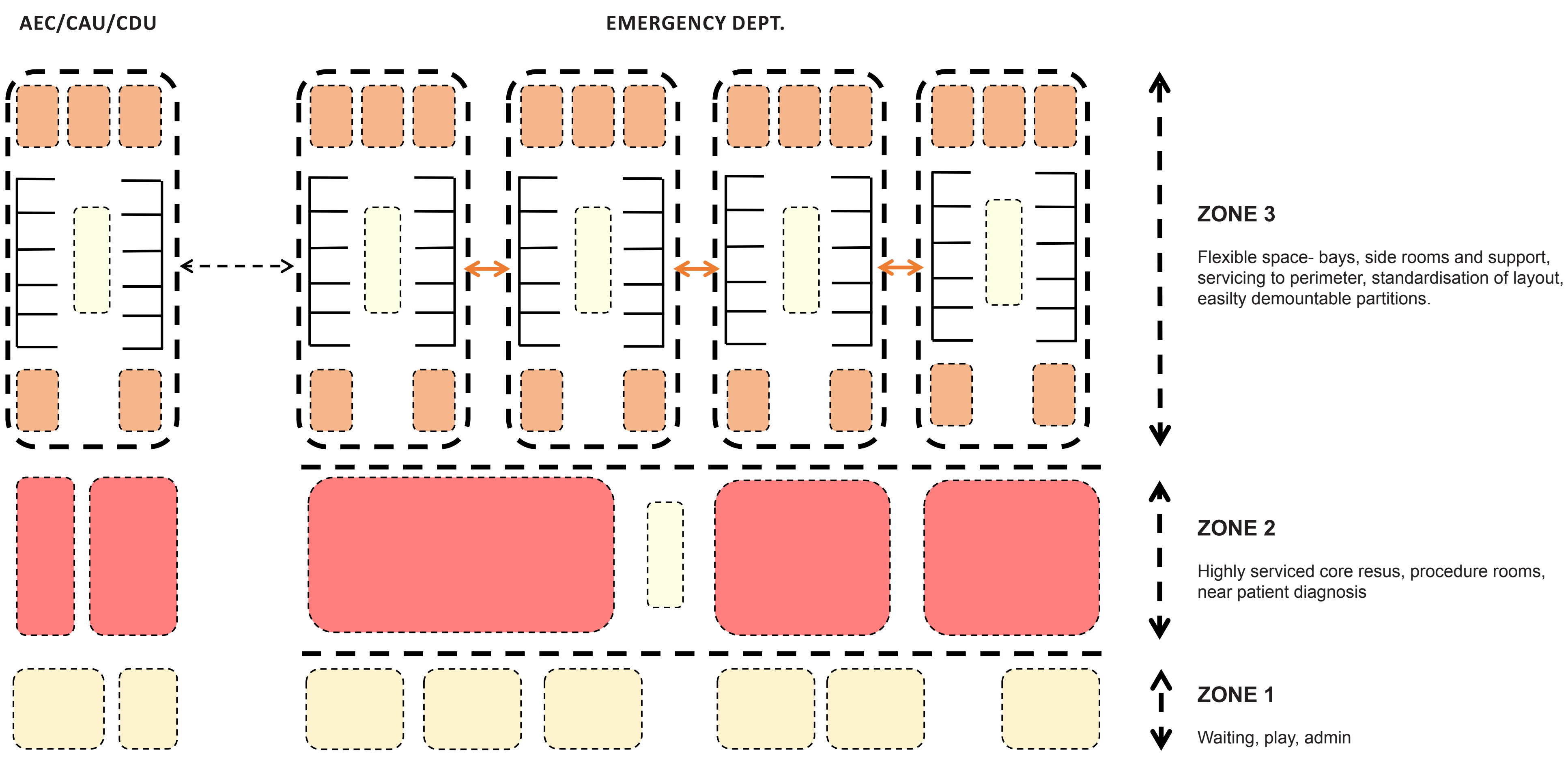
2. ED Cubicle

3. Central Nurse Station
Optimum observation to all beds

EMERGENCY DEPARTMENT Bespoke Solution



EMERGENCY DEPARTMENT Flexible Solution



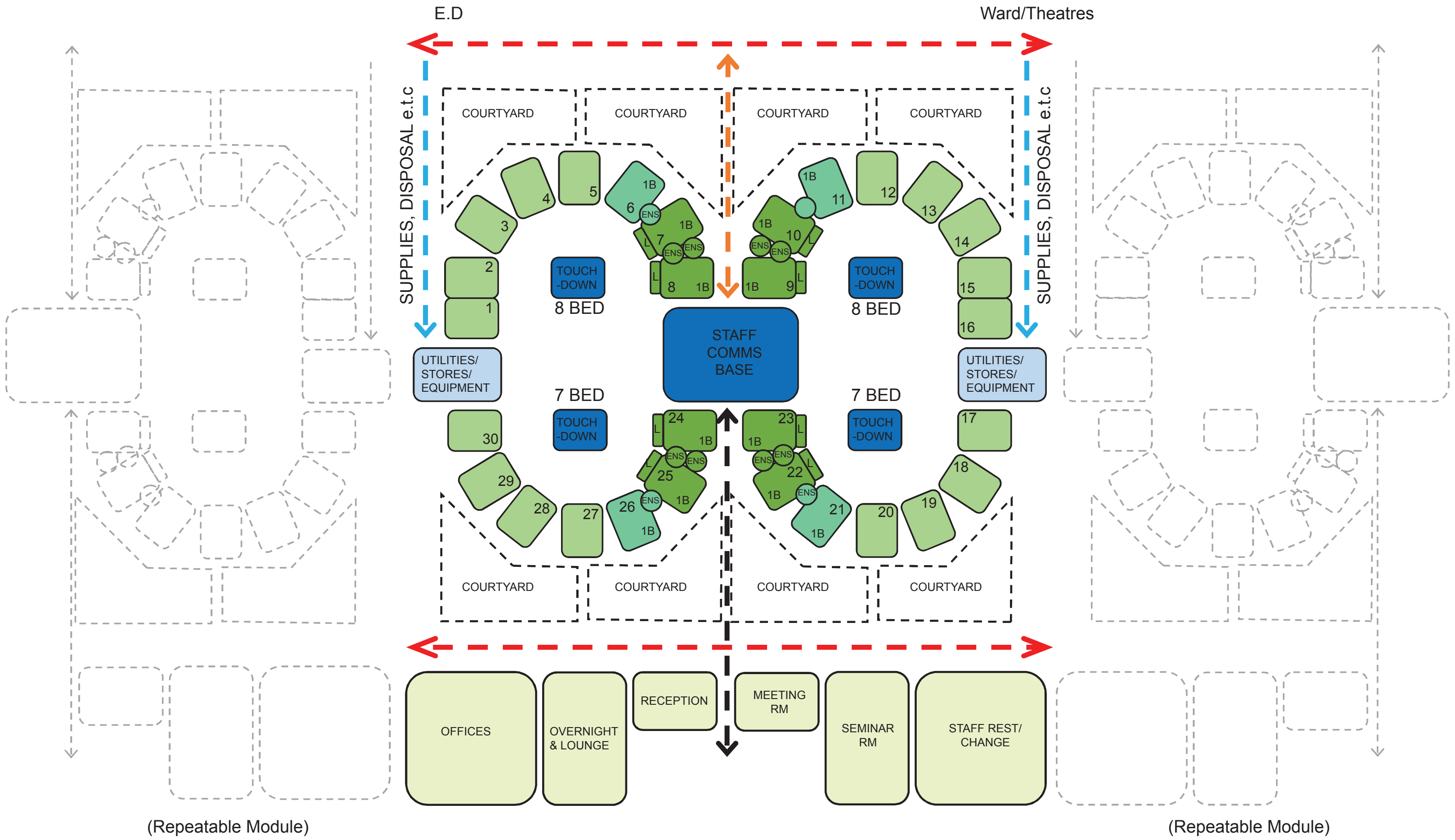
1. Central Nurse Station
Optimum observation to all beds

2. Nurse Touchdown Zones
Large windows at Touchdown areas to maximise observations.
Full view from the corridor through the sliding doors.

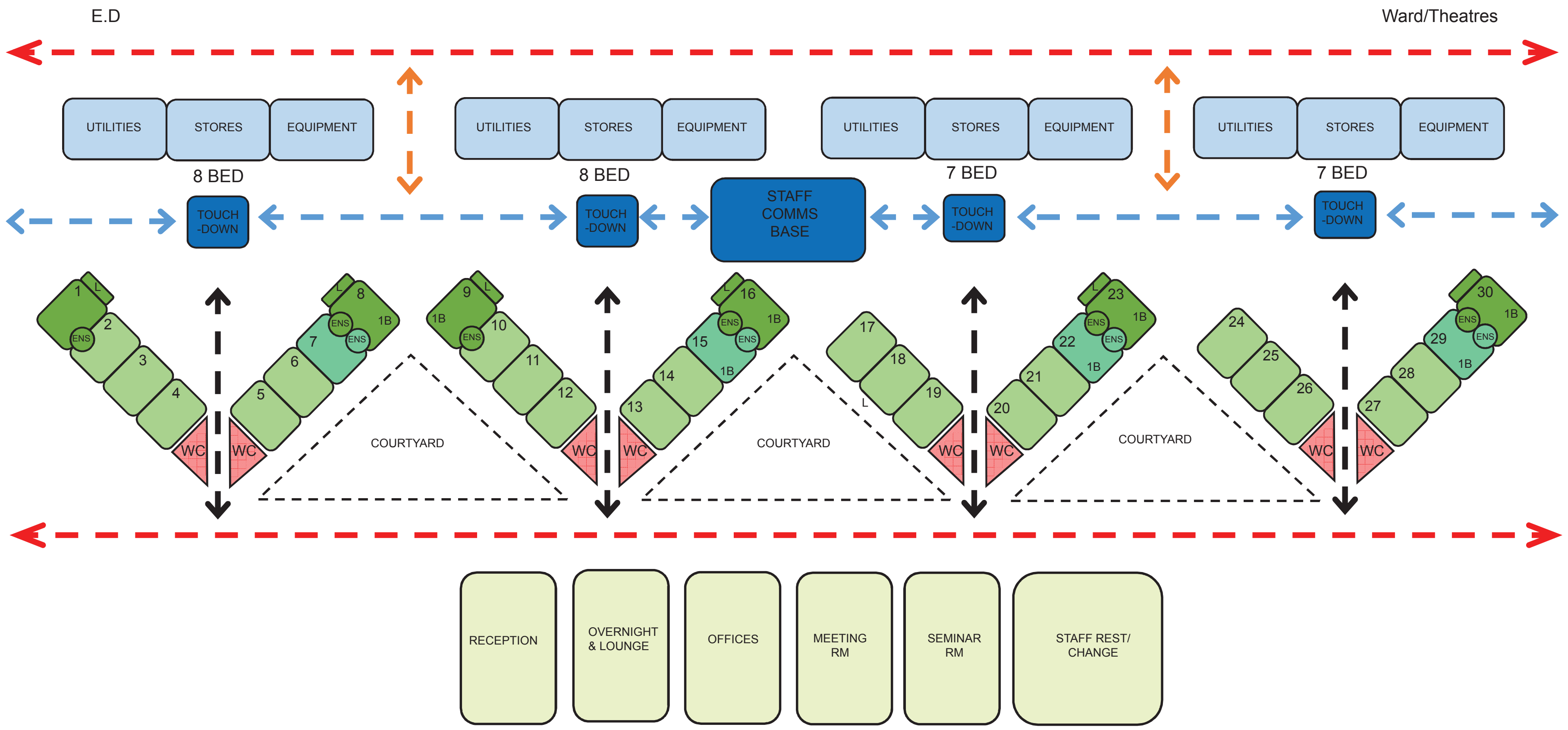
3. Large External Windows
To allow natural light into the room and provide a view out.

4. Large Internal Windows for Observation
Maximise observation

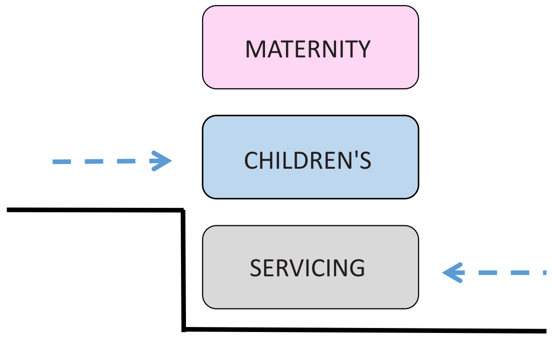
VISITOR ROUTE
PATIENT ROUTE



CCU Option 1

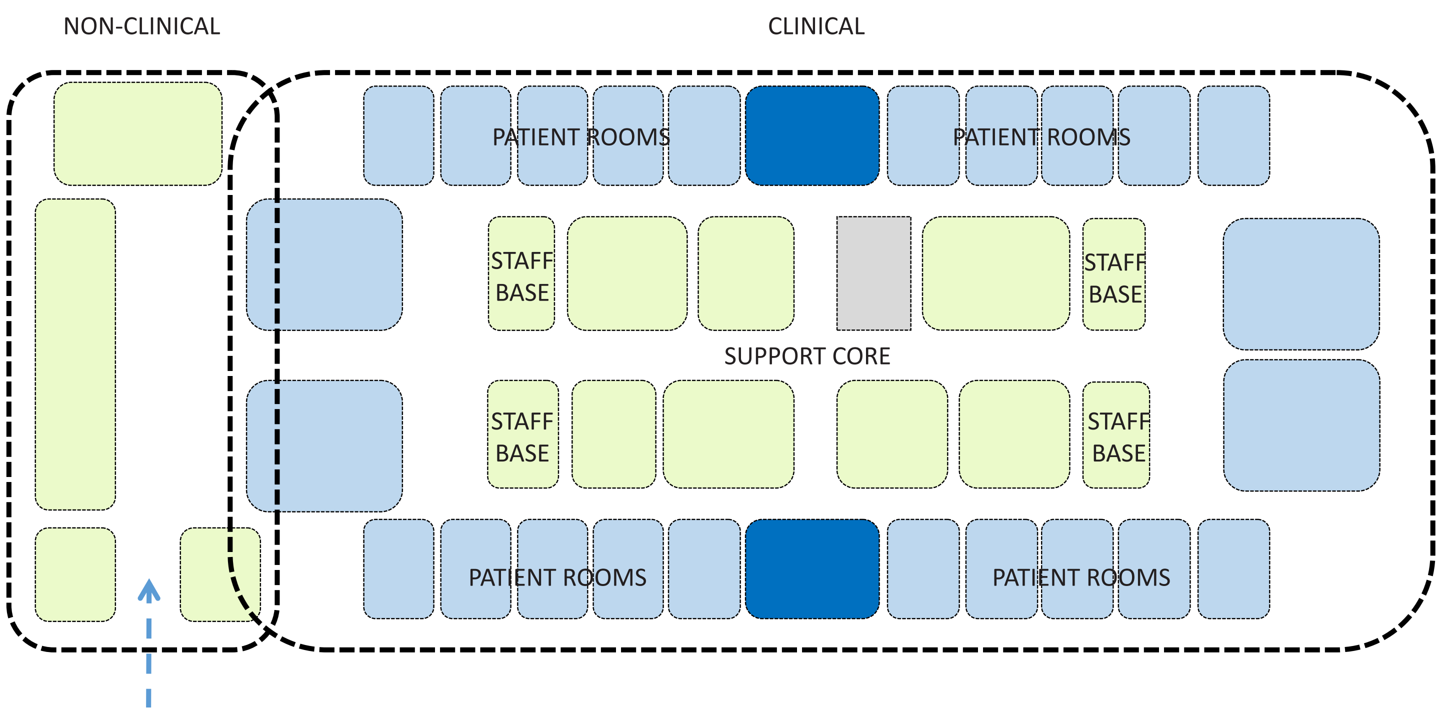


CCU Option 2

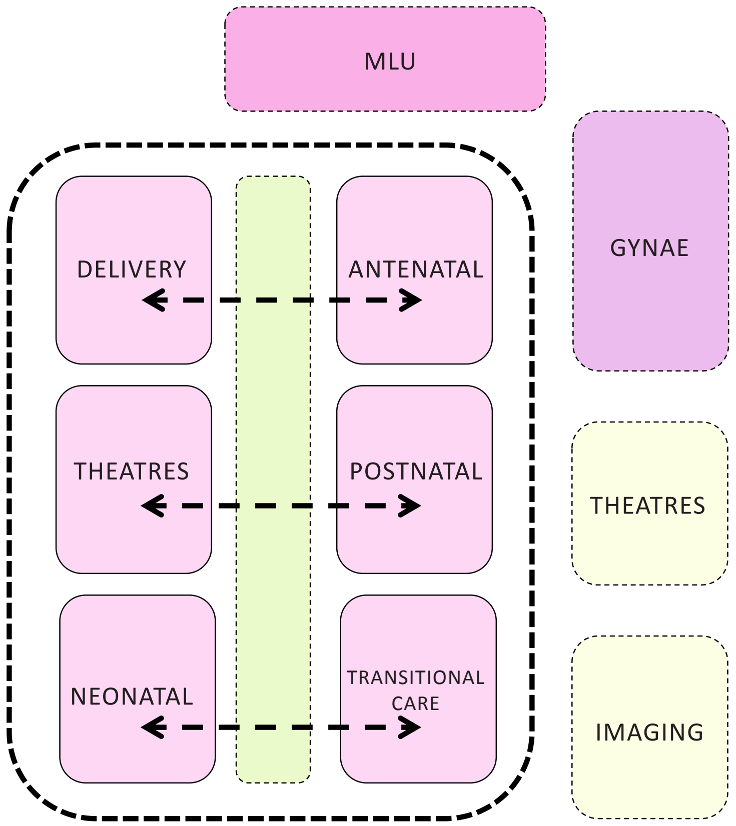


Maternity Section Concept

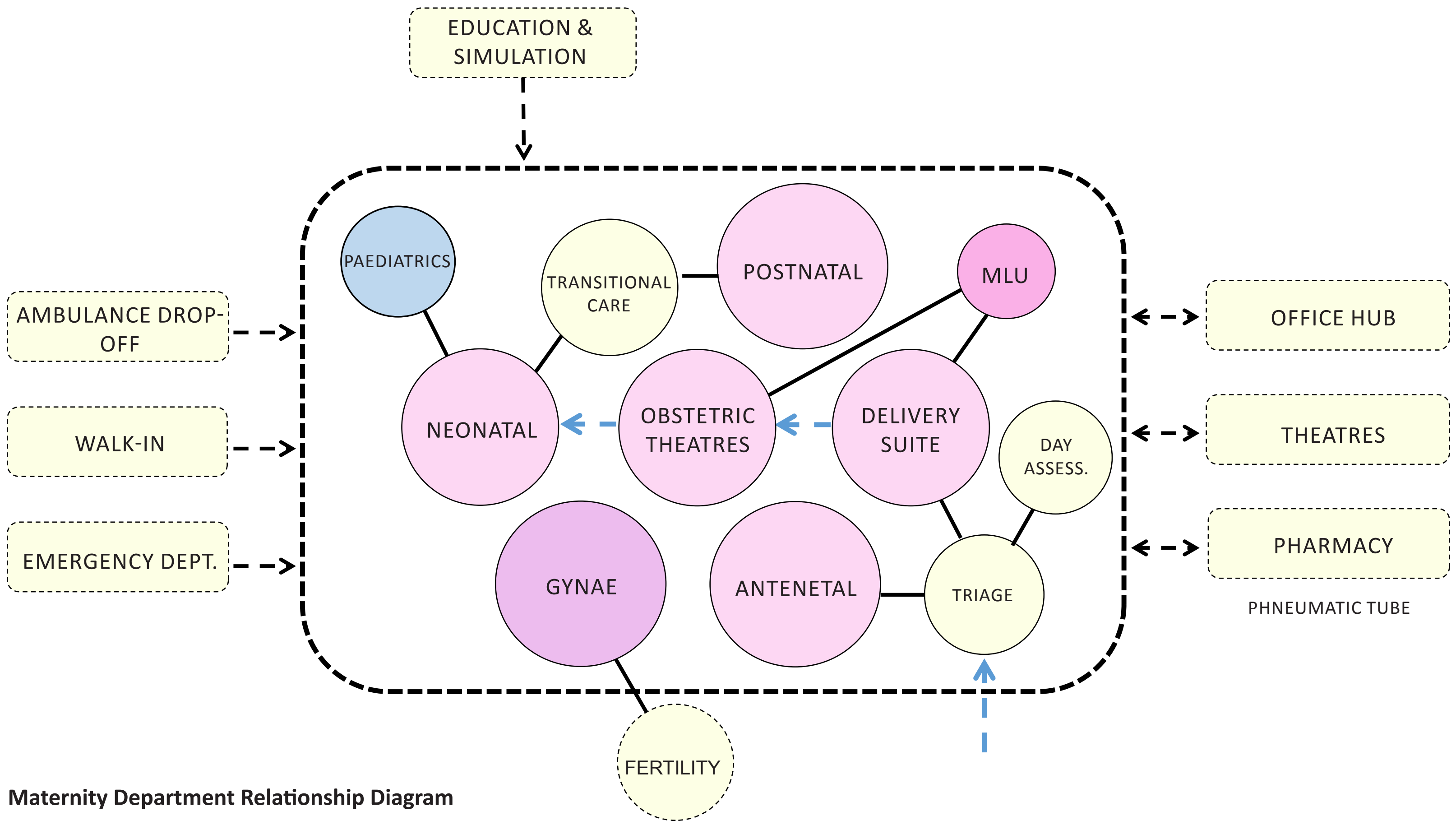
1. **Central Nurse Station**
2. **Full view for Observations**
3. **Colour on floor for way-finding, reflected in room**



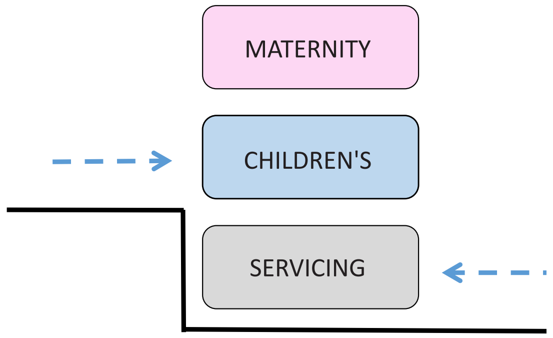
Ward Diagram



Maternity Department Activty Diagram



Maternity Department Relationship Diagram



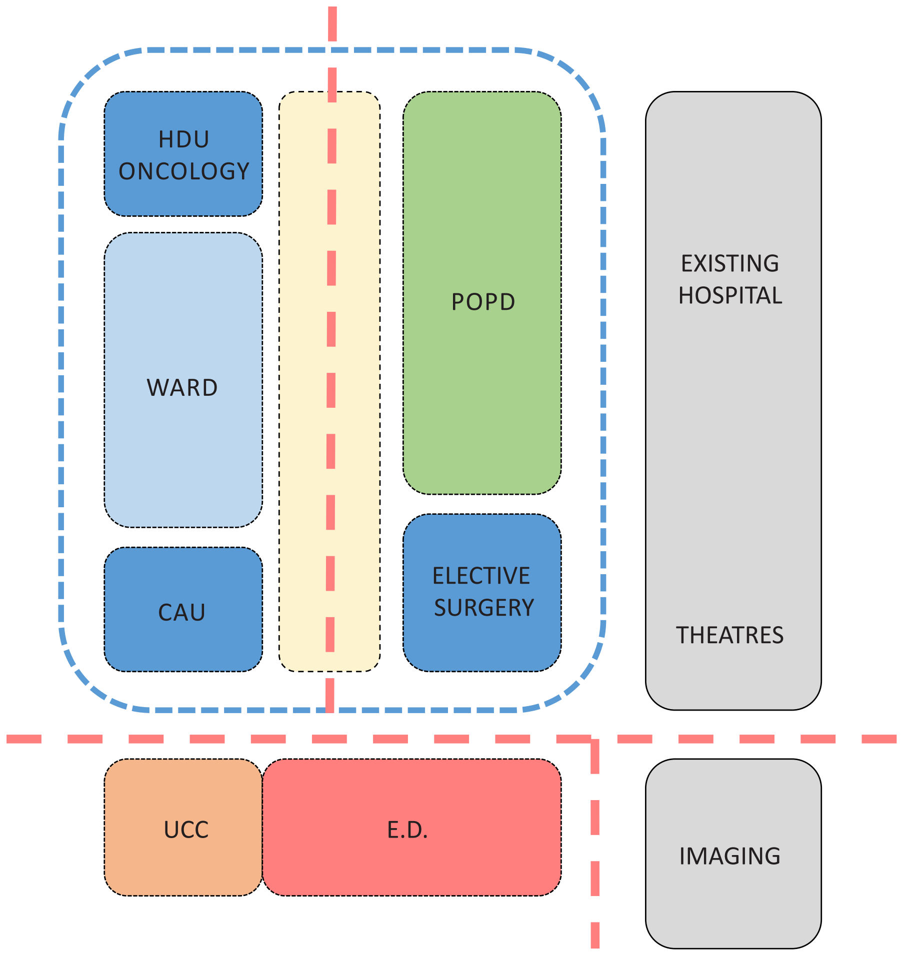
Children's Section Concept

1. Children's Sky Garden - Outdoor Play

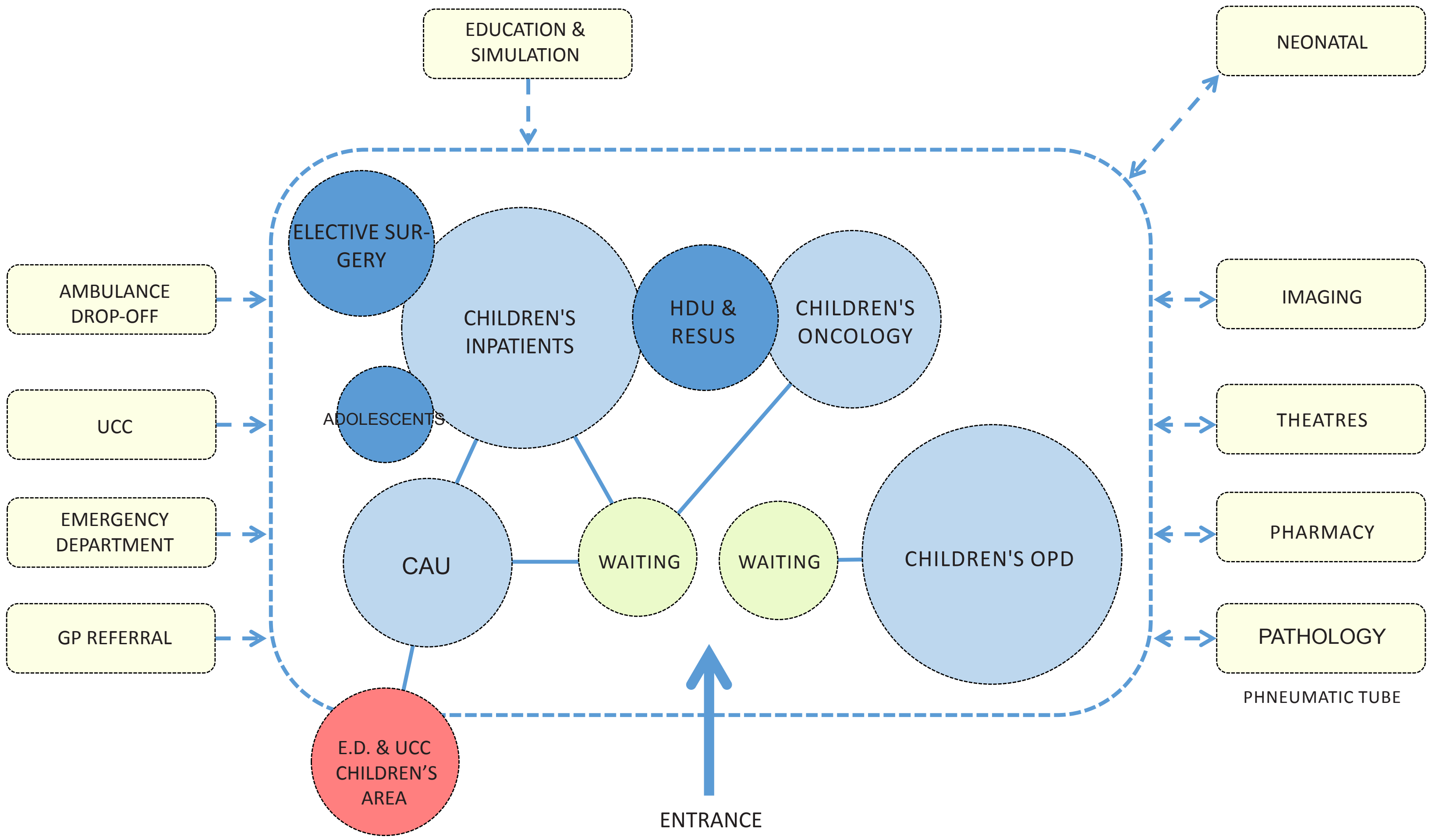
2. Children's Sky Garden - Outdoor Play

High level walls - e.g. Green walls, glazing

3. Indoor Play

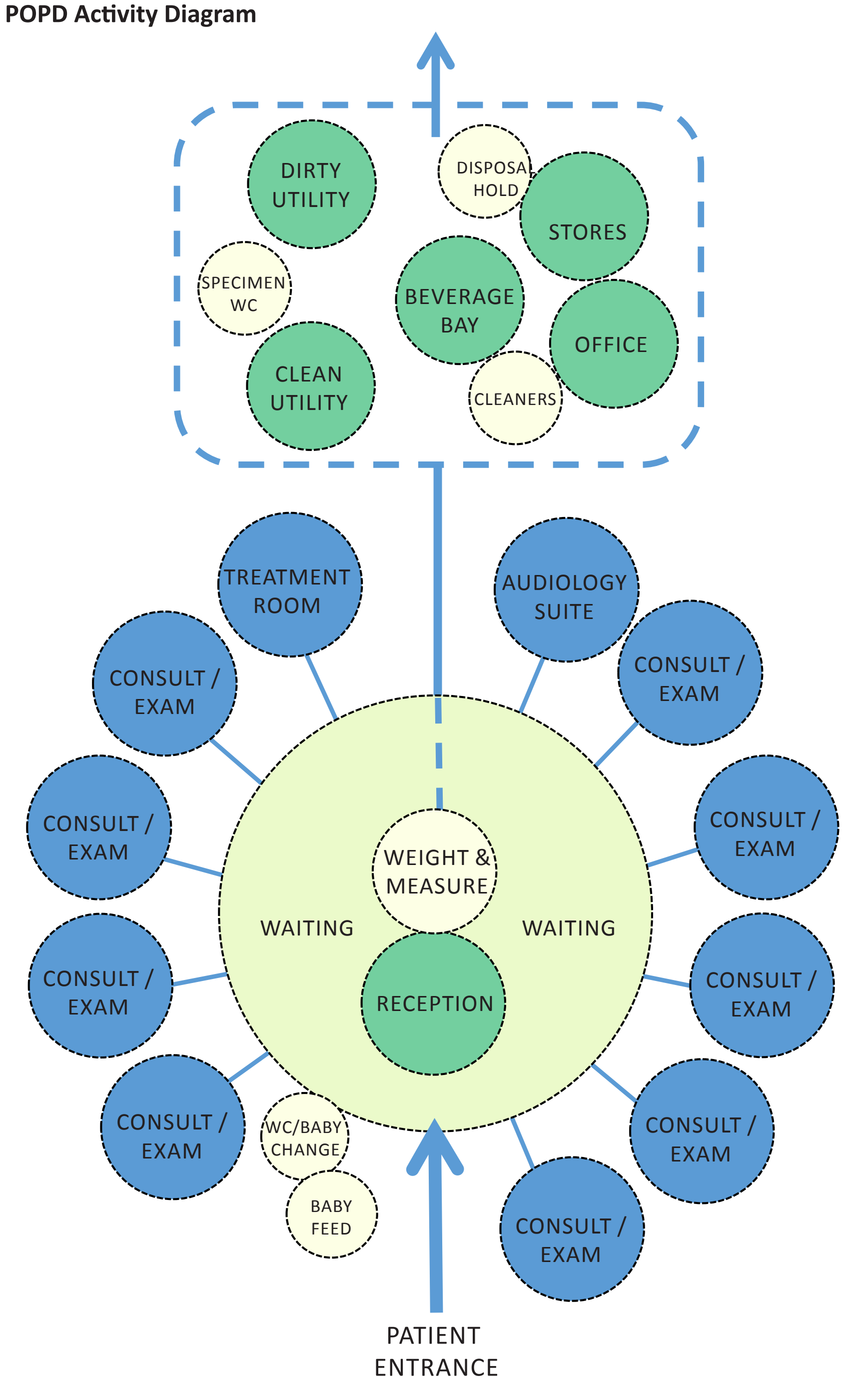


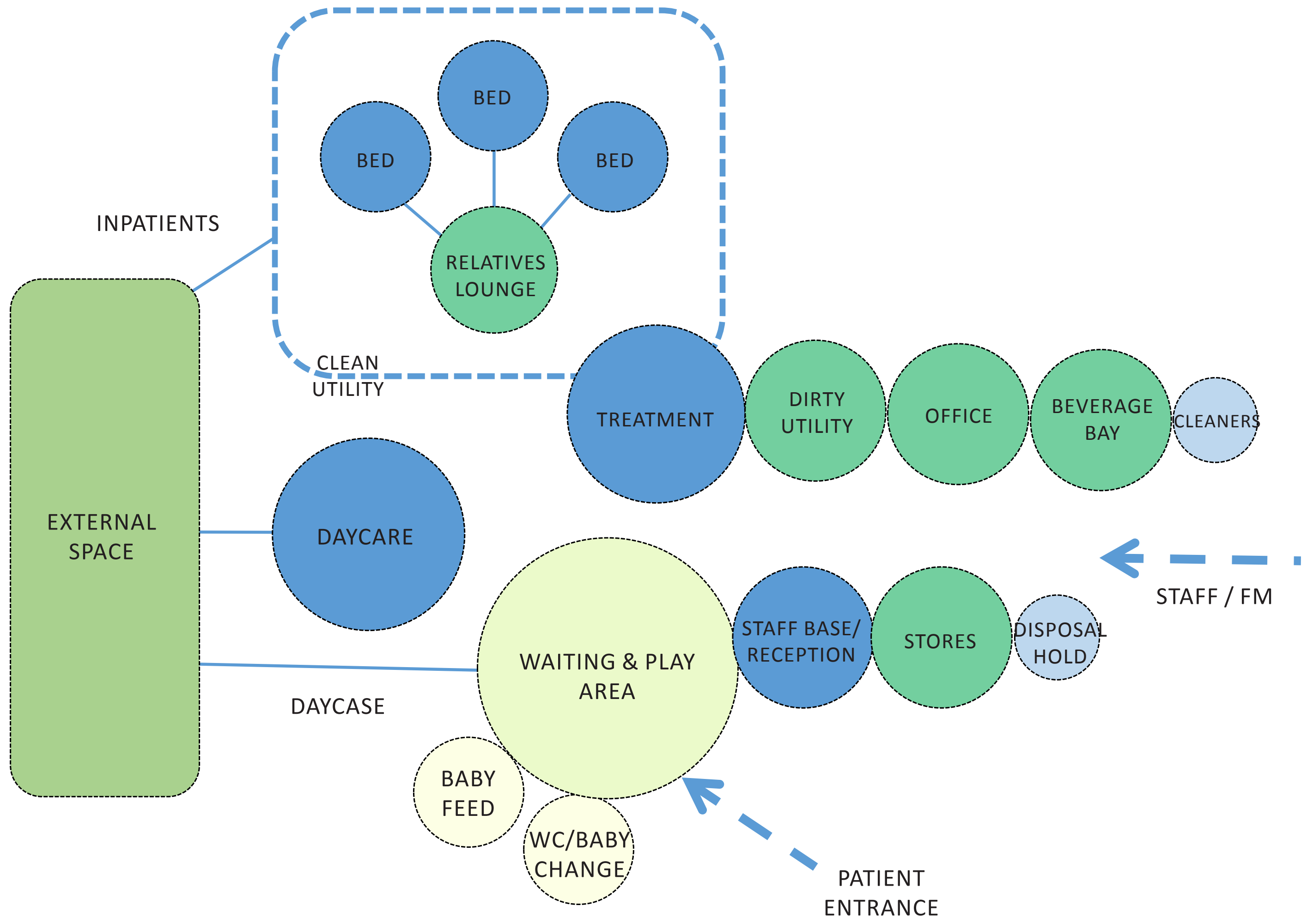
Children's Department Activty Diagram



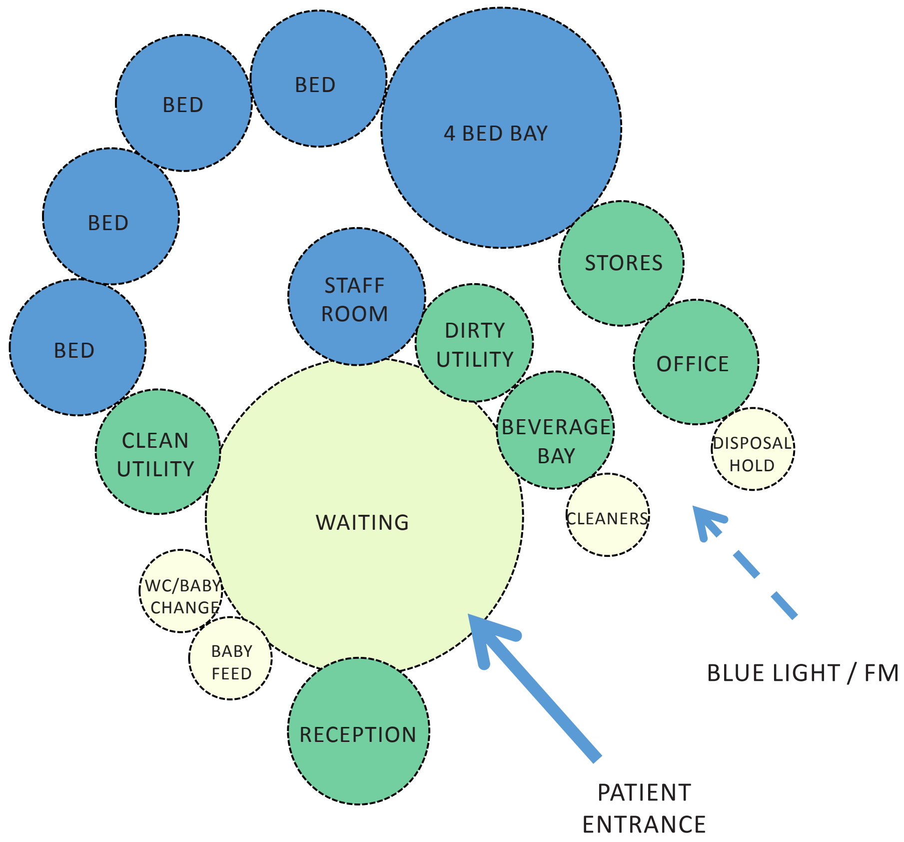
Children's Department Relationship Diagram

POPD Activity Diagram





Children's Oncology Activity Diagram



CAU Activity Diagram

Sustainable Services Programme

Task & Finish Groups- Engagement Tracker

Revision Date

(Refer to Scratchpad for detail items to be incorporated later in the programme)

		Document	External Relationships	Functional Content	Departmental Planning	Actions
ED and UCC	Departmental Visit RSH- 23 May 2016 Attendees: DH, RM, AE		1. Existing Walk-in Entrance badly located and obstructed by adjoining buildings 2. Inadequate space for ambulance parking 3. No vehicle drop off near entrance 4. Issues with admissions and discharges 5. Route to imaging- patient flows 6. Consider location of Security	1. Department too small 2. Poor Paediatric Provision	1. Existing Staff Base Congested- inadequate access to computers 2. Departmental Entrances too small and discrete 3. Poor observation of bays 4. Lack of seperation of waiting areas	
	Departmental Visit PRH- 24 May 2016 Attendees: DH, LJ, AE		1. Role of Melling Health in SSP model	1. Barn style Resus Room- is this proposed for the new dept? 2. Consider requirement for office accommodation on dept, adjoining, close-by etc 3. Mental Health Facilities 4. Consider Training Meeting Facility on department- with glazed walls	1. Consider how the Streaming, Registration, Triage Process Works 2. Impact of Physical Medical Records on Staff flows 3. Consider delineation of public/ private areas if open staff base is proposed; patient confidentiality	
	Task & Finish Group Meeting 1- 1st June 2016 RSH Attendees:	AHR-RP-006 Rev 00	1. 'Fast-track' routes through for some conditions eg Stroke 2. Co-ordinated working between ED and UCC 3. Relationships with CDU, AEC and AMU to be illustrated 4. Consider provision of a more integrated Assessment Unit, including Head & Neck	1. RAT will take place in a cubicle/ in resus 2. Generally bays to have curtains to the front, but one bay should have doors to enable Gynae exam etc 3. The UCC should have 2 No. rooms suitable for use mental heath, domestic violence etc (1 No. full anti-ligature specification; 1 No. with some measures but not full spec) 4. The ED should have a procedure room but not a full Emergency Theatre 5. Viewing Room is not required on department; 6. Decontamination- External 'Tent' Facility- External Storage required 7. End of Life area adjoining resus 8. 2 No. Relatives Rooms adjoining Resus with tea and coffee-making facilities 9. Consider incorporation of a 'Changing Places' facility to accommodate the needs of older children/ adults 10. Patient Kitchen 11 Consider plain film X-Ray room within the E.D. 12 Make provision for ambulances at the warm site U.C.C. 13 Provide Head Wash facility within Treatment Areas	1. Mix of Assessment Areas Required to ED- Some with solid walls between, some which have curtains between two adjoining bays to provide flexibility; 2. Consider Lean Principles- Dirty Utility with dual access etc 3. Distinct Paediatric Waiting and Treatment- minimising cross flow with adult pathways ; Facilities can be shared between ED and UCC 4. Protect the minors cubicles as 'distinct' to prevent Gridlock	1. Updates to External Relationships and Departmental Diagrams- AHR 2. Consideration of Screening, Registration, Triage Process- Task and Finish Group 3. Consider whether patients return to the waiting room after Triage or move through a series of sub-waits- Task & Finish Group 4. Bariatric Policy to be developed- Transformation Team 5. Office Accommodation Policy to be developed- Transformation Team 6. Consider how monitoring and charting will take place in the future model- COW, tablets at the bedside?- Task & Finish Group; IT 7. Consider the implications of 'Paper lite' methods of working- Task & Finish Group; IT 8. Storage Strategy- Task & Finish Group & Non-Clinical Support Workstream 9. Liaise with Fran Collins regarding Emergency Planning- Transformation Team 10. Security Requirements-Task & Finish Group & Non-Clinical Support Workstream 11 Up-dates to Accommodation Schedules for Procedure Room, End of Living facility, Plain Film X-Ray, etc. - Transformation Team 12 Review number of Cubicles/Rooms within Treatment Areas - Transformation Team
	Task & Finish Group Meeting 1- 30 June 2016 PRH Attendees:	AHR-RP-006 Rev 01	1. Localised Lab provision could be considered if a new Pneumatic tube system and existing lab provision cannot be improved	1. Resus areas to accommodate multiple trolleys in 'barn' configuration 2. Majors area to incorporate a mental health cubicle	1. Patients will progress through the department; A sub-wait will be provided for use when monirs cubicles are all occupied 2. Wherever possible, children will be held in the Waiting area where there are toys etc available 3. Dept to be designed to be able to flex to accomodate surges in activity 4. Department could consist of zones, which are staffed by allocated team members with patients allocated to zone as cubicles come free	1. Consideration to be given to the Surge Capacity model which is followed at New Cross- Task & Finish Group and Transformation Team 2. Cubicle and trolley numbers to be issued- Transformation team 3. Imaging team to consider whether a reliable ceiling mounted X-Ray can be sourced- Imaging Team 4. Task & Finish Group to consider how many cubicles each zone should comprise based upon the preferred nursing model- Task & Finish Group 5. AHR to produce diagrams illustrating alternative approaches for consideration- AHR
	E-Mail LJ 190716			Planned Care Site- Space to stabalise a critical patient prior to transfer to the Emergency Site; Slightly larger space with additional power, gases etc		1. Incorporate into S0A- SHP
	E-Mail LJ 190714- Comments re security from John Simpson				1. Security to be located in or adjacent to A&E; 2 person office	

Sustainable Services Programme

Task & Finish Groups- Engagement Tracker

Revision Date 17 June 2016

(Refer to Scratchpad for detail items to be incorporated later in the programme)

		Document	External Relationships	Functional Content	Departmental Planning	Actions
Critical Care Unit	Departmental Visits RSH and PRH Attendees:		1. Storage currently presents some challenges; (Frequency of deliveries, holding high volumes on dept); bed storage etc.;	1. Pneumatic Tube required	1. The department will operate as a single Unit; Not seperated as currently at RSH 2. Privacy & Dignity- Gender Seperation needs to be considered for wardable and Level 2 patients 3. Drug Preperation currently takes place at the Staff Base- Is this the most appropriate location? 4. A side-room/ Office next to the staff base where private phone calls/ discussions can take place	
	Task & Finish Group Meeting 1- 2nd June 2016 RSH Attendees:	AHR-RP-008 Rev 00			1. External Space- accessible to beds 2. Consider the Configuration of Staff Bases, Hubs and charting areas to avoid isolating staff 3. Flexibility of Acuity in bays to avoid the need to constantly move patients 4. Mix of Acuity within the department- not segregated by level of care	1. Bed Numbers for the unit to be confirmed- Transformation Team 2. Consider what can be learned from Virginia Mason- Transformation Team 3. Update report to illustrate specific questions requiring consideration- AHR 4. CCU Team to provide feedback on Schedule of Accommodation and Activity Diagrams- CCU Task & Finish Group 5. Operational Policy to be updated- Transformation Team
	Task & Finish Group Meeting 1- 7 July 2016 PRH Education Centre, Room C Attendees:	AHR-RP-008 Rev 01	1. Proximity and ease of access to Imaging, including CT Scanning on RSH site questionned 2. Proximity and ease of access to Theatres questionned	1. Concern that an inadequate number of Recovery beds in existing accommodation will impact on CCU beds provision 2. Increase required in Clean Utilities (4 no. not 3no.)	1. 30 beds to be nursed in 4 "pods", 3 x 8 beds and 1 x 6 bed. Each pod will have a mix of side rooms/isolation rooms and bays 2. Ratio of side rooms to total beds needs to increase. 10 no. isolation/side rooms required, 6 of which will be lobbied 3. All side rooms will have en-suite/sluice facility 4. All beds will be serviced for Level 3 care 5. Clean Utility/ drug prep to be provided for each pod 6. Clear lines of visibility to all beds from staff areas critical 7. Department should have open and spacious feel 8. Patient Privacy between beds and across the department should be addressed 9. Non-clinical support areas should not impinge on clarity and openness of clinical spaces 10. Planning should demonstrate capability of expansion 11. Each pod will have a nurse base, but these should not be isolated from each other. There should be a further central base that can be used for confidential staff discussion. This could be a room with glazed walls 12 Each bed should have daylight	1. Update diagrams to reflect discussions at the meeting- AHR 2. Operational Policy to be updated- Transformation Team 3. Nursing principles of pods, numbers of siderooms, etc to be ratified by internal discussions with CCU doctors- CCU Team 4. Up-date schedules of accommodation- Transformation Team 5. Any issues of gender separation, and the split between medical and surgical beds to be discussed within the clinical team- CCU Team
	Task & Finish Group Meeting 1- 3 August 2016 PRH ITU Coffee Room Attendees:	AHR-RP-008 Rev 01		1. Explanation of capacity calculations required 2. Engagement of all Clinicians and nursing staff is required to adequately brief the Design Team. It was suggested that an "away" day is organised for all who will use the new facility to attend and contribute	1.Distant views from unit would be advantageous 2. Separation of Relatives accommodation from staff areas preferred, not as shown on diagrams	1 Organise away day - Transformation Team 2. Update diagram - AHR
	Meeting - RSH- 13 September 2016; Attendees Chris Mowat, David Heath, Roy Stokes		1. CT scanner close to Critical Care and ED		1. Each side room needs to have negative pressure air handling and a lobby large enough for three people to gown up 2. High Visibility throughout the unit 3. Ability to isolate a multiple bedded bay for infected patients 4. Touch down area for staff between each two bed bays	1. CM to review HBN room layout and SoA and advise of any required changes- Chris Mowatt

		Document	External Relationships	Functional Content	Departmental Planning	Actions
Ambulatory Emergency Centre	Task & Finish Group Meeting 1- 15 June 2016 RSH Attendees:	AHR-RP-010 Rev 00	1. Majority of referrals are from GPs, the remainder coming through ED/UCC 2. There is a relationship and transfer between AEC and Medical Day Unit 3. Patients may be admitted and discharged in the AEC without passing through any other part of the Hospital 4. Convenient access to a dispensing pharmacy would be helpful 5. Close proximity to CDU and AMU is required 9. Close access to CT Scanner would be an advantage	1. Department needs a dedicated Treatment Room 2. There should be a few Consult/Exam Rooms for confidential patient discussion and examination 3. Wheelchair storage space is required 4. Equipment Store is required for IV stands, etc 5. Patient kitchen required. Depending on location, this may be shared with the ED 6. Provision required, within a comfortable sitting area, for vending machines 7. As well as the ward manager's office, there needs to be an office, to be shared by consultants and visiting GPs, within the AEC 8. Stock storage required	1. There needs to be a clear and separate entrance from the outside, but still remaining part of the "Big Front Door", co-located with ED and UCC 2. Ambulance access is required to the entrance 3. There is no need for separating public/patients/staff entrances. Escorts will accompany patients into the cubicle area, so patient confidentiality needs to be considered. 4. Patient observation could be from touchdown bases (with COWs), but central Staff Communications base will also be required, with noticeboard, etc	1. Updates to External Relationships and Departmental Diagrams- AHR 2. Operational Policy to be developed- Transformation Team 3. Office Accommodation Policy to be developed- Transformation Team 4. Consider how monitoring and charting will take place in the future model- COW, tablets at the bedside?- Task & Finish Group; IT 5. Storage Strategy- Task & Finish Group & Non-Clinical Support Workstream 6 Up-dates to Accommodation Schedules for Treatment Room, Consult/Exam Rooms/Equipment Store etc. - Transformation Team 7 Review number of Cubicles - Transformation Team 8 Clarify provision of AEC on warm site - Transformation Team 9 Storage Strategy- Task & Finish Group & Non-Clinical Support Workstream

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		Document	External Relationships	Functional Content	Departmental Planning	Actions
Neonatal	Task & Finish Group Meeting 1- 6th June 2016 PRH Attendees:		1. It would be useful for Paediatrics and Neonatal to be closer to assist staff who are required to attend on both departments 2. Neonatal needs to be closer to Post-Natal to cover Transitional Care 3. The MLU needs to be adjacent to the rest of the Maternity Dept	1. The current 6-Bedded HDU is too small/ the central Staff Base resricts flexibility & circulation 2. Scheme should include a Staff Base with an enclosed private area for discrete conversations 3. A Staff Room and Locker Room must be included on the unit 4. A relatives bedroom should be provided for each ITU Space 5. A shared training area for Neonatal and obstetrics		
Maternity	Task & Finish Group Meeting 1- 6th June 2016 PRH Attendees:		1. A Transitional Care ward is required adjacent to Post-Natal and Neonatal 2. Obsteric Theatres need to be close to main theatres 3. MLU to be adjacent to main Maternity Dept 4. Day Assessment should be part of the overall Maternity Dept	1. Separate Patient kitchens from Pantry's 2. Counselling room next to Bereavement Suites 3. A triage area is required adjacent to Ante-Natal and Delivery Suite	1. The Bereavement Suites should be located discretely away from department entrances and main thoroughfares 2. Visitors and patients entering the departments should immediately be faced with the ward clerk's staff base	
Gynae	Task & Finish Group Meeting 1- 6th June 2016 PRH Attendees:		1. Need to be close to theatres, Obsterics and ED 2. Useful to be close to General Surgery Wards, and Outpatients 3. Need to have an admin 'pool' close to the department 4. Fertility needs to be on the same site as patients are sent to Gynae for 'Reassurance Scans' as part of their Fertility Appointments;	1. The current GATU Counched area is not big enough	1. Preferable to have a single entrance to the department with a single reception 2. Series of Sub-Waits for each department	1. Task & Finish Groups to confirm naming preferences for all departments- Task & Finish Group 2. Clarification required as to whether the Fertility Business Case delivery will be associated with SSP- Transformation team
Gynae	Task & Finish Group Meeting 2- 29th June 2016 PRH Attendees:	AHR-RP-011	1. EPAS on the warm site should be adjoining antenatal clinic so sonographers and scanners can be shared (Scan room with 2 doors); but EPAS must be distinct from Antenatal with a separate entrance and discrete exit and non cross-flow of patients	1. EPAS- Hot Site- Consult/ Exam not required - 3 No. Counselling rooms in lieu; 1 No. Treatment room required 2. EPAS- Warm Site- 1 No. 1-2 person office; 2 No. Counselling Rooms, Waiting Area, Access to a shared scan room		1. Task & Finish Group to consider implications of all gynae interventional and ambulatory activities being based on the hot site- Task & Finish Group
Paediatrics	Task & Finish Group Meeting 1- 6th June 2016 PRH Attendees:	Following the meeting, Paediatrics Team provided a concept diagram & document to illustrate their brief	1. CAU adjacent to ED 2. Paediatric Dept adjacencies to- ED, UCC, Education & Simulation; Imaging; Theatres; Neonatal; Consultant Office Hub;	1. Resus Room 50% larger than current provision 2. Shared Resource room- 50-100% larger than current provision; 3. General Ward Area needs a minor procedures room/ treatment room in close proximity to beds 4. Retain internal & external play areas including Mayor's 'Garden Room' 5. Oncology Day-room to include an en-suite bathroom to enable it to provide escalation capacity 6. CAU- A private Office is required for Clinical Admin 7. CAU- Larger, single waiting area required 8. Dedicated area for Children's Elective Surgery	1. Oncology adjacent to HDU Beds; HDU Closest to Resus Room 2. A single entrance to the ward and CAU with a single reception area 3. Direct access to oncology from the reception without being routed through the ward 4. CAU adjacent to the ward 5. Avoid locating Clinical areas near main ward entrance 6. Avoid impermeable central 'core' to racetrack; provide routes through 7. Paediatric Consultants office to be closer to central activities 8. Consider Departmental Planning relative to proposed Nursing Model 9. Dedicated area for Adolescents	1. SoA to be updated- Transformation Team 2. Paediatrics Team to consider Ward nursing model- dividable unit or a single large dept?- Paediatrics Task & Finish Group
Paediatrics	Task & Finish Group Meeting 2- 29th June 2016 PRH Attendees:	AHR-RP-009	1. An Ambulance drop off/ Pick-up Point should be available for use by CAU 2. Café/ Coffee Shop Facility should be available within/ next to the department entrance 3. Office hub must be close to the department	1. (page 5) The 'Elective Surgery' module should be re-named as 'Daycase' 2. (page 6) 2 No. treatment rooms should be provided in OPD so that when the waiting area is split to form 2 separate clinics each would have a treatment room. 3. (page 9) Treatment Room is to be illustrated in the CAU diagram 4. CAU- 1 person office to be added adjoining the Staff Base	1. (page 5) HDU and Oncology should be located closer to the emergency dept, Daycase should be located closer to the entrance 2. CAU- Dirty utility to be closest to beds and treatment room.	1. Transformation team to identify functional content of the Daycase area- Transformation Team 2. AHR to illustrate 2 No. alternative options for the location of Oncology Option 1- as a zone of the main ward (seperated by doors); or as a distinct wing of accommodation connecting back to the main ward (similar to Rainbow Unit)- AHR 3. Updates to block plans to reflect discussions- AHR 4. The Paediatrics team requested an invitation to ED Task and Finish Group where the Paediatric area of the ED would be discussed- Transformation team 5. Task & Finish Group to advise of their preferred number of beds per zone/ cluster to align with their preferred nursing model- Task & Finish Group

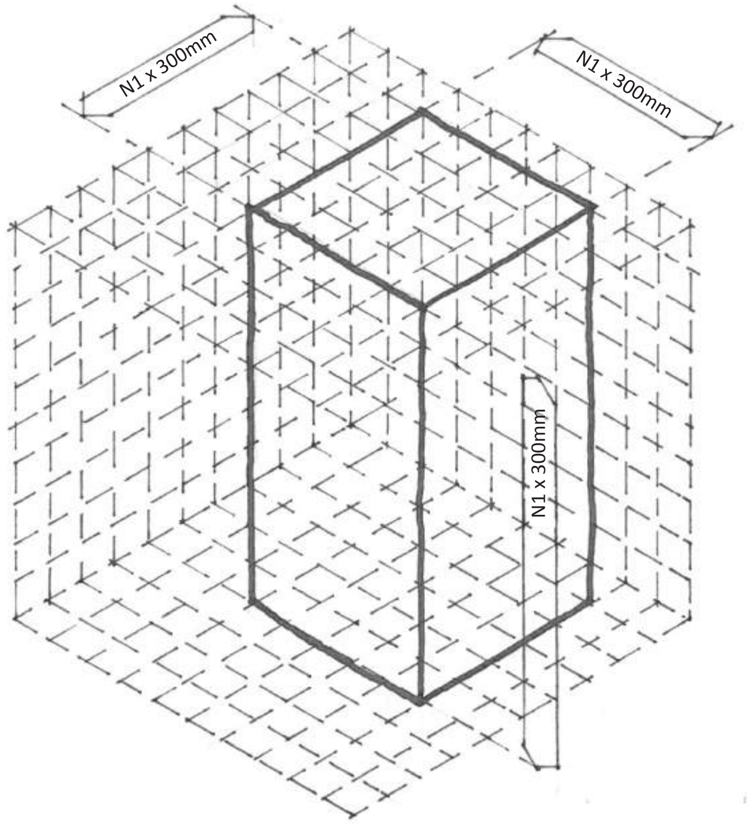
Sustainable Services Programme

Task & Finish Groups- Engagement Tracker

Revision Date: 11 July 2016

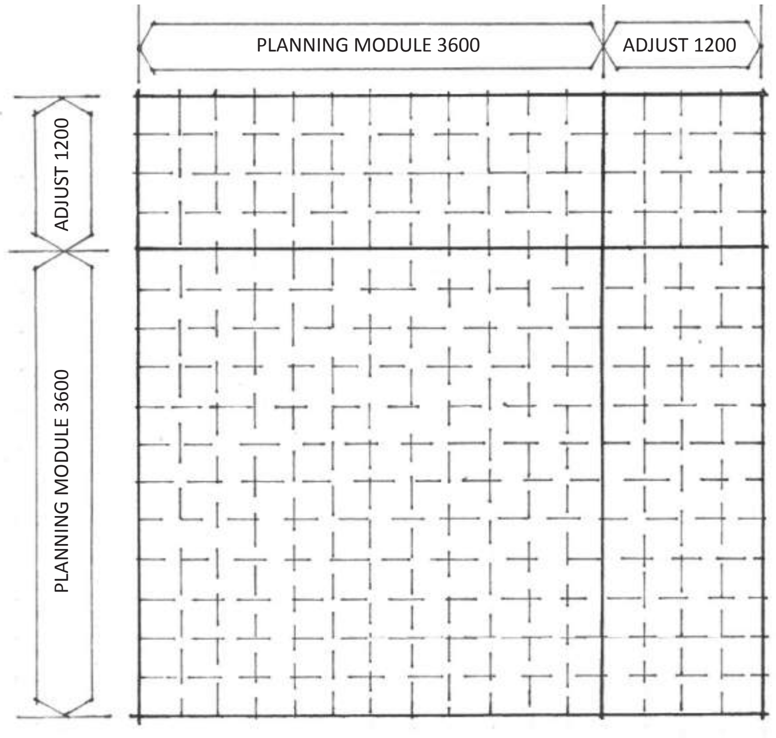
(Refer to Scratchpad for detail items to be incorporated later in the programme)

			Document	External Relationships	Functional Content	Departmental Planning	Actions
Non Clinical Support	Catering	Catering Briefing Meeting 01/07/2016- RSH Attendees: Joanne Yale Chris Shelley Goode Ross Mushet Keeley Sutton Alison Evans		1. Catering Deliveries are supplied by large lorries 2. Catering Distribution Strategy to be considered at each site	1. The 'Commercial' Catering offer in the entrance atriums will need kitchens, storage, access for deliveries & waste out etc 2. Ward catering will be via regen trolleys on the ward 3. Larger kitchens are required on the wards to accommodate the trolleys for the new food delivery strategy 4. The Loading Bay needs a designated Bay for Food Deliveries	1. There should be a provision for a vending area so that snacks and drinks are available when the catering units are closed; Look at Stoke where the 'Food Court' area can be partially closed-off out of hours	1. Shelley Goode to provide specification for each kitchen type- (Staff, Patients, Relatives kitchen etc), and to advise of any existing facilities which achieve the current requirements for the design team to view- Shelley Goode 2. Design and Transformation team to view existing Loading & Storage areas- Transformation Team 3. Catering team to advise of Staffing numbers for Lockers welfare facilities etc- Chris 4. Catering team to advise of office requirements- Hot desks to be utilised where possible- Chris
	Telecomms	Telecomms Briefing Meeting 01/07/2016- RSH Attendees:		1. To provide resiliance- a switchboard service should be considered at both sites; 2. Consider whether switchboard could be located on the warm site 3. There is a mobile phone mast (o2) on the traffic island at Telford and on top of the ward block (vodafone) at RSH	1. Telecomms Equipments can be co-located in Comms Rooms 2. Switchboard will have a 'Staff-Facing' Role and currently monitor all the alarms for the site; 3. Switchboard- 8No. Staff 4. Videoconfering facilities should be provided in a series of different settings- Seminar Room; Huddle Room and at individual PC's	1. Hard Wired Red Phone System required to Staff Bases/ Hub areas in all depts 2. Hard Wired Infrastructure required from Battery Room and Comms Room 3. UPS and Generator Back-up required to the Comms Room 4. Switchboard has 24 hour operation- Staff must not be isolated and must be located within 24-hour occupied area	1. Angela Lewis to be involved in discussions-Transformation Team 2. Consideration to be given to a Support Services- Hub- containing staff welfare, shared offices, switchboard etc-Tranformation Team/ AHR 3. Discussion with IT required to establish Future Strategy for alarm monitoring- Direct to mobile phones etc-Transformation Team 4. Brief for the Education & Simulation requirements to be developed Transformation Team 5. Consider whether a physical link of comms back to Redwood if RSH is hot is worth considering to provide resiliance-Transformation Team
	Portering & Waste	Portering Briefing Meeting 01/07/2016- RSH Attendees:		1. Space required in the loading bay for incoming and outgoing mail; 2. Linen is outsourced- Clear Flows to be defined within the loading Bay for Clean-in and Dirty Out	1. ED portering team is based in ED 2. 12-15 Portering Staff on Shift 3. Superviser requires an office near the Porters accommodation 4. Single Site Mailroom required operating during office hours 5. An area for franking mail (2 machines) is required at one of the sites; 'Hybrid Mail' is utilised where possible 6. Current Disposal Holds on wards are not big enough- They need to accommodate Large Bins, Recycling and dirty Linen 7. Mattress and Bed Stores Required		1. 'Ownership' of the Pneumatic Tube System to be taken over by Estates- Estates 2. Design team to consider any implications of building work on 'Tele-tracking systems'- Design Team 3. Consideration to be given to a Support Services- Hub- containing staff welfare, shared offices, etc- Tranformation Team/ AHR 4. Facilities Team to advise of any Disposal Holds on the current Estate which work well- Facilities Team 5. Facilities team to advise of any Building Requirements to support Vacuum Packing of Waste- Facilities Team 6. EBMU to be involved in discussions-Transformation Team 7. Major Incident Planning- Fran Collins to be involved in discussions Transformation Team 8. CSSD loading & Storage requirements to be identified- Transformation Team
	Car Parking	Car Parking & Residential Accommodation Briefing Meeting 01/07/2016- RSH Attendees: Joanne Yale Sue Hambley Ross Mushet Keeley Sutton Alison Evans				1. Parkmark Accredittation required for new car parking areas 2. Impact of any changes to Carpark Cameras and Paystations to be considered	1. Impact on accommodation levels relative to the 'hot' and 'cold' site to be considered- Transformation Team
	Domestics & Linen	Domestics & Linen Briefing Meeting 08/07/2016- RSH Attendees: Joanne Yale Kelly McCorville Ross Mushet Alison Evans			1. A Major Incident Linen Room must be provided near to the Hot Core of the hospital on the hot site 2. A Central Linen Storage and distribution facilirty is required which will be occupied by a housekeeper 3. An Ambulance Linen Store must be provided within ED 4. Linen will move from a 5-day to a 7-day service 5. Linen provision is calculated on the basis of 3 Bed Changes per bed per day 6. A 'Wash-down' base is required, associated with the Loading Bay on both the hot and warm sites 7. A 'Mop-Laundering' area will be required incorporating washers & tumble dryers 8. A caged area is required for storing the cleaning machines incorporating charging points 9. Cleaning Cupboard- To include Bucket Sink, Hand-wash, Shelv`ing, Storage area for cleaning Machine; Yelloe COSHH cupboard, Staff personal Locker- Use the size & specification from Women & Childrens 10. Area to be identified for the anatomy fridge	1. The Loading Bay must have clear designated Routes- Clean Linen in, Dirty Linen Out; 2. Linen is delivered in cages with plastic covering; Dirty Linen goes out in plastic bags	1. Estates Team to provide specification for Equipment for mop-laundering room etc- Estates 2. Areas of Staff Welfare, Clocking, Manager Office Accommodation etc to be identified- KM
		Security- E-Mail from John Simpson via LJ 16 June 16			1. Welfare Facilities for 10 No. Staff on each site		



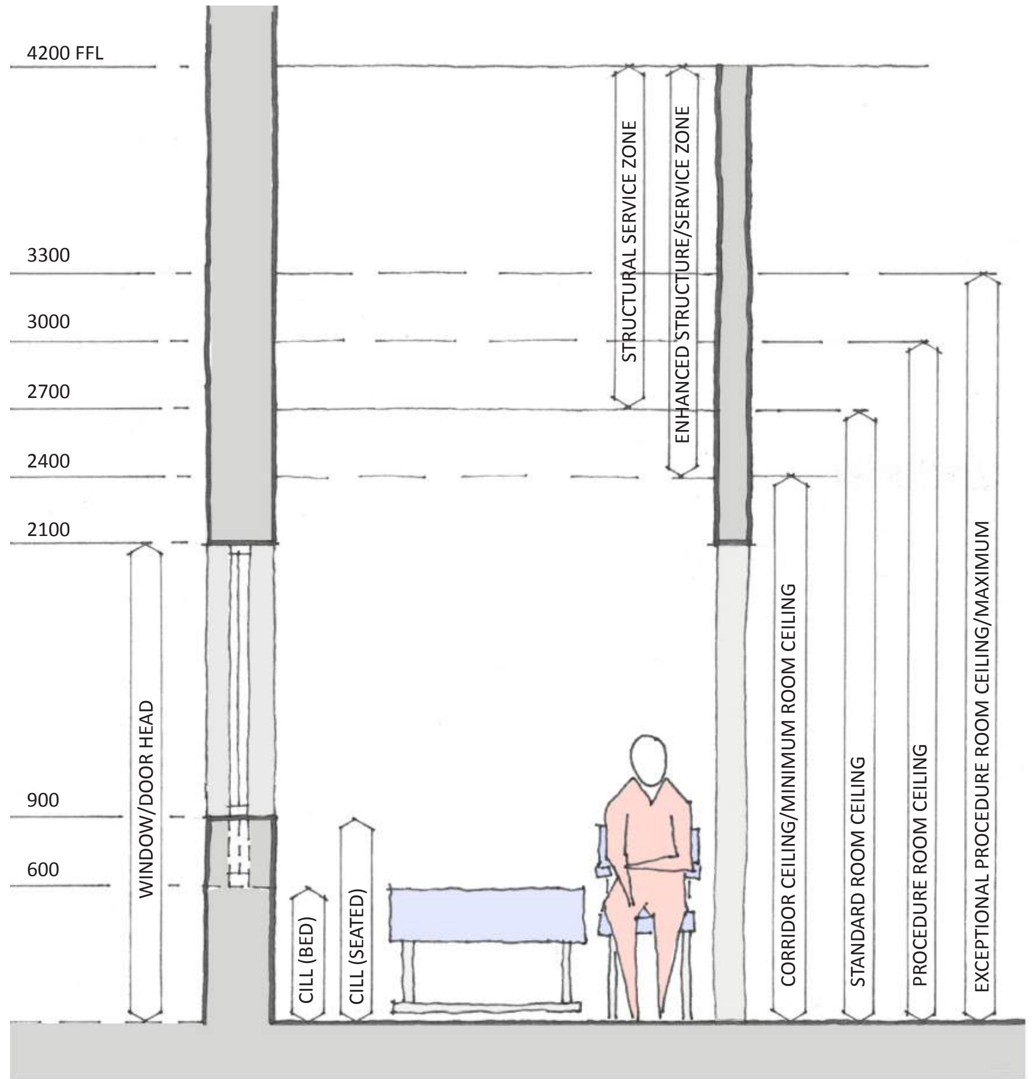
DIMENSIONAL CO-ORDINATION

The intial planning strategy starts from the base of a 300mm grid vertically and horizontally.

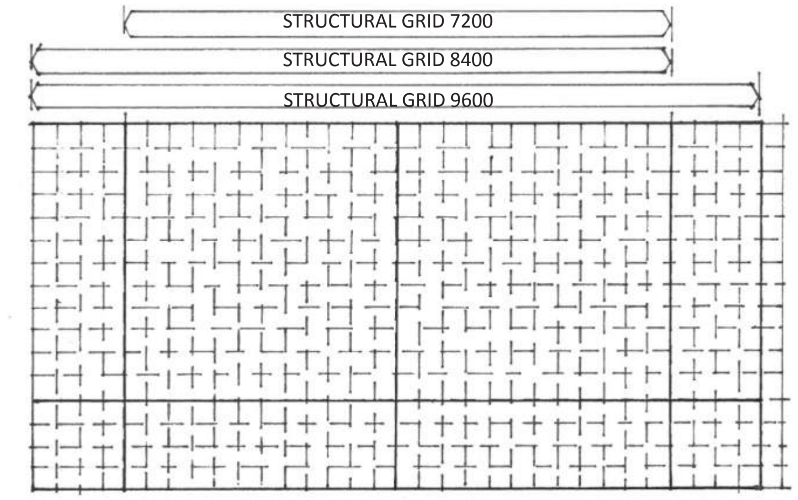


GRID ZONES

From the 300mm module forms the 3600mm Planning Module and a 1200mm Adusting Zone to form a 'Tarten' Grid pattern.



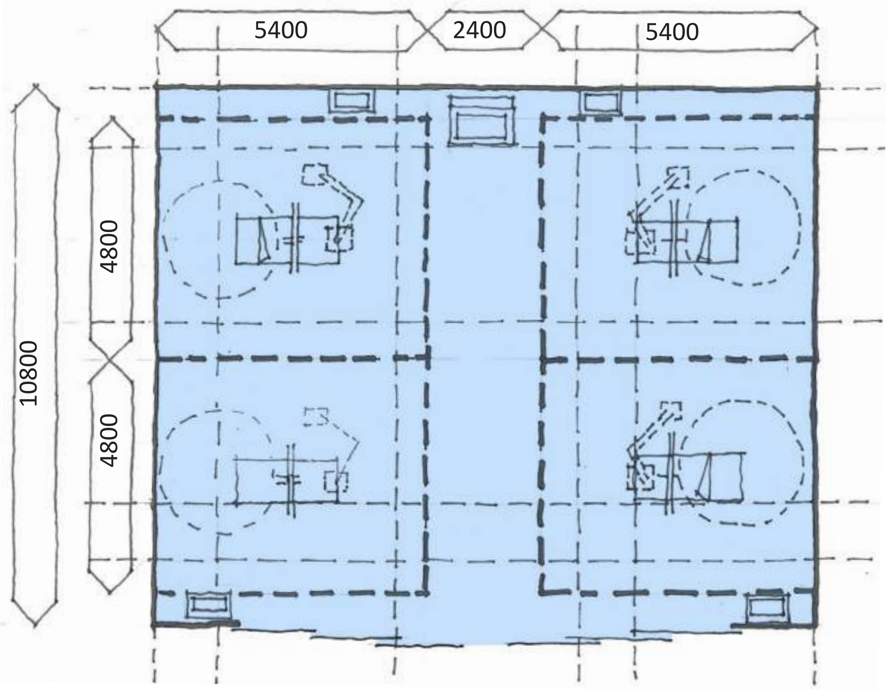
VERTICAL CONTROLLING DIMENSION



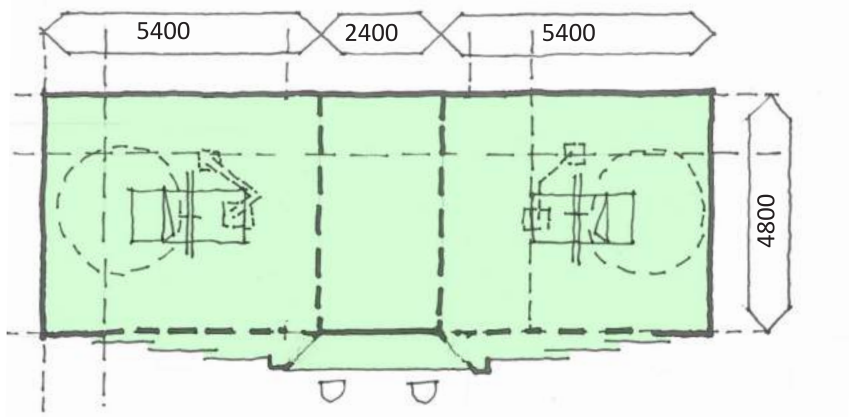
PLANNING GRID

This can then provide optional strutural girds of 7.2m, 8.4m or 9.6m.

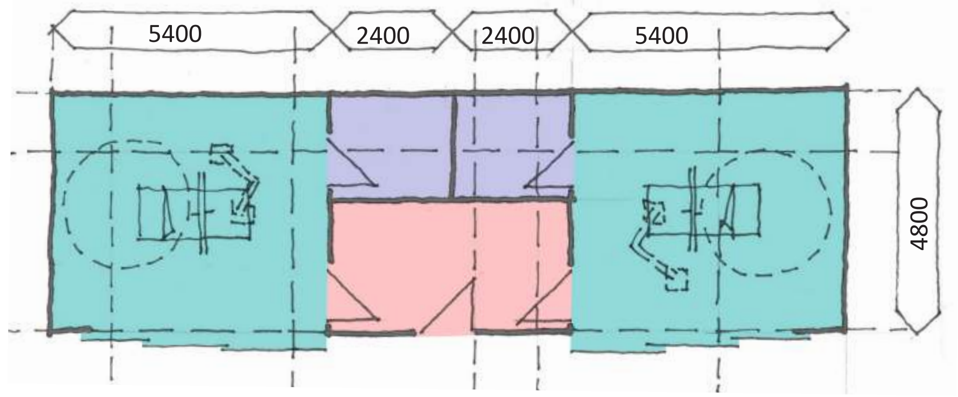
- ASSESSMENT BAY
- 4 BED CCU BAY
- SINGLE BED BAY
- EN-SUITE FACILITIES
- DEPARTMENTAL CIRCULATION
- ISOLATION LOBBY
- ISOLATION ROOM



4 BED CCU BAY



2 BED CCU BAY

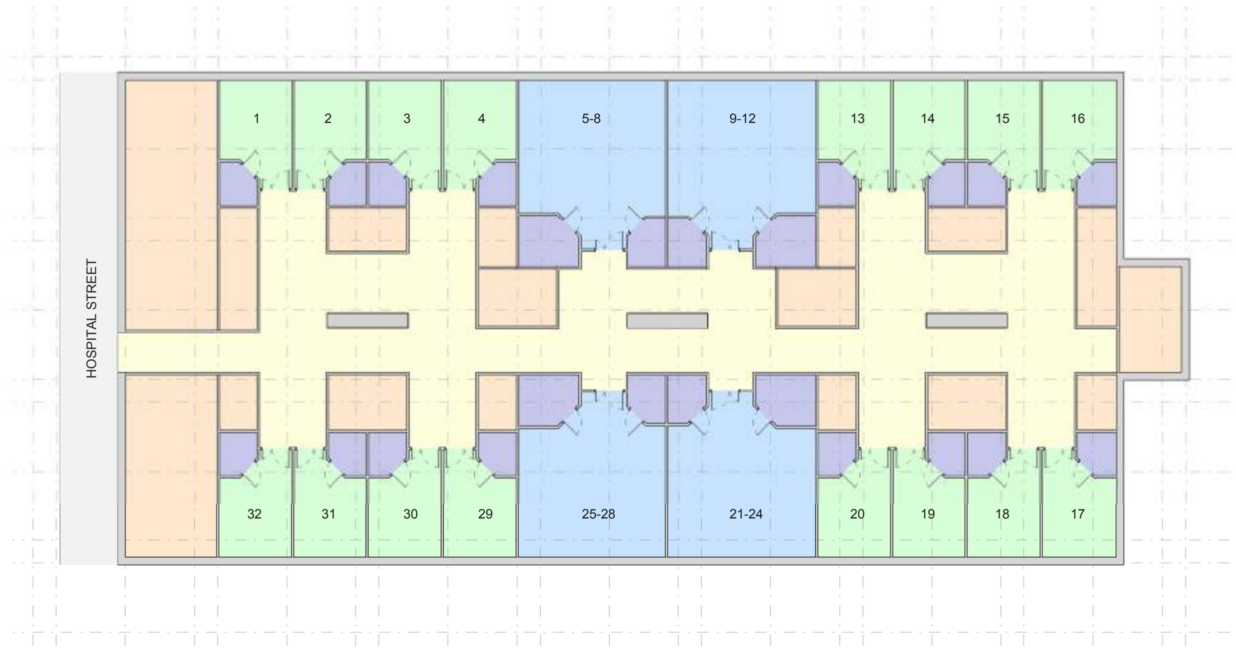


CCU ISOLATION ROOMS WITH SHARED LOBBY

DEPARTMENT LEGEND

- DEPARTMENTAL CIRCULATION
- EN-SUITE FACILITIES
- FOUR BED ROOM
- SINGLE BED ROOM
- STAFF BASE
- SUPPORT ACCOMMODATION

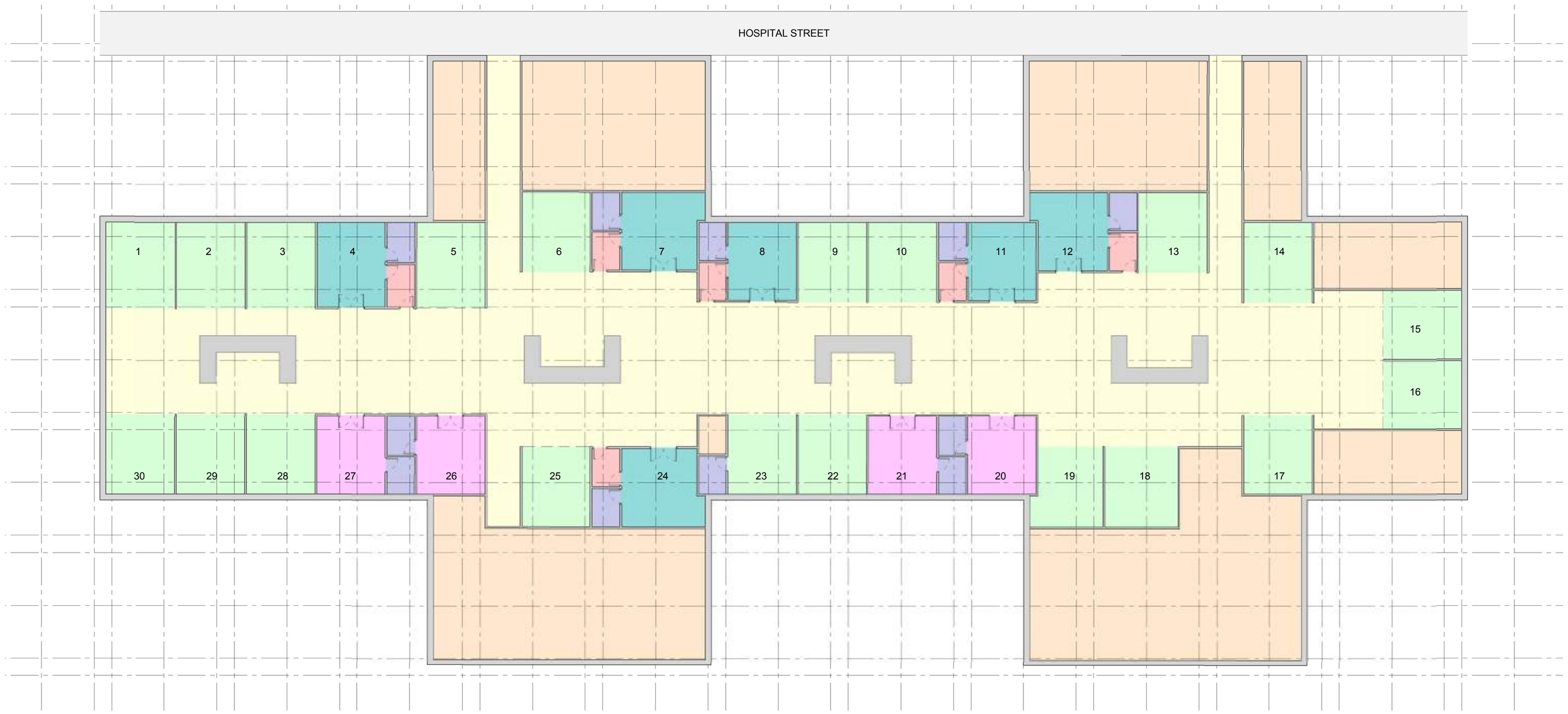
General Ward - Cruciform Option



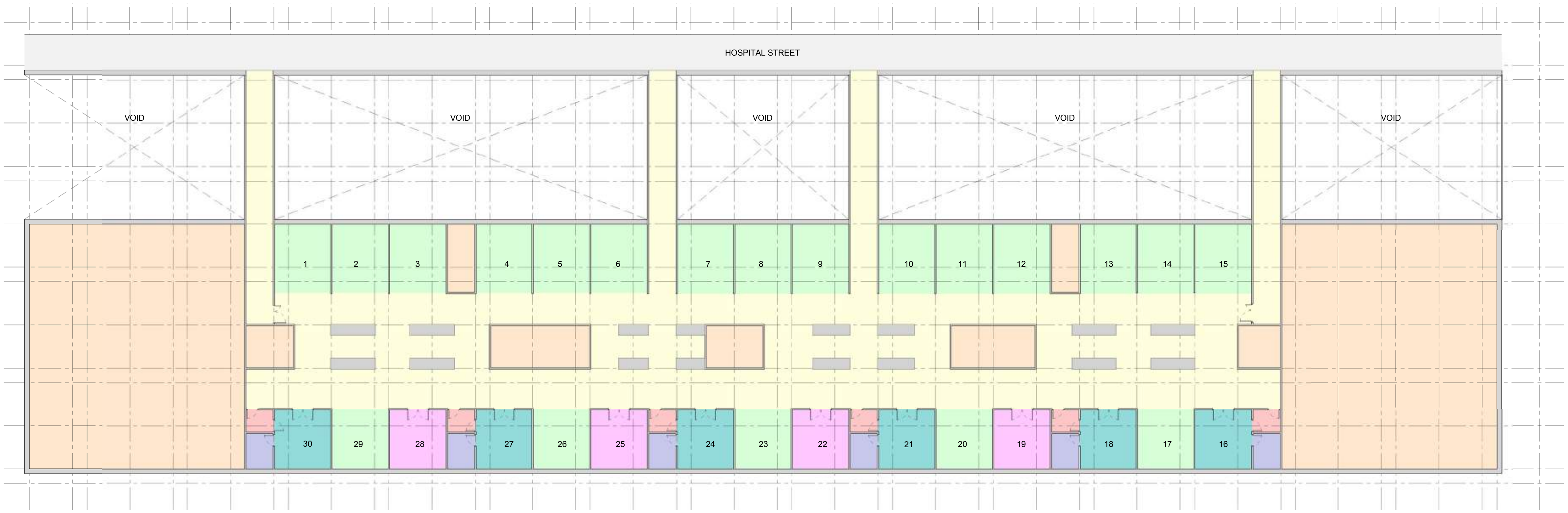
General Ward - Linear Option

DEPARTMENT LEGEND

- DEPARTMENTAL CIRCULATION
- EN-SUITE FACILITIES
- ISOLATION LOBBY
- ISOLATION ROOM
- SINGLE BED BAY
- SINGLE BED ROOM
- STAFF BASE
- SUPPORT ACCOMMODATION



CCU - OPTION 1

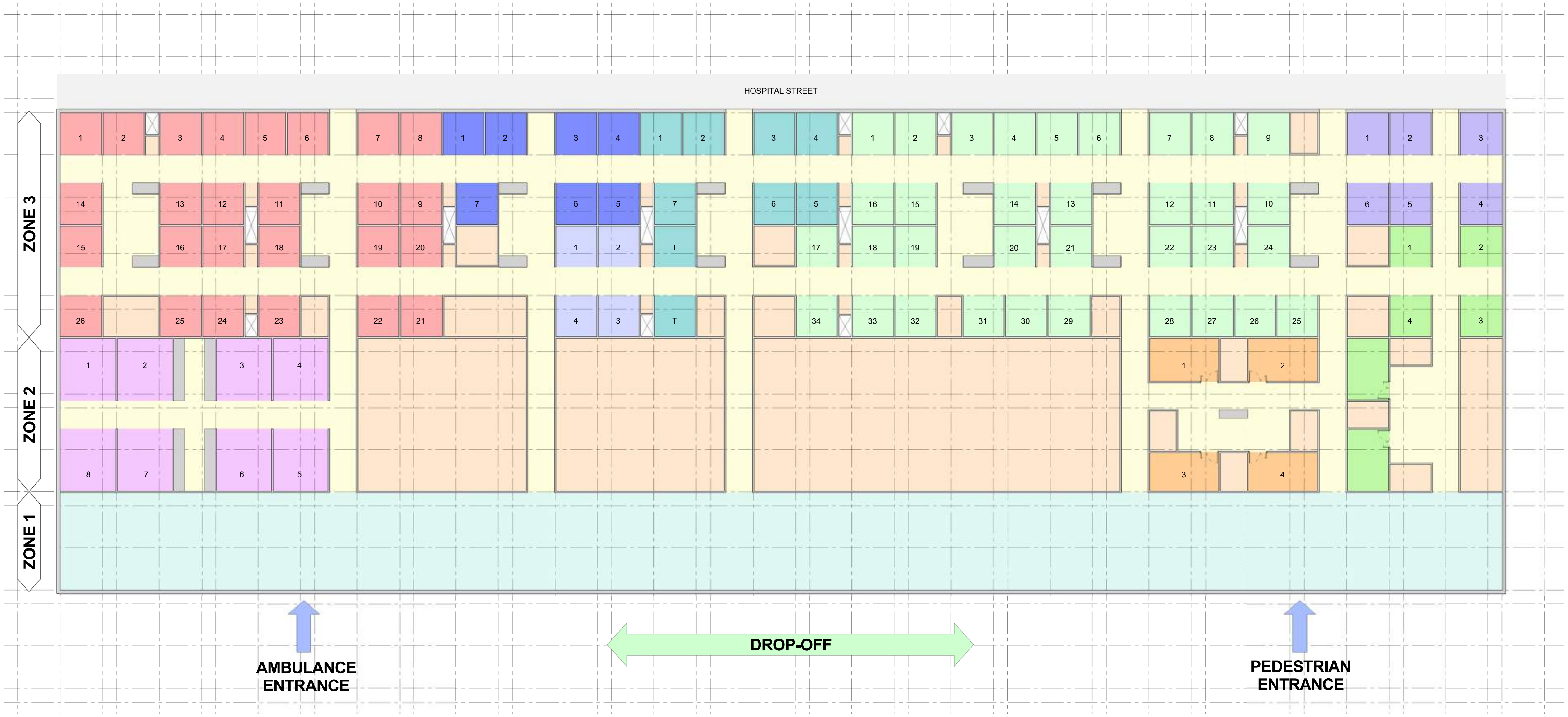


CCU - OPTION 2

DEPARTMENT LEGEND

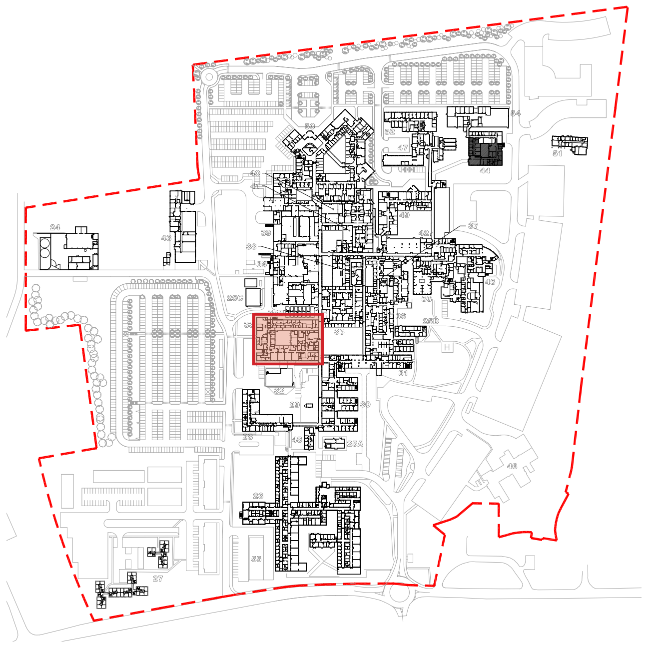
- AMBULATORY EMERGENCY CARE
- AMBULATORY EMERGENCY CARE DAYCASE
- ASSESSMENT / CONSULT EXAM SUITE
- CHILDRENS MAJOR
- CHILDRENS MINOR
- CLINICAL DECISIONS UNIT
- DEPARTMENTAL CIRCULATION
- EMERGENCY DEPARTMENT
- ENTRANCE / WAITING / DISCHARGE
- RESUSCITATION
- STAFF BASE
- SUPPORT
- URGENT CARE CENTRE

- ZONE 1 ENTRANCE / STREAMING / WAITING DISCHARGE.
- ZONE 2 SHARED CLINICAL SUPPORT / PROCEDURE ROOMS (HIGH SERVICE IMPACT, FIXED WALLS)
- ZONE 3 MODULAR CUBICLE SPACE (FLEXIBLE USE TO COPE WITH SERVICE DEMAND CHANGE)

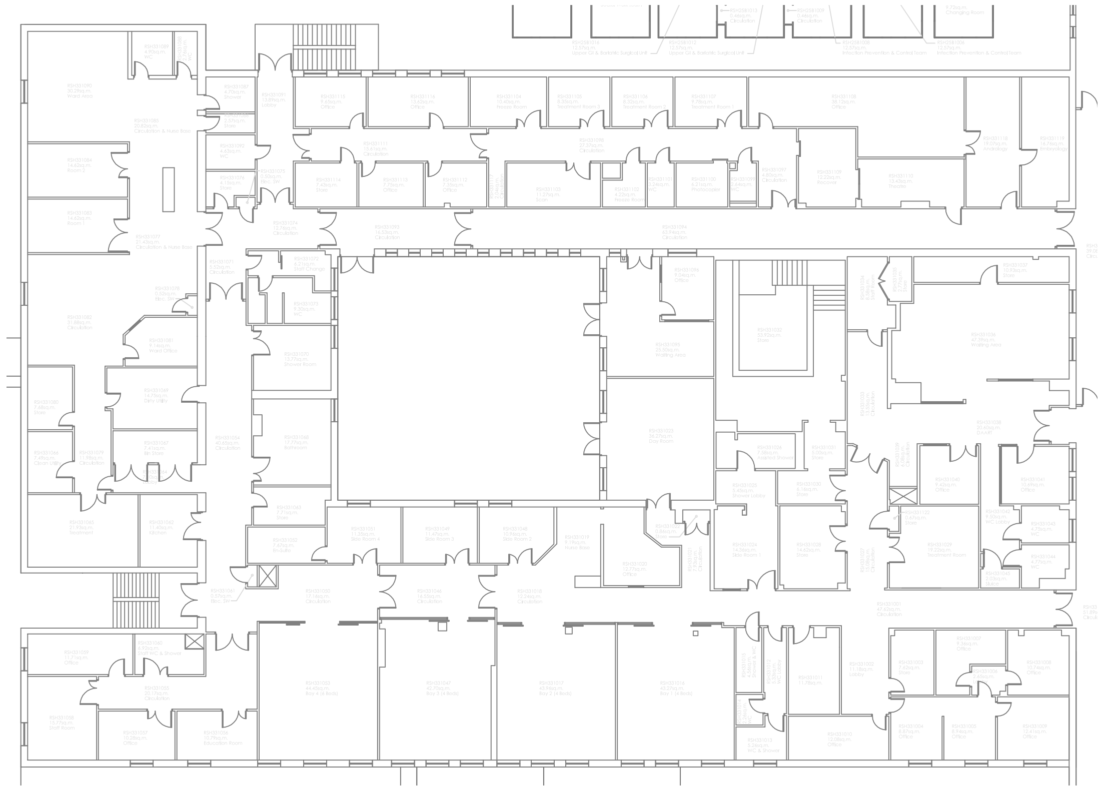


DEPARTMENT LEGEND

- DEPARTMENTAL CIRCULATION
- EN-SUITE FACILITIES
- FOUR BED ROOM
- SINGLE BED ROOM
- STAFF BASE
- SUPPORT ACCOMMODATION



WARD 32 LOCATION AT RSH



EXISTING WARD 32 LAYOUT

POTENTIAL WARD 32 LAYOUT

4.0 ROOM LAYOUTS

Wherever possible the design will utilise the Repeatable Rooms developed as part of the P21 process. The single and 4 bed inpatient room designs will be the base components of the ward templates and the emergency department cubicles, will form the basis of discussions with the clinical teams. The Consult/ Exam Configurations will be used throughout a number of departments.

This strategy of developing a standard room configuration which can significantly reduce the amount of user and design team consultation time, create standardisation across the estate, and offer procurement savings offers clear benefits, and the design team will be developing further repeatable rooms for use on this project, which have not yet been produced by the P21 Team. For example:

- Clean Utility
- Dirty Utility
- Near Patient Testing
- Pantry's and Beverage Bays
- Assisted Bathroom
- WC's
- Cleaner's Room
- Disposal Hold
- Linen Store
- 1 person office

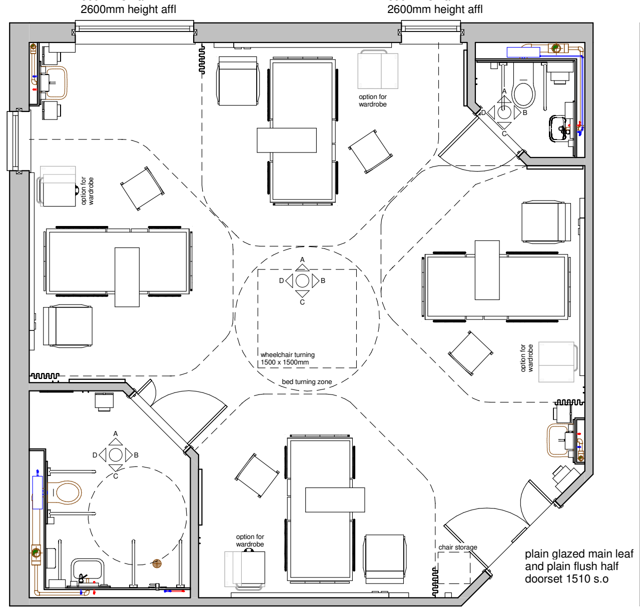
To obtain further benefits, the scheme will, wherever possible utilise the P21 Standard components. The principles of this will be expanded by the design team to produce Standard Assemblies which can be utilised across the scheme. Examples of components where Standard Assemblies could be developed are:

- Clinical Handwash
- Vanity Units
- Headwalls
- Fixed Cupboard Configurations
- Staff Bases
- Vertical & Horizontal Trunking

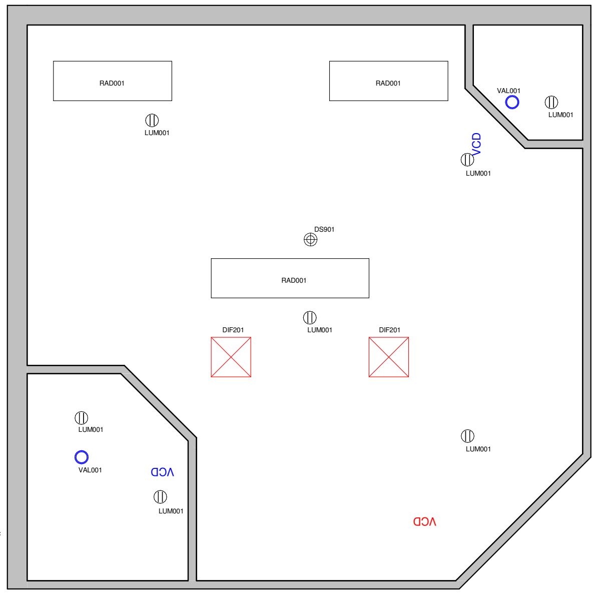
1800mm wide x 2000mm high
600mm sill affl
2600mm height affl

900mm wide x 2000mm high
600mm sill affl
2600mm height affl

900mm wide x 2000mm high
600mm sill affl
2600mm height affl

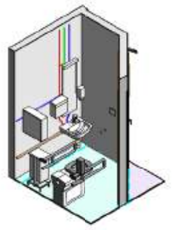


ROOM PLAN

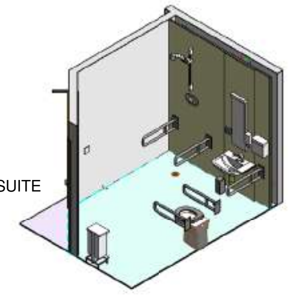


CEILING PLAN

3D VIEW MULTI BED BAY

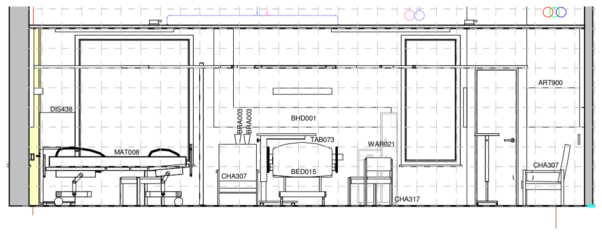


3D VIEW WC

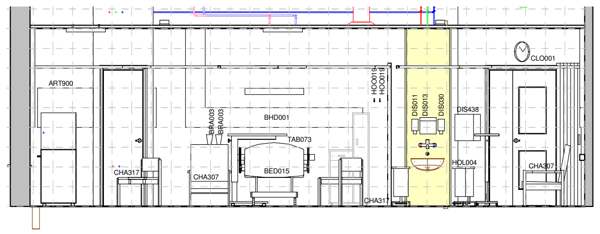


3D VIEW ENSUITE

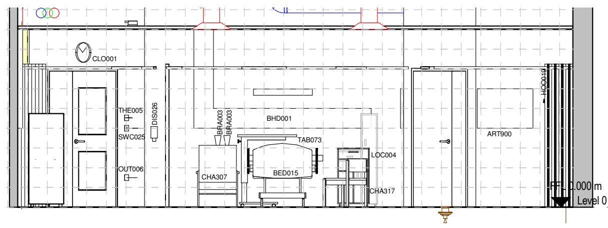
MULTI BED BAY (DIAMOND)



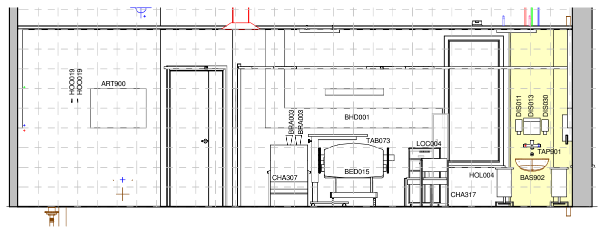
ELEVATION A



ELEVATION B

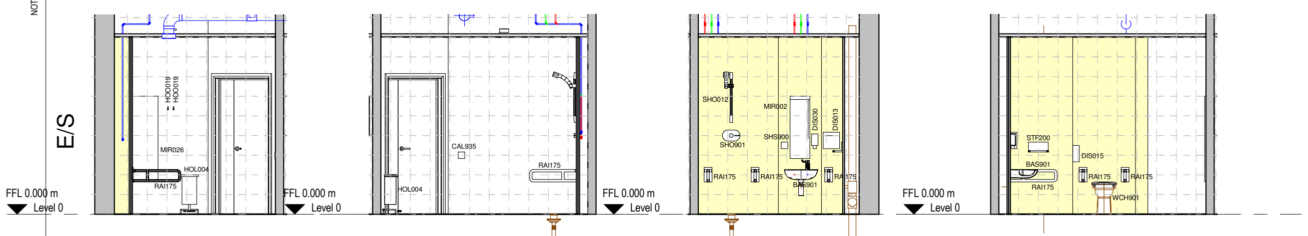


ELEVATION C



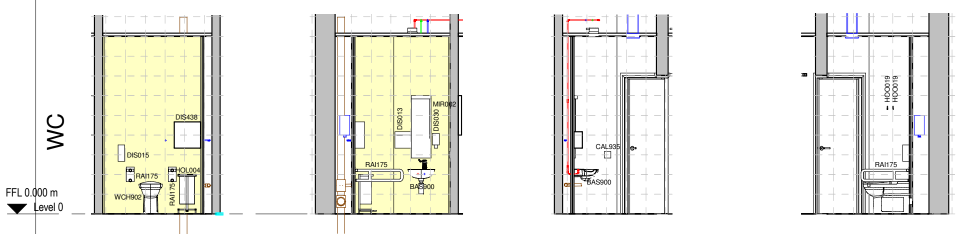
ELEVATION D

E/S

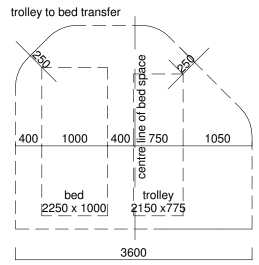


ELEVATION A ELEVATION B ELEVATION C ELEVATION D

WC



ELEVATION A ELEVATION B ELEVATION C ELEVATION D



Multi Bed Bay FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	4
BBF900	Bed Head Buffer, Vertical	1	4
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	4
BRA003	BRACKET, holder, suction unit, wall mounted	2	8
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	4
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	4
CLO001	CLOCK battery, wall mounted	3	1
CUR900	Curtain Rail	1	4
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	2
DIS013	DISPENSER, paper towel, wall mounted	2	2
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	2
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	2
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	4
HOO019	HOOK, single, small, wall mounted	1	6
LOC004	LOCKER, bedside, 4 compartment with lockable section /drawer, towel rail at rear, lockable drugs cabinet inside, on castors, 902H 485W 485D	3	2
MAT008	MATTRESS, suitable for BED015	3	4
RAI001	Railing (To Suit Length)	1	4
TAB073	TABLE, overbed, cantilevered	3	4
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	4

WC FF&E Schedule

Code	Description	Group	Count
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	2

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

MEP Schedule

Code	Description	Group	Count
BAS900	Portman 21 Washbasin 40cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	2
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	4
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	2
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	2
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	1
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	2
THE005	Thermostat wall mounted	1	1
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	1
WCH902	Contour 21 back to wall rimless raised height WC pan, 70cm projection with horizontal outlet	1	1

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
- HBN compliance
- Adult acute in-patient room, excl bariatric, paediatric and maternity
- Local storage external to the room
- Patients may be of high acuity requiring observation inside and outside the room
- Patients may be elderly and/or confused/have dementia

Area:-
- Bedroom nia 58.5 sqm
- En-Suite nia 6.3 sqm
- En-Suite WC nia 1.9 sqm
- Ips 1.8 sqm
- Corridor run 2500mm

Enhancements/Local Choice:-
- Patient entertainment system
- Ceiling mounted overhead hoist
- Locker with hanging space shown outlined
- Horizontal windows above bed space 2 and 3
- Window Curtains & Openings
- Shower Curtains

Note: Partition thickness assumed 125mm

REV	COMMENT					
6	M&E ADDED					
	JT	03.09.15	GB	03.09.15	GB	03.09.15
REV	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A1	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROCURE 21 +

PROJECT

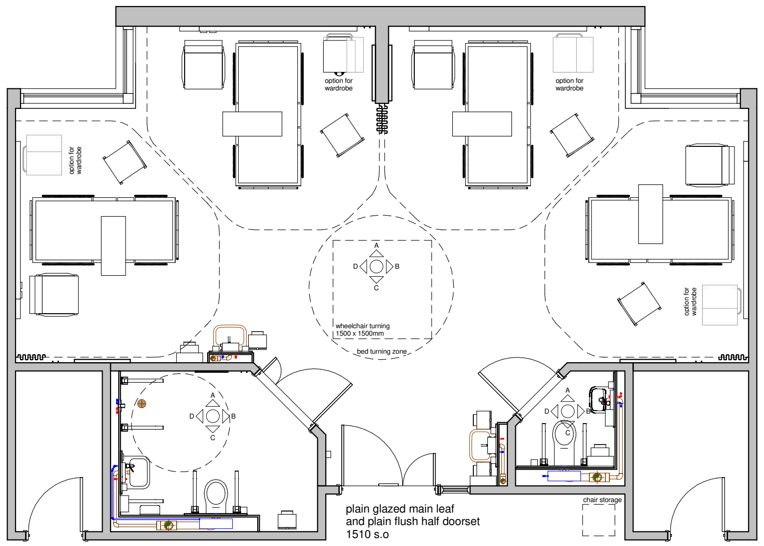
P21+ Repeatable Rooms

TITLE

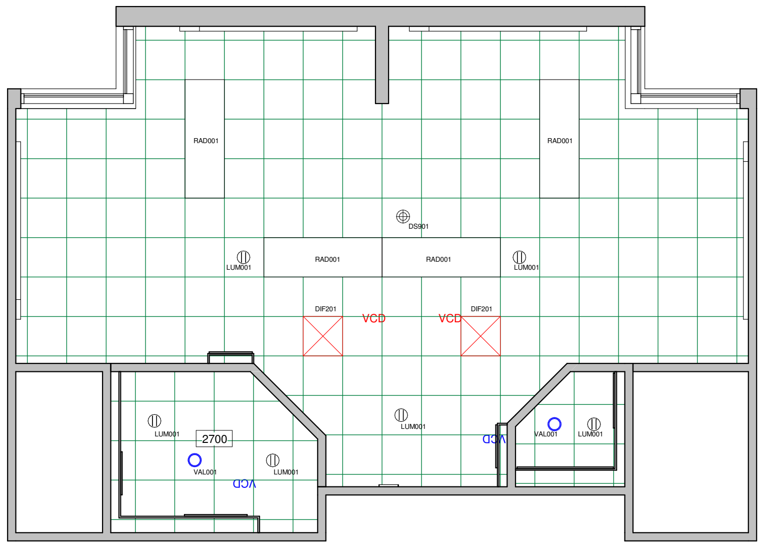
Multi Bed Bay Diamond Configuration

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0001	6



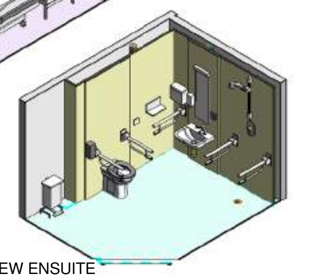
ROOM PLAN



CEILING PLAN

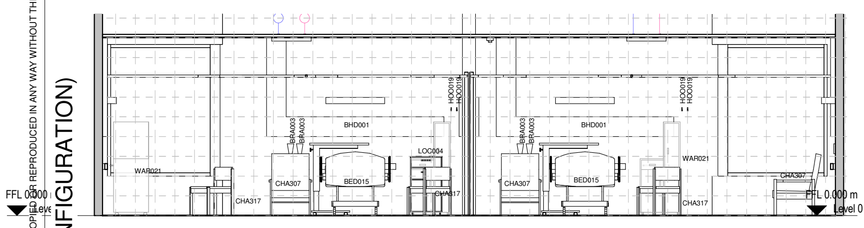
3D VIEW MULTI BED BAY

3D VIEW WC



3D VIEW ENSUITE

MULTI BED BAY (T CONFIGURATION)



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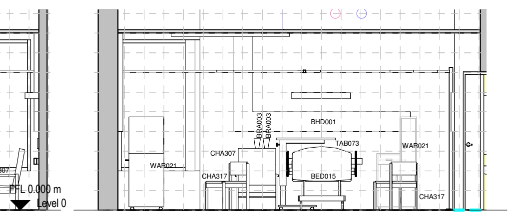
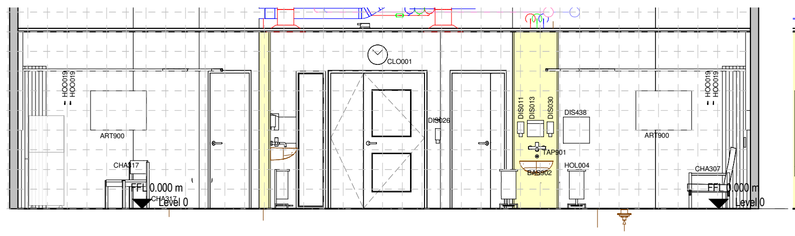


ELEVATION B



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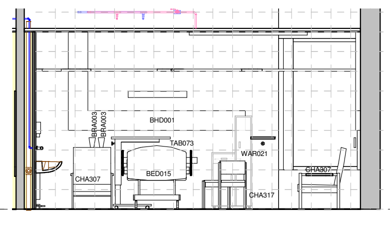
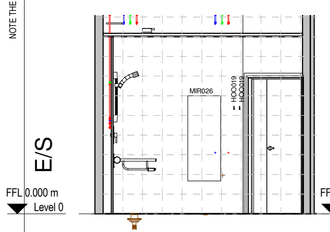


ELEVATION D

E/S



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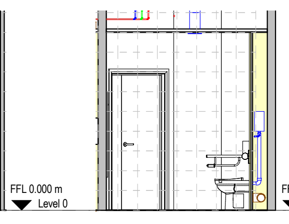

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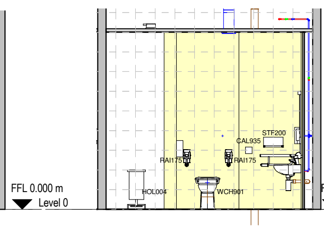

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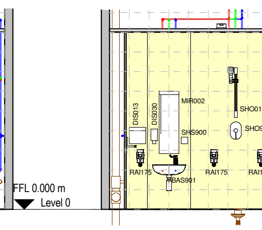
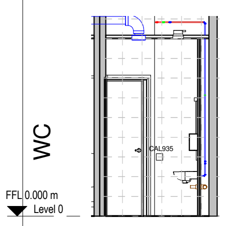


ELEVATION D

WC



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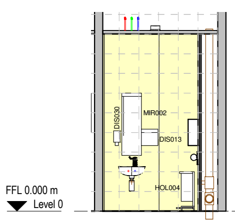

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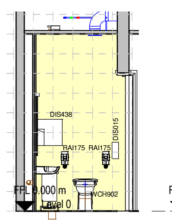
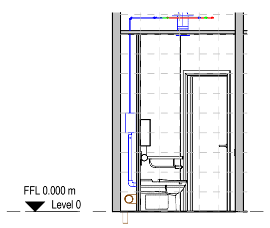
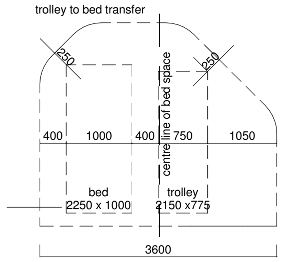


ELEVATION C



ELEVATION D



Multi-Bed Bay FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	4
BBF900	Bed Head Buffer, Vertical	1	4
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	4
BRA003	BRACKET, holder, suction unit, wall mounted	2	8
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	4
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	4
CLO001	CLOCK battery, wall mounted	3	1
CUR900	Curtain Rail	1	4
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	2
DIS013	DISPENSER, paper towel, wall mounted	2	2
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	2
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	2
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	4
HOO019	HOOK, single, small, wall mounted	1	8
LOC004	LOCKER, bedside, 4 compartment with lockable section /drawer, towel rail at rear, lockable drugs cabinet inside, on castors, 902H 485W 485D	3	1
MAT008	MATTRESS, suitable for BED015	3	4
RAI001	Railing (To Suit Length)	1	4
TAB073	TABLE, overbed, cantilevered	3	4
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	4

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	Hinged Grab Rail	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

WC FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
MIR002	MIRROR, wall mounted, 900H 300W	1	1
RAI175	Hinged Grab Rail	1	2

MEP Schedule

Code	Description	Group	Count
BAS900	Portman 21 Washbasin 40cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	2
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	4
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	2
DIF201	Supply Diffuser 250 diameter connection	1	2
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	2
LUM001	Nightingale LED	1	6
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
RAD001	Radiant Panel	1	4
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	1
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	2
THE005	Thermostat wall mounted	1	1
VAL001	Air Valve	1	2
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	1
WCH902	Contour 21 back to wall rimless raised height WC pan, 70cm projection with horizontal outlet	1	1

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
- HBN compliance
- Adult acute in-patient room, excl bariatric, paediatric and maternity
- Local storage external to the room
- Patients may be of high acuity requiring observation inside and outside the room
- Patients may be elderly and/or confused/have dementia

Area:-
- Bedroom nia 58.4 sqm
- En-Suite nia 6.3 sqm
- En-Suite WC nia 1.9 sqm
- Ips 1.8 sqm
- Corridor run 11150mm

Enhancements/Local Choice:-
- Patient entertainment system
- Ceiling mounted overhead hoist
- Locker with hanging space shown outlined
- Window Curtains & Openings
- Shower Curtains

Note: Partition thickness assumed 125mm

REV	COMMENT / DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
5	AMENDED TO DK COMMENTS					
	JT	18.08.15	GB	18.08.15	GB	18.08.15

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A1	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROJECT

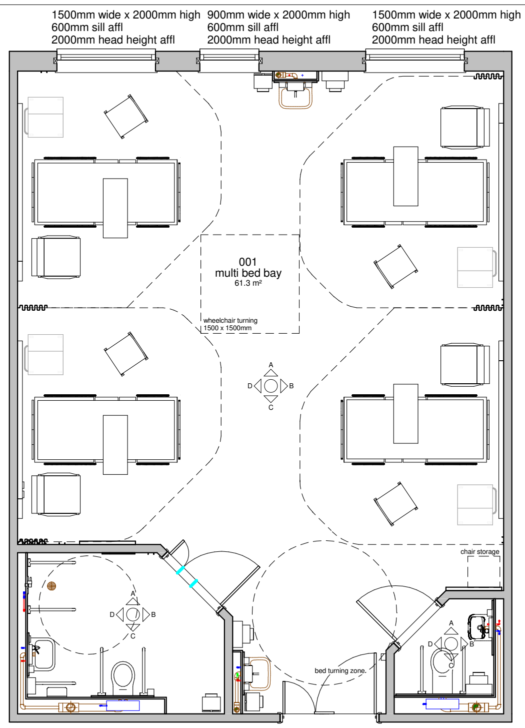
P21+ Repeatable Rooms

TITLE

Multi Bed Bay T Configuration

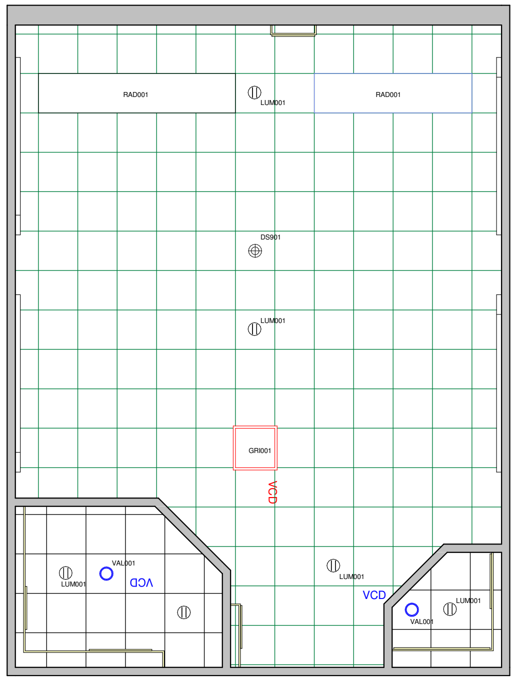
CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0002	6



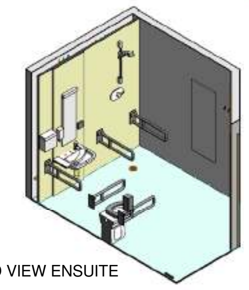
ROOM PLAN

plain glazed main leaf
and plain flush half doorset
1510 s.o



CEILING PLAN

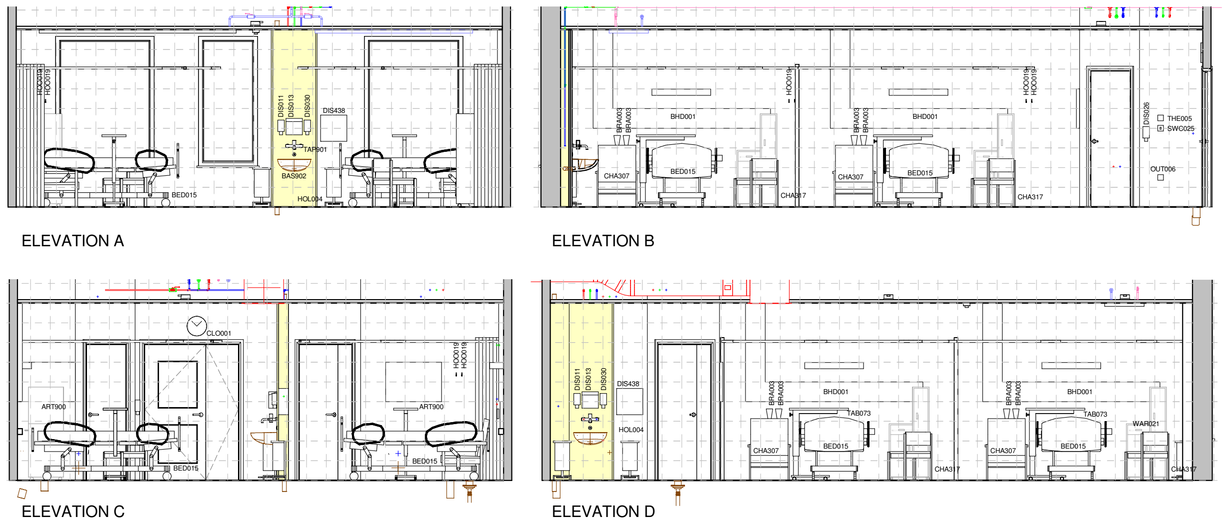
3D VIEW MULTI BED BAY



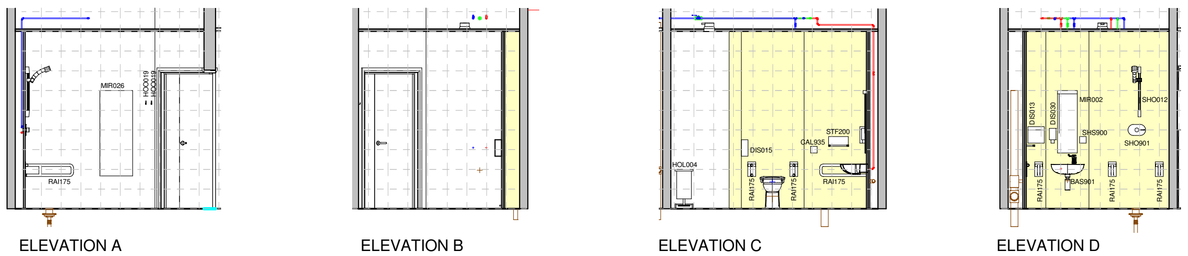
3D VIEW ENSUITE

3D VIEW WC

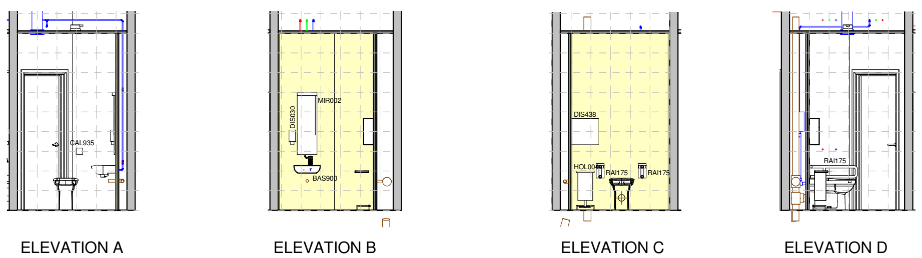
MULTI BED BAY (TRADITIONAL)

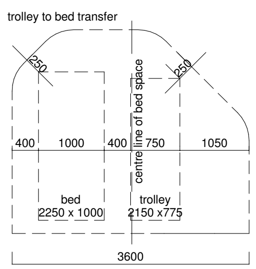


E/S



WC





Multi-Bed Bay FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	2
BBF900	Bed Head Buffer, Vertical	1	4
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	4
BRA003	BRACKET, holder, suction unit, wall mounted	2	8
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	4
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	4
CLO001	CLOCK battery, wall mounted	3	1
CUR900	Curtain Rail	1	4
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	2
DIS013	DISPENSER, paper towel, wall mounted	2	2
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	2
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	2
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	4
HOO019	HOOK, single, small, wall mounted	1	8
MAT008	MATTRESS, suitable for BED015	3	4
RAI001	Railing (To Suit Length)	1	4
TAB073	TABLE, overbed, cantilevered	3	4
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	4

WC FF&E Schedule

Code	Description	Group	Count
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
MIR002	MIRROR, wall mounted, 900H 300W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	2

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

MEP Schedule

Code	Description	Group	Count
BAS900	Portman 21 Washbasin 40cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	2
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	4
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	2
DS901	Smoke Detector	1	1
GRI001	Grille	1	1
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	2
LUM001	Nightingale LED	1	6
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
RAD001	Radiant Panel	1	2
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	1
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	2
THE005	Thermostat wall mounted	1	1
VAL001	Air Valve	1	2
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	1
WCH902	Contour 21 back to wall rimless raised height WC pan, 70cm projection with horizontal outlet	1	1

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
- HBN compliance
- Adult acute in-patient room, excl bariatric, paediatric and maternity
- Local storage external to the room
- Patients may be of high acuity requiring observation inside and outside the room
- Patients may be elderly and/or confused/have dementia

Area:-
- Bedroom nia 61.3 sqm
- En-Suite nia 6.3 sqm
- En-Suite WC nia 1.9 sqm
- Ips 1.8 sqm
- Corridor run 7400mm

- Enhancements/Local Choice:-
- Patient entertainment system
- Ceiling mounted overhead hoist
- Locker with hanging space shown outlined
- Windows Curtains & Openings
- Shower Curtains

Note: Partition thickness assumed 125mm

REV	COMMENT / DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
5	AMENDED TO DK COMMENTS					
	JT	18.08.15	GB	18.08.15	GB	18.08.15

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A1	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROJECT

P21+ Repeatable Rooms

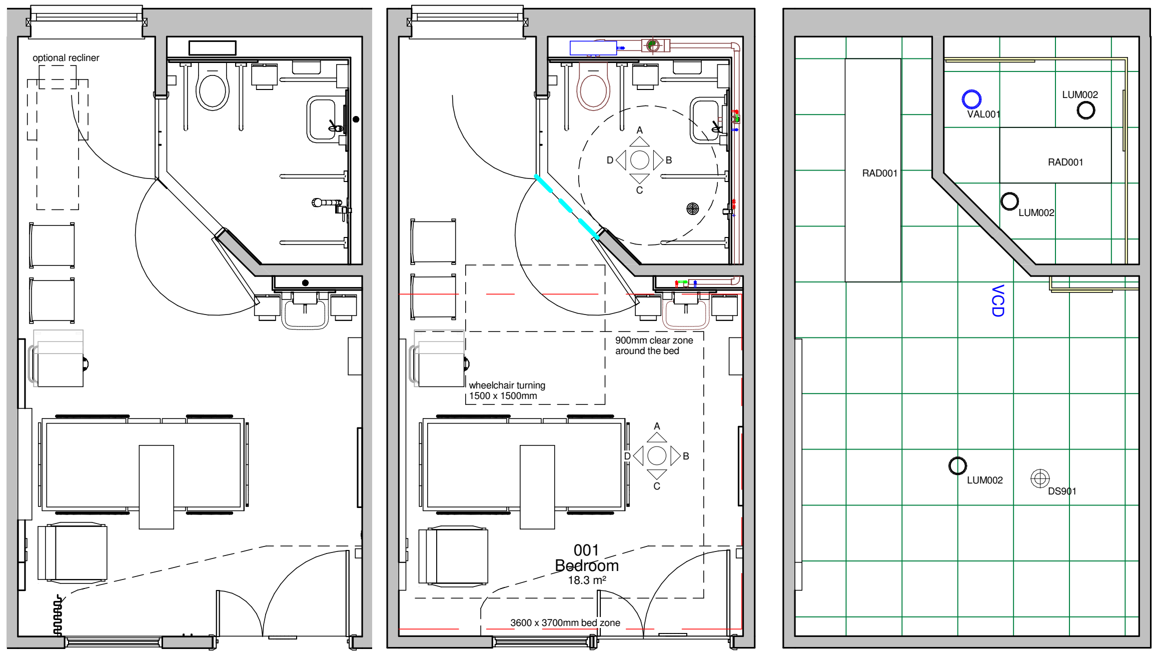
TITLE

Multi Bed Bay Traditional

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0003	6

1200mm wide x 2000mm high
600mm sill affl
2600 head height affl



alternative screen location for refurbishment

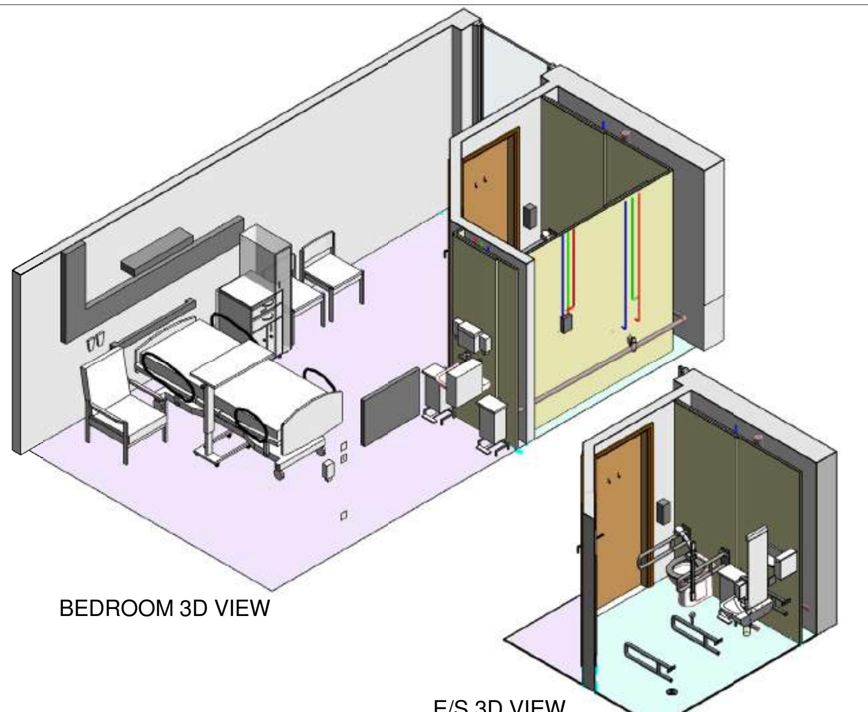
door open

plain flush leaf and half doorset 1510 s.o

door closed

ROOM PLAN

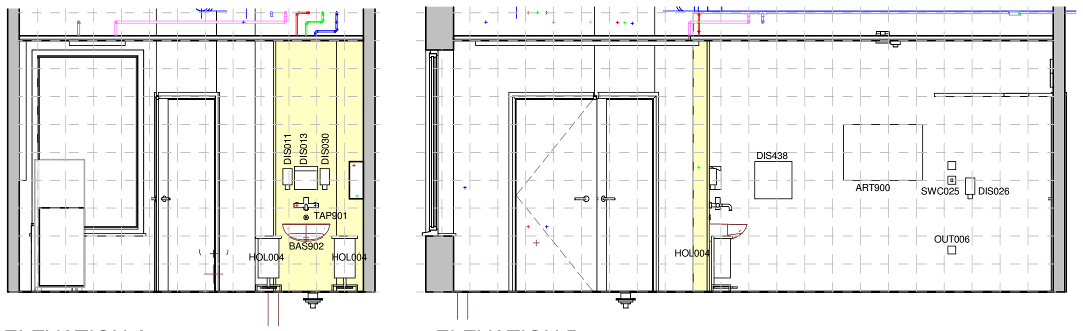
CEILING PLAN



BEDROOM 3D VIEW

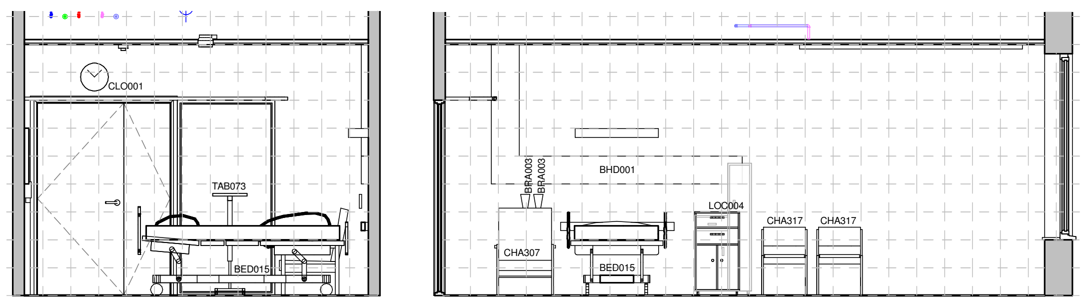
E/S 3D VIEW

SINGLE BEDROOM OUTBOARD



ELEVATION A

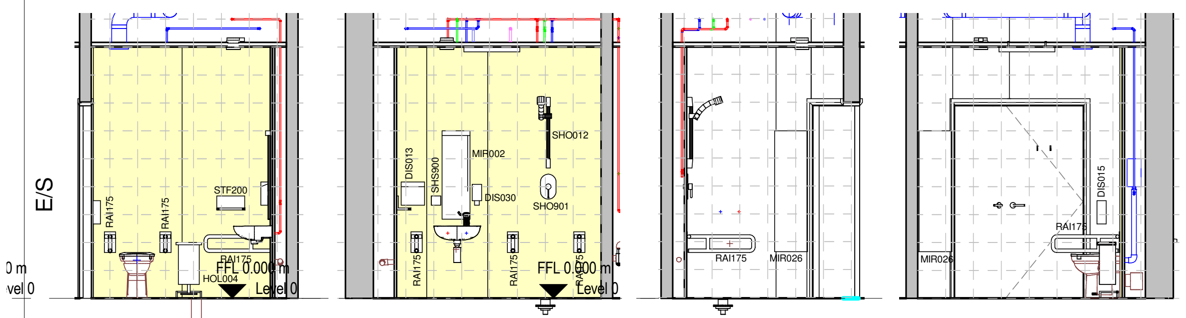
ELEVATION B



ELEVATION C

ELEVATION D

E/S



ELEVATION A

ELEVATION B

ELEVATION C

ELEVATION D

Bedroom FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	1
BBF900	Bed Head Buffer, Vertical	1	1
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	1
BRA003	BRACKET, holder, suction unit, wall mounted	2	2
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	1
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
IPS016	IPS Panel	1	1
LOC004	LOCKER, bedside, 4 compartment with lockable section /drawer, towel rail at rear, lockable drugs cabinet inside, on castors, 902H 485W 485D	3	1
LUM002	Mirage LED	1	1
MAT008	MATTRESS, suitable for BED015	3	1
TAB073	TABLE, overbed, cantilevered	3	1
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	1

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
IPS017	IPS Panel	1	1
LUM002	Mirage LED	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

MEP Schedule

Code	Description	Group	Count
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	1
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	1
DS901	Smoke Detector	1	1
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	1
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
RAD001	Radiant Panel	1	2
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	1
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	1
THE005	Thermostat wall mounted	1	1
VAL001	Air Valve	1	1
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	1
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	1

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

REV	COMMENT					
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF

A - NO COMMENTS

B - MINOR COMMENTS

C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROCURE 21 +

PROJECT

P21+ Repeatable Rooms

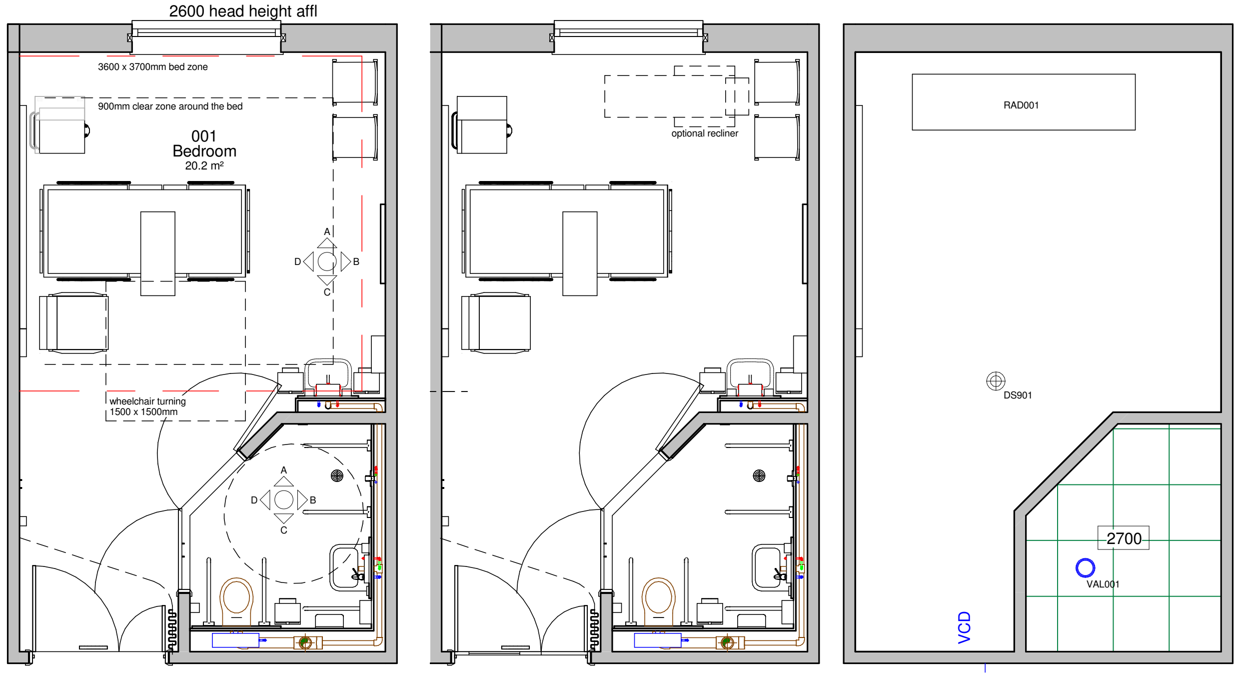
TITLE

Single Bedroom Outboard

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0004	6

1600mm wide x 2000mm high
600 sill affl
2600 head height affl



plain glazed full leaf (obscurable) and a plain flush half doorset 1510mm s.o

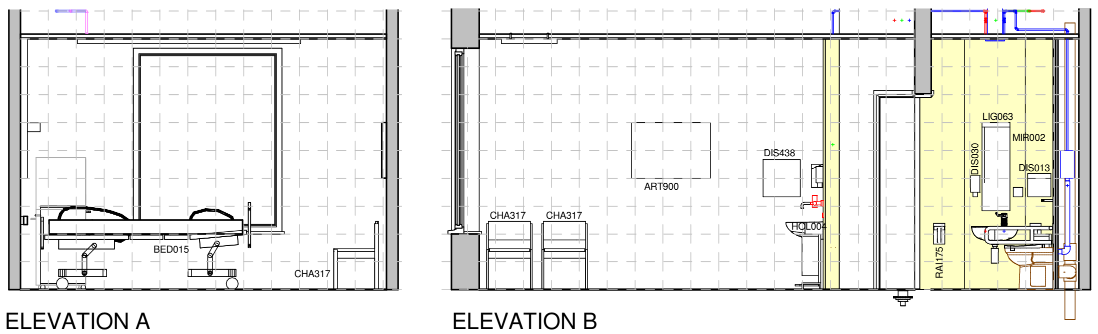
ROOM PLAN

CEILING PLAN

3D VIEW BEDROOM

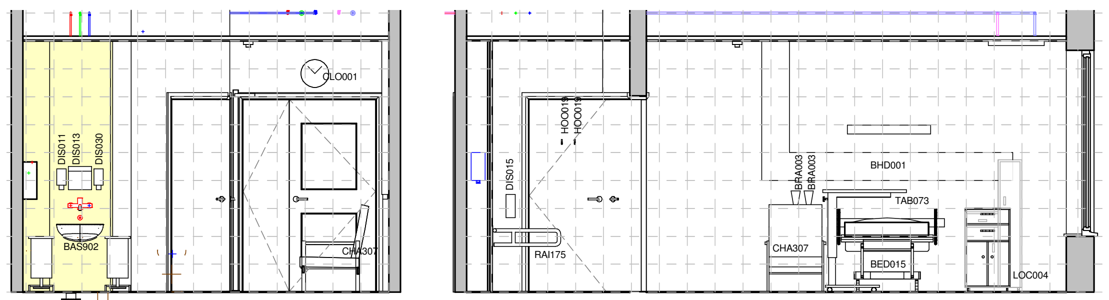
3D VIEW ENSUITE

SINGLE BEDROOM INBOARD



ELEVATION A

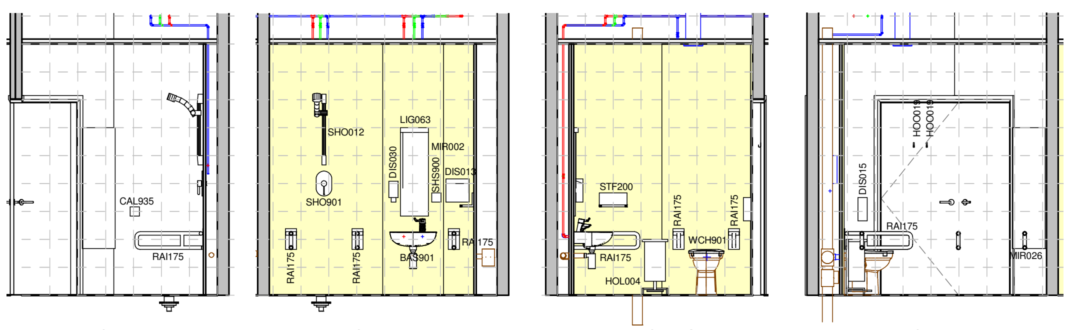
ELEVATION B



ELEVATION C

ELEVATION D

E/S



ELEVATION A

ELEVATION B

ELEVATION C

ELEVATION D

Bedroom FF&E Schedule

Code	Description	Group	Count
			1
ART900	Artwork	3	1
BBF900	Bed Head Buffer, Vertical	1	1
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	1
BRA003	BRACKET, holder, suction unit, wall mounted	2	2
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	1
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
CUR900	Curtain Rail	1	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
HOO019	HOOK, single, small, wall mounted	1	2
LOC004	LOCKER, bedside, 4 compartment with lockable section /drawer, towel rail at rear, lockable drugs cabinet inside, on castors, 902H 485W 485D	3	1
MAT008	MATTRESS, suitable for BED015	3	1
RAI001	Railing (To Suit Length)	1	1
TAB073	TABLE, overbed, cantilevered	3	1
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	1

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	1
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

MEP Schedule

Code	Description	Group	Count
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	1
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	1
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	1
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	1
DS901	Smoke Detector	1	1
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	1
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
RAD001	Radiant Panel	1	1
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	1
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	1
THE005	Thermostat wall mounted	1	1
VAL001	Air Valve	1	1
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	1
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	1

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
- HBN compliance
- Adult acute in-patient room, excl bariatric, paediatric and maternity
- Local storage external to the room
- Patients may be of high acuity requiring observation inside and outside the room
- Patients may be elderly and/or confused/have dementia

Area:-
- Bedroom nia 20.1 sqm
- En-Suite nia 3.8 sqm
- Ips 1 sqm

Enhancements/Local Choice:-
- Patient entertainment system
- Ceiling mounted overhead hoist
- Locker with hanging space shown dotted
- Window Curtains & Openings
- Shower Curtains

Note: Partition thickness assumed 125mm

REV	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
	COMMENT					

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
A - NO COMMENTS
B - MINOR COMMENTS
C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

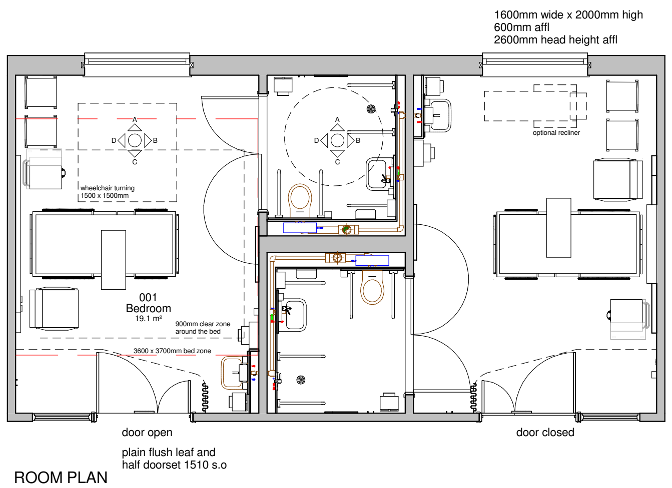
PROCURE 21 +

PROJECT
P21+ Repeatable Rooms

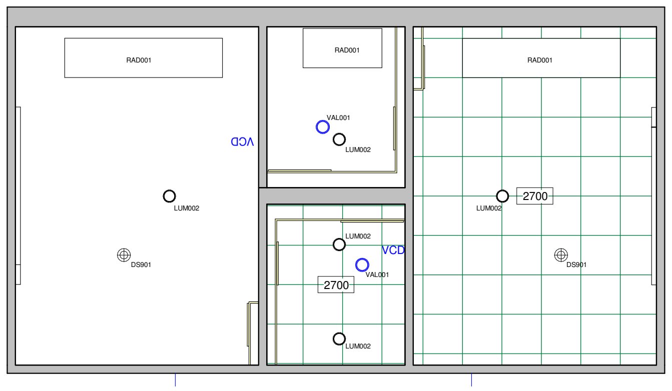
TITLE
Single Bedroom Inboard

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0005	6

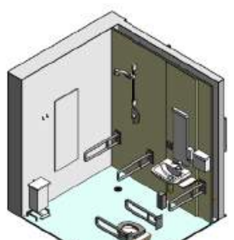


ROOM PLAN



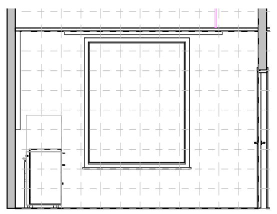
CEILING PLAN

3D VIEW BEDROOM

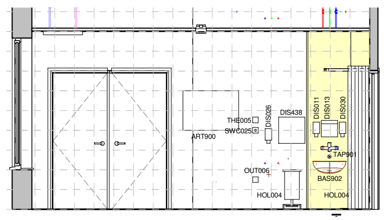


3D VIEW ENSUITE

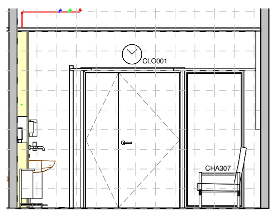
SINGLE BEDROOM NESTED



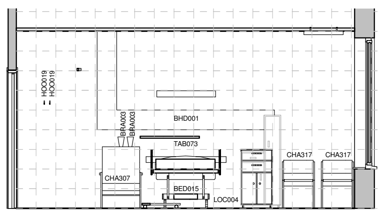
ELEVATION A



ELEVATION B

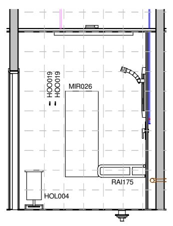


ELEVATION C

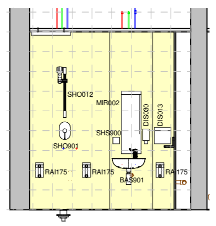


ELEVATION D

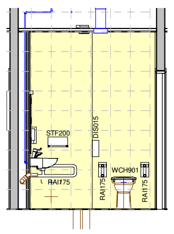
E/S



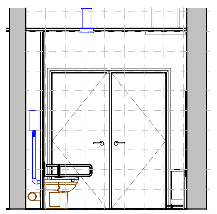
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

Bedroom FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	1
BBF900	Bed Head Buffer, Vertical	1	1
BED015	BED variable height, two-way tilt, adjustable backrest and knee-break, built-in bed extension with mattress retainer, electrically operated, on castors, 380-780H 2260/2430L 1010W	3	1
BRA003	BRACKET, holder, suction unit, wall mounted	2	2
CHA307	CHAIR, easy, high back, with open arms, upholstered, wipeable	3	1
CHA317	CHAIR, upright, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
CUR900	Curtain Rail	1	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
HOO019	HOOK, single, small, wall mounted	1	2
IPS016	IPS Panel	1	1
LOC004	LOCKER, bedside, 4 compartment with lockable section /drawer, towel rail at rear, lockable drugs cabinet inside, on castors, 902H 485W 485D	3	1
LUM002	Mirage LED	1	1
MAT008	MATTRESS, suitable for BED015	3	1
RAI001	Railing (To Suit Length)	1	1
TAB073	TABLE, overbed, cantilevered	3	1
WAR021	ROBE-LOCKER combined, with lockable section/drawer, towel rail at rear, on castors, 1430H 610W 530D (Optional)	3	1

Ensuite FF&E Schedule

Code	Description	Group	Count
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS015	DISPENSER, toilet paper, dispense individual sheets	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	1
HOO019	HOOK, single, small, wall mounted	1	2
IPS017	IPS Panel	1	1
LUM002	Mirage LED	1	2
MIR002	MIRROR, wall mounted, 900H 300W	1	1
MIR026	MIRROR, wall mounted, 1300H 500W	1	1
RAI175	RAIL, grab, hinged, wall mounted, 750mm	1	5
SHO012	SHOWER, single function shower kit, IdealSpec B9308AA	1	1
STF200	STORAGE UNIT, mid, shelf, 150H 300W 150D, HTM63	1	1
WAS105	Floor gulley to shower area	1	1

MEP Schedule

Code	Description	Group	Count
BAS901	Portman 21 Washbasin 50cm RH Taphole, No Overflow or Chainstay Hole	1	2
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	2
BHD001	BEDHEAD UNIT, horizontal with ability to incorporate right or left vertical dropper. To include: Switched 13amp twin socket 4no. 4kPa compressed air medical 1no. Oxygen medical 1no. Vacuum medical 1no. Double Data/Voice socket 1no. Patient/Nurse Emergency Call with reset and integral indicator lamp 1no. Patient/Nurse call with reassurance light 1no. Patient power (USB) 1no.	1	2
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	1
DS901	Smoke Detector	1	2
LIG063	LUMINAIRE fitted with single fluorescent lamp, 8watt, 300mm, wall mounted	1	2
OUT006	SOCKET outlet, switched, 13 amp, single	1	2
RAD001	Radiant Panel	1	3
SHO901	Contour 21 Lever Operated Concealed Thermostatic Mixer	1	2
SHS900	Shaver Socket	1	1
SWC025	SWITCH, light	1	2
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	2
THE005	Thermostat wall mounted	1	2
VAL001	Air Valve	1	2
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	2
WCH901	Contour 21 back to wall rimless raised height WC pan with horizontal outlet	1	2

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
- HBN compliance
- Adult acute in-patient room, excl bariatric, paediatric and maternity
- Local storage external to the room
- Patients may be of high acuity requiring observation inside and outside the room
- Patients may be elderly and/or confused/have dementia

Area:-
- Bedroom nia 18.9 sqm
- En-Suite nia 4.3 sqm
- Ips 1 sqm

Enhancements/Local Choice:-
- Patient entertainment system
- Ceiling mounted overhead hoist
- Locker with hanging space shown dotted
- Interstitial blind within glazed screen
- Window Curtains & Openings
- Shower Curtains

Note: Partition thickness assumed 125mm

REV	COMMENT / DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
5	AMENDED TO DK COMMENTS					
	JT	18.08.15	GB	18.08.15	GB	18.08.15

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A1	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

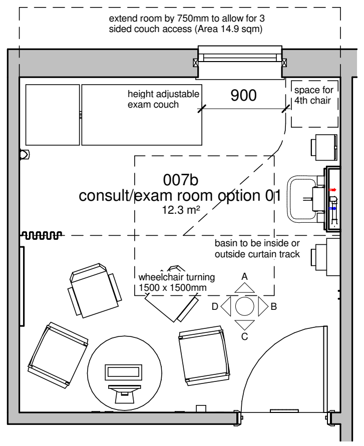
PROCURE 21 +

PROJECT
P21+ Repeatable Rooms

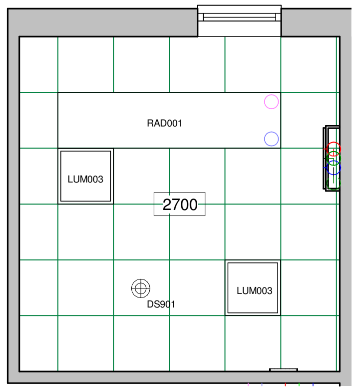
TITLE
Single Bedroom Nested

CLIENT

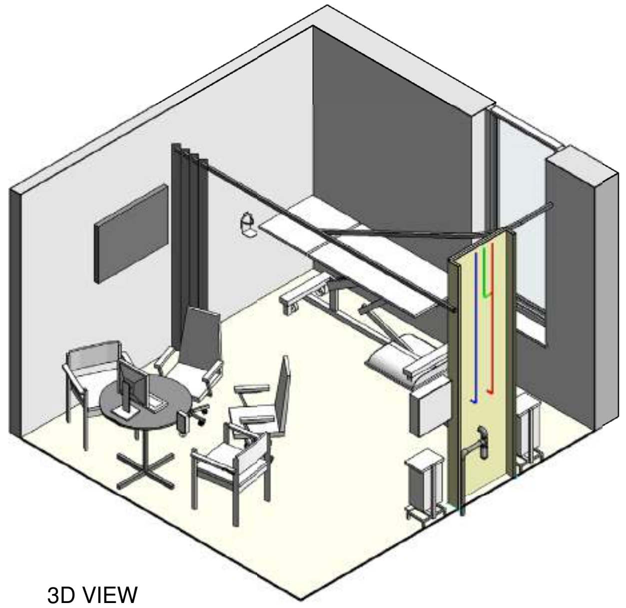
PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0006	6



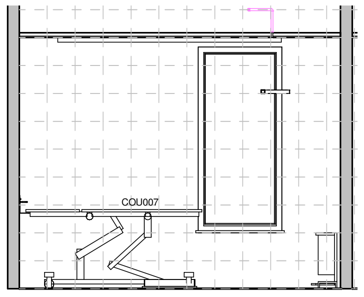
ROOM PLAN



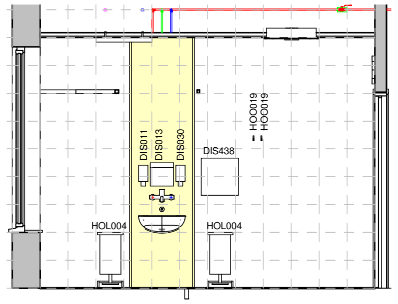
CEILING PLAN



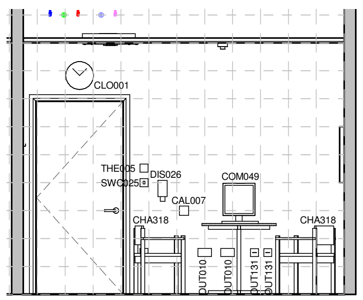
3D VIEW



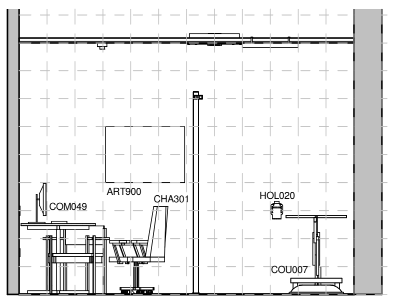
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

FF&E Schedule			
Code	Description	Group	Count
ART900	Artwork	3	1
CHA301	CHAIR, swivel, height adjustable, high back, with arms, wipeable, 5 star base, on castors	3	2
CHA318	CHAIR, upright, with arms, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
COM033	COMPUTER KEYBOARD	3	1
COM049	COMPUTER MONITOR, 17" TFT, digital flat panel display, high-resolution screens, desk top	3	1
COU007	COUCH, examination/treatment, (2 section), with paper roll holder, variable height, retractable wheels, 1890mm (l) x 650mm (w)	3	1
CUR900	Curtain Rail	1	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
HOL020	HOLDER, sharps box, up to 7 litre capacity, rail/trolley hang or wall mounted, 170H 125W 100D	2	1
HOO019	HOOK, single, small, wall mounted	1	2
IPS003	IPS Panel	1	1
RAI001	Railing (To Suit Length)	1	1
TAB912	TABLE, circular, 760H 800mm dia.	3	1

MEP Schedule			
Code	Description	Group	Count
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	1
CAL007	PULL/PUSH BUTTON, staff emergency call, reset and integral/adjacent indicator lamp	1	1
DS901	Smoke Detector	1	1
LUM003	Lister 2 LED 600	1	2
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
OUT010	SOCKET outlet, switched, 13 amp, twin	1	2
RAD001	Radiant Panel	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	1
THE005	Thermostat wall mounted	1	1
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	1

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

REV	COMMENT					
6	M&E ADDED					
	JT	02.09.15	GB	02.09.15	GB	02.09.15
REV	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF

- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROCURE 21 +

PROJECT

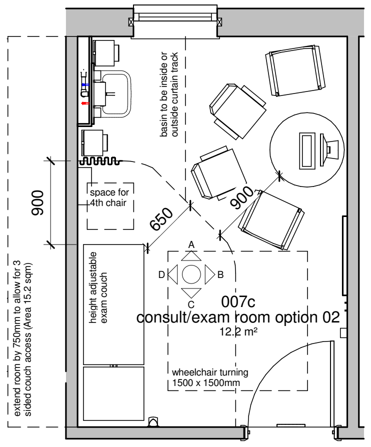
P21+ Repeatable Rooms

TITLE

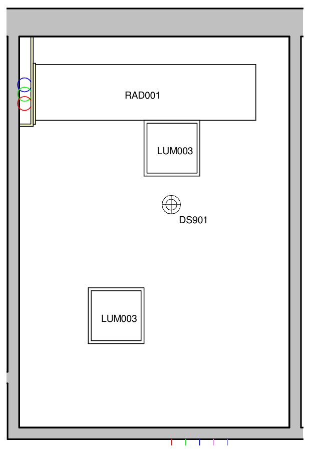
Consult/Exam Room Option 1

CLIENT

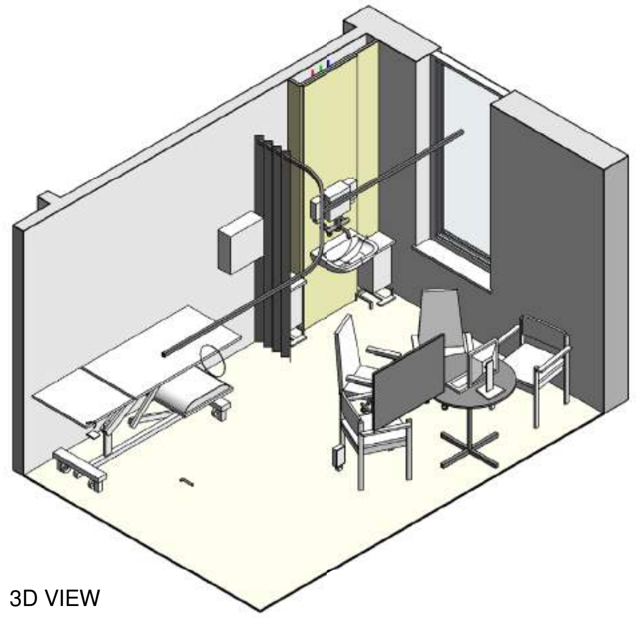
PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0007	6



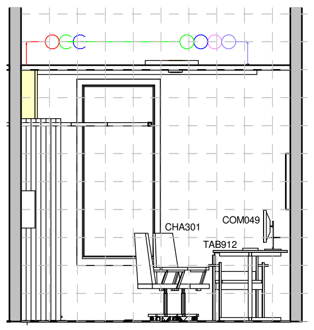
FLOOR PLAN



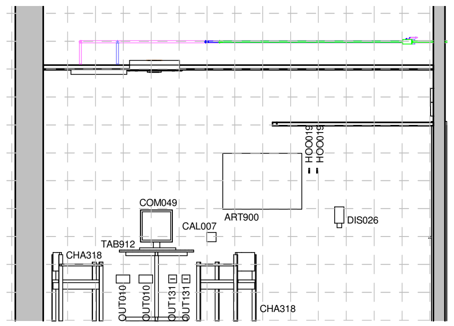
CEILING PLAN



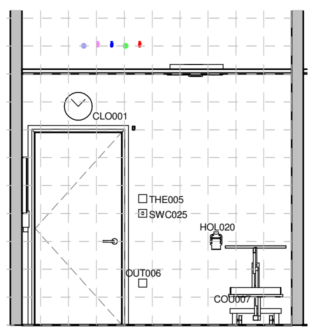
3D VIEW



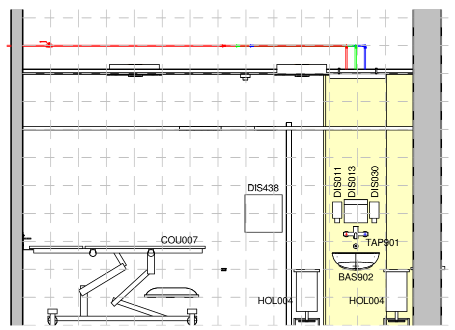
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	1
CHA301	CHAIR, swivel, height adjustable, high back, with arms, wipeable, 5 star base, on castors	3	2
CHA318	CHAIR, upright, with arms, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
COM033	COMPUTER KEYBOARD	3	1
COM049	COMPUTER MONITOR, 17" TFT, digital flat panel display, high-resolution screens, desk top	3	1
COU007	COUCH, examination/treatment, (2 section), with paper roll holder, variable height, retractable wheels, 1890mm (l) x 650mm (w)	3	1
CUR900	Curtain Rail	1	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
HOL020	HOLDER, sharps box, up to 7 litre capacity, rail/trolley hang or wall mounted, 170H 125W 100D	2	1
HOO019	HOOK, single, small, wall mounted	1	2
IPS016	IPS Panel	1	1
RAI001	Railing (To Suit Length)	1	1
TAB912	TABLE, circular, 760H 800mm dia.	3	1

MEP Schedule

Code	Description	Group	Count
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	1
CAL007	PULL/PUSH BUTTON, staff emergency call, reset and integral/adjacent indicator lamp	1	1
DS901	Smoke Detector	1	1
LUM003	Lister 2 LED 600	1	2
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
OUT010	SOCKET outlet, switched, 13 amp, twin	1	2
OUT131	SOCKET outlet double data/voice, wall/trunking mounted	1	2
RAD001	Radiant Panel	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	1
THE005	Thermostat wall mounted	1	1
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	1

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
+ HBN compliance
+ Within a suite of generic c/e rooms with separate storage and utilities
+ Available to all acute clinical specialities on a booked basis, excl paediatrics and maternity
+ Specialit specific equipment will be brought in on trolleys
+ Each suite will have a dedicated treatment room
+ This room is designed for consultation and examination only
+ Majority of consultations comprise patient + attendant with 2 staff
+ Diagnostic images may be shown to the patient on the screen

Area:-
Consult Room 7.7 sqm
Consult/Exam Room Opt 01, 2 sided couch access nia 12.3 sqm
Consult/Exam Room Opt 01, 3 sided couch access nia 14.9 sqm
Consult/Exam Room Opt 02, 2 sided couch access nia 12.1 sqm
Consult/Exam Room Opt 02. 3 sided couch access nia 15.2 sqm

Enhancements/Local Choice:-
+ Clinical whb in or out of the curtained area

REV	COMMENT					
6	M&E ADDED					
	JT	03.09.15	GB	03.09.15	GB	03.09.15
	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

PROCURE 21 +

PROJECT

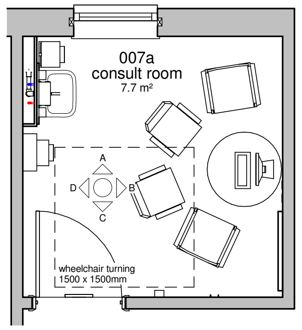
P21+ Repeatable Rooms

TITLE

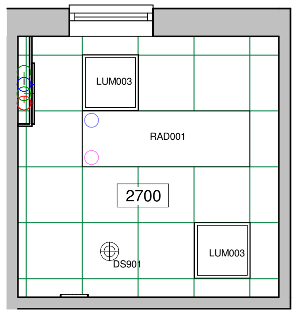
Consult/Exam Room Option 2

CLIENT

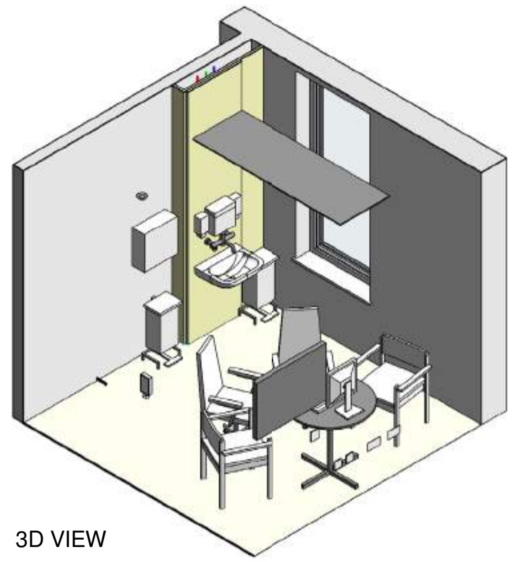
PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0008	6



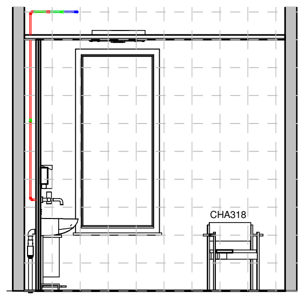
ROOM PLAN



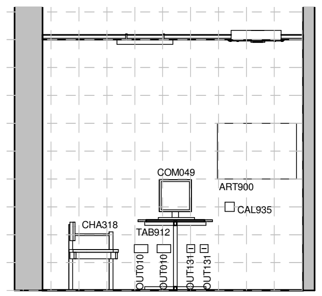
CEILING PLAN



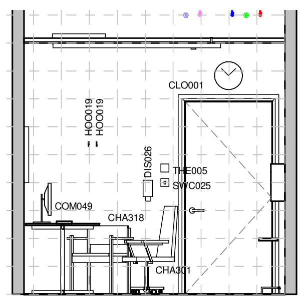
3D VIEW



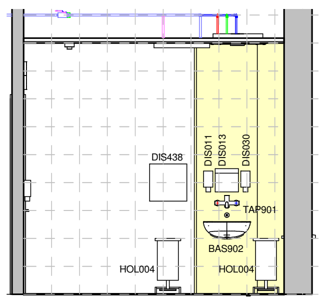
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

FF&E Schedule

Code	Description	Group	Count
ART900	Artwork	3	1
CHA301	CHAIR, swivel, height adjustable, high back, with arms, wipeable, 5 star base, on castors	3	2
CHA318	CHAIR, upright, with arms, upholstered, stacking, wipeable	3	2
CLO001	CLOCK battery, wall mounted	3	1
COM033	COMPUTER KEYBOARD	3	1
COM049	COMPUTER MONITOR, 17" TFT, digital flat panel display, high-resolution screens, desk top	3	1
DIS011	DISPENSER, barrier cream, disposable single cartridge, wall mounted	2	1
DIS013	DISPENSER, paper towel, wall mounted	2	1
DIS026	DISPENSER, Medical hand sanitizer, lever action, wall mounted	2	1
DIS030	DISPENSER, soap, disposable single cartridge, lever action, wall mounted	2	1
DIS438	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
HOL004	HOLDER, sack, with lid foot operated, small, freestanding	3	2
HOO019	HOOK, single, small, wall mounted	1	2
IPS016	IPS Panel	1	1
TAB912	TABLE, circular, 760H 800mm dia.	3	1

MEP Schedule

Code	Description	Group	Count
BAS902	Contour 21 back outlet washbasin, 50cm, no tapholes, no overflow, no chainstay hole	1	1
CAL935	PUSH BUTTON staff/patient emergency call, reset and integral/adjacent indicator lamp, wall mounted	1	1
DS901	Smoke Detector	1	1
LUM003	Lister 2 LED 600	1	2
OUT006	SOCKET outlet, switched, 13 amp, single	1	1
OUT010	SOCKET outlet, switched, 13 amp, twin	1	2
OUT131	SOCKET outlet double data/voice, wall/trunking mounted	1	2
RAD001	Radiant Panel	1	1
SWC025	SWITCH, light	1	1
TAP901	Markwik 21 Demountable Panel Mixer, Proximity Sensor, Detachable Spout	1	1
THE005	Thermostat wall mounted	1	1
WAS107	TRAP, bottle, 1.1/4 in, plastic resealing. HTM64TRR1/P	1	1

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

The brief specifies:-
+ HBN compliance
+ Within a suite of generic c/e rooms with separate storage and utilities
+ Available to all acute clinical specialities on a booked basis, excl paediatrics and maternity
+ Specialit specific equipment will be brought in on trolleys
+ Each suite will have a dedicated treatment room
+ This room is designed for consultation and examination only
+ Majority of consultations comprise patient + attendant with 2 staff
+ Diagnostic images may be shown to the patient on the screen

Area:-
Consult Room 7.7 sqm
Consult/Exam Room Opt 01, 2 sided couch access nia 12.3 sqm
Consult/Exam Room Opt 01, 3 sided couch access nia 14.9 sqm
Consult/Exam Room Opt 02, 2 sided couch access nia 12.1 sqm
Consult/Exam Room Opt 02. 3 sided couch access nia 15.2 sqm

Enhancements/Local Choice:-
+ Clinical whb in or out of the curtained area

REV	COMMENT					
6	M&E ADDED					
	JT	03.09.15	GB	03.09.15	GB	03.09.15
REV	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE
PMG	GB	GB	03/02/14

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1 : 50	GDA	7210

SIGN OFF
A - NO COMMENTS
B - MINOR COMMENTS
C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S3	For Comment

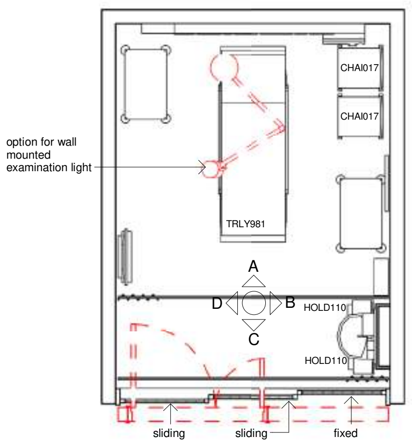
PROCURE 21 +

PROJECT
P21+ Repeatable Rooms

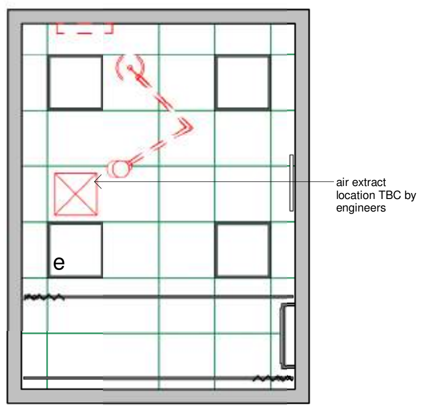
TITLE
Consult/Exam Room Option 3

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
P21RR-Z1-00-A-GDA-DR-JB-0009	6

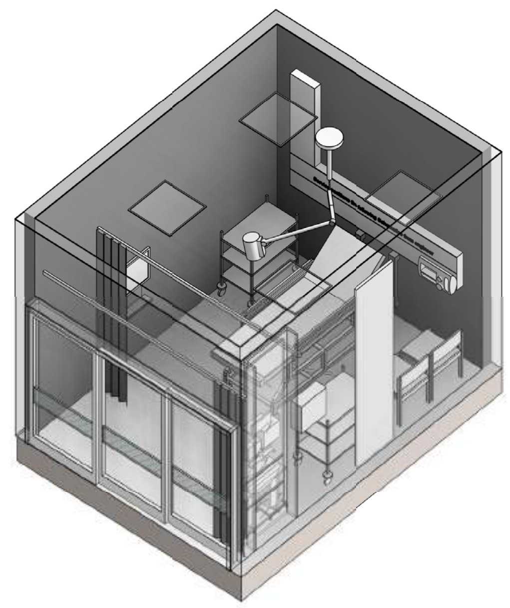


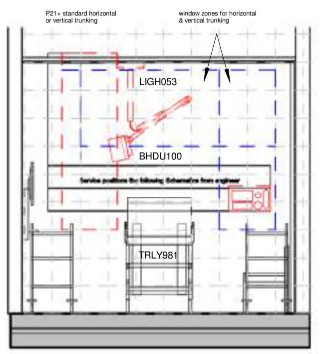
Floor Plan



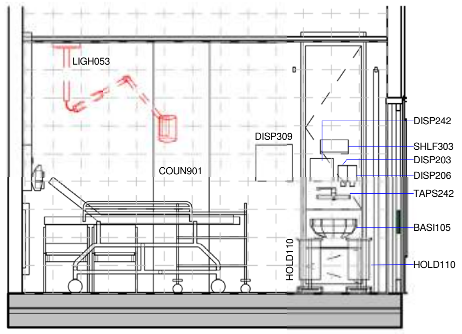
Reflected Ceiling Plan

MEP design to be agreed between Trust and Designers

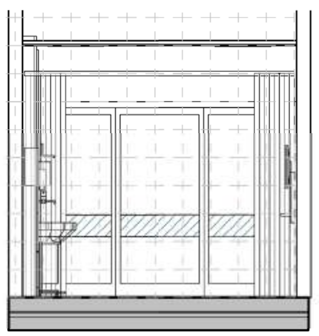




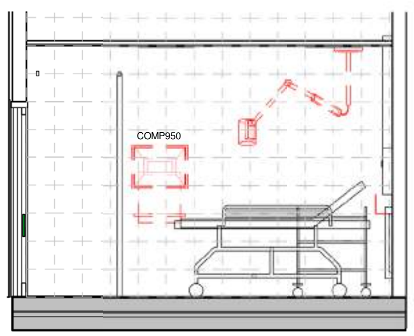
Elevation A



Elevation B



Elevation C



Elevation D

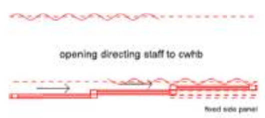
AREA:-
P21+ ED Repeatable Room, single entry
3/4 sided couch access, nia 11.6-12.2sqm

LOCAL CHOICE:-
+ glazed sliding doors and/or staggered curtain (RCEM supported option combines both the glazed sliding doors and staggered curtains)
+ overhead ceiling mounted hoist
+ examination light mobile, wall or ceiling mounted
+ cwhb surface mounted or recessed ips
+ w/m IT computer station
+ small shelf for local consumables
+ window high level or vertical, dependant on medical trunking choice
+ vertical or horizontal medical trunking

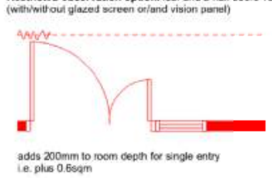
OPTIONS impacting on room size:-
+ leaf and a half in-ward opening glazed doors (require an additional 200mm room depth i.e. +0.6sqm)
+ any fixed storage cupboards and/or worktop (impact dependant on depth and extent)
+ patient trolley size if larger or with more attachments (design based on 750mm x 2100mm patient trolley)

LOCAL CHOICE OPTIONS FOR FRONT OF BAY:-

option 1. Royal College Emergency Medicine (RCEM) supported option.
glazed sliding doors with staggered two track curtains

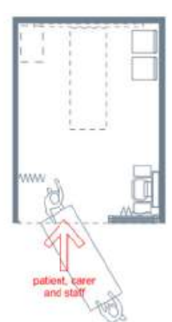


option 2. Not supported by the RCEM.
Restricted observation option. leaf and a half doors 1510mm s.o. (with/without glazed screen or/and vision panel)

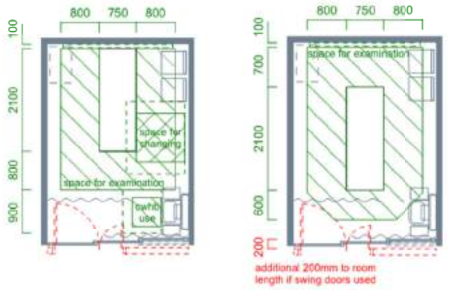


(35-05)-00-0002_Room Data Schedule										
							Primary Finish			
Number	Name	Department	Area	Occupancy	Room Activities	Room Design Notes	Floor Finish	Base Finish	Wall Finish	Ceiling Finish
002	Single Entry		11.6 m²		Patient may be ambulant, in a wheelchair or on a trolley. Patient transferred to a treatment trolley. Administration of local anaelgesics. Minor clinical and surgical procedures and dressings. Monitor vital physiological signs. Holding working supplies within mobile trolleys. Disposal of contaminated dressings. Clinical hand washing. Use of visual display terminal. Assessing diagnostic images.					

(35-05)-00-0002_Room Equipment Schedule			
Furniture Item Code	Furniture Description	Furniture Group	Count
1			
BASI105	BASIN, clinical, medium, no overflow, integral back outlet, with resealable trap, 400w x 500l x 200h	1	1
BBF901	Bed Head Buffer, Vertical	1	2
BHDU100	MEDICAL TRUNKING, horizontal, right dropper or vertical unit, 3 medical gas outlets, 4 twin switched power socket outlets, 1 usb charger outlet, bedlight control switch, nurse and emergency call, 2 RJ45 data outlet plates	1	1
IPSX122	IPS, one length, 1 set of panels with 2 splits, return on both sides	1	1
LIGH053	LUMINAIRE examination adjustable, 1000 lux, ceiling mounted	1	1
RRLF901	LIGHTING, lister 2	1	4
SHLF303	SHELF, with upstand, 130x300mm	1	1
TAPS242	TAPS, bib, single tap, with single extended lever handle, twin inlet	1	1
TRAC101	TRACK, privacy curtain track, with hooks, left handed curtain	1	1
TRAC102	TRACK, privacy curtain track, with hooks, right handed curtain	1	1
2			
COMP950	COMPUTER, terminal, wall mounted with associated outlets	2	1
COUN901	DESIGN, council information slice	2	1
DISP203	DISPENSER, medical hand sanitizer, lever action, wall/unit mounted	2	1
DISP206	DISPENSER, soap, disposable single cartridge, lever action, wall/unit mounted	2	1
DISP242	DISPENSER, paper towel, wall/unit mounted	2	1
DISP309	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
3			
CHAI017	CHAIR, upright, upholstered, stacking	3	2
HOLD110	HOLDER, sack, with lid foot operated, small, freestanding	3	2
MONT901	MONITOR, vital signs, multi-parameter, with accessories	3	1
TRLY910	TROLLEY, supplies, 870x750x450mm	3	2
TRLY981	TROLLEY PATIENT, with brakes	3	1



accesss diagram (not to scale)



space planning diagrams (not to scale)

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

REV	COMMENT					
	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1/50		

SIGN OFF

- A - NO COMMENTS
- B - MINOR COMMENTS
- C - DO NOT USE

STATUS	PURPOSE OF ISSUE

PROJECT

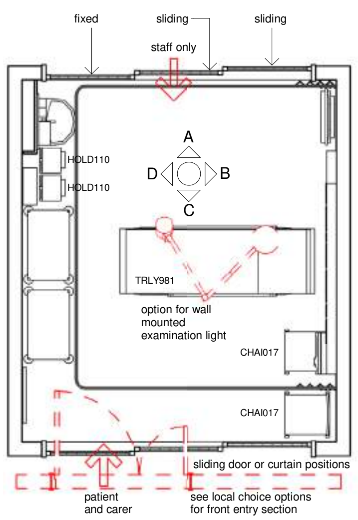
P21+ Repeatable Rooms

TITLE

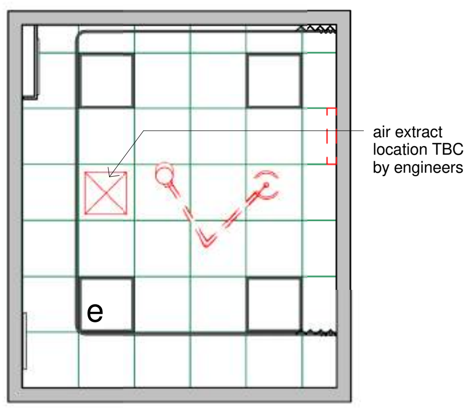
Single Entry Room

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
RRS-ZZ-00-A-GDA-DR-(35-05)-0001	

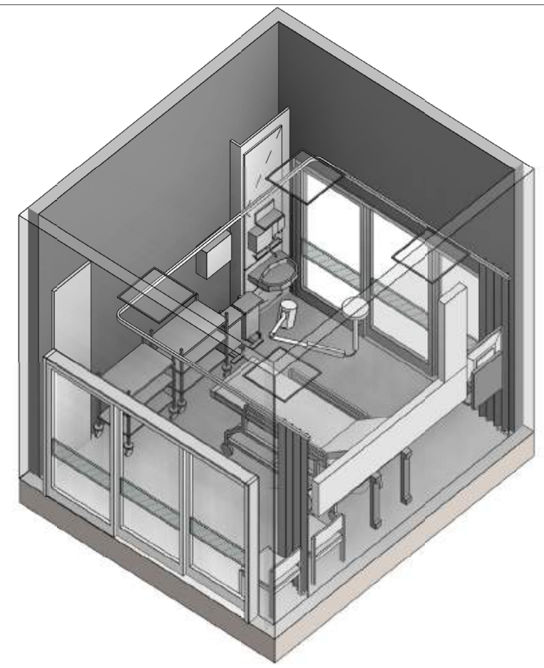


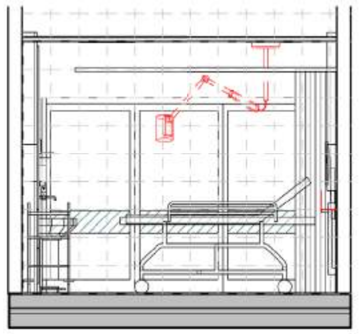
Floor Plan



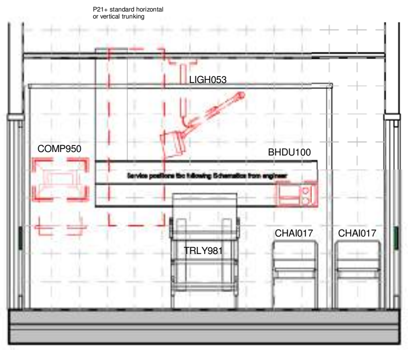
Reflected Ceiling Plan

MEP design to be agreed between Trust and Designers

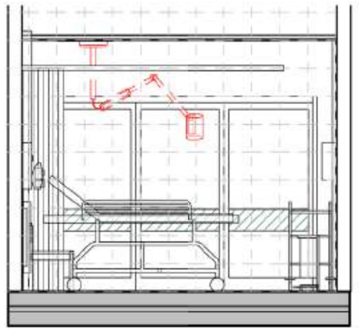




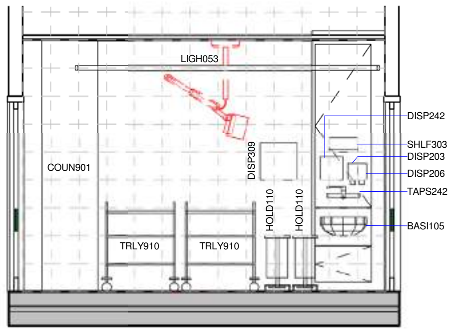
Elevation A



Elevation B



Elevation C



Elevation D

(35-05)-00-0001_Room Data Schedule										
							Primary Finish			
Number	Name	Department	Area	Occupancy	Room Activities	Room Design Notes	Floor Finish	Base Finish	Wall Finish	Ceiling Finish
001	Dual Entry		13.2 m²		Patient may be ambulant, in a wheelchair or on a trolley. Patient transferred to a treatment trolley. Administration of local anaelgesics. Minor clinical and surgical procedures and dressings. Monitor vital physiological signs. Holding working supplies within mobile trolleys. Disposal of contaminated dressings. Clinical hand washing. Use of visual display terminal. Assessing diagnostic images. Patient observation from staff side.					

(35-05)-00-0001_Room Equipment Schedule			
Furniture Item Code	Furniture Description	Furniture Group	Count
1			
BASI105	BASIN, clinical, medium, no overflow, integral back outlet, with resealable trap, 400w x 500l x 200h	1	1
BBF901	Bed Head Buffer, Vertical	1	2
BHDU100	MEDICAL TRUNKING, horizontal, right dropper or vertical unit, 3 medical gas outlets, 4 twin switched power socket outlets, 1 usb charger outlet, bedlight control switch, nurse and emergency call, 2 RJ45 data outlet plates	1	1
IPSX123	IPS, one length, 1 set of panels with 2 splits, left handed return	1	1
LIGH053	LUMINAIRE examination adjustable, 1000 lux, ceiling mounted	1	1
RRLF901	LIGHTING, lister 2	1	4
SHLF303	SHELF, with upstand, 130x300mm	1	1
TAPS242	TAPS, bib, single tap, with single extended lever handle, twin inlet	1	1
TRAC903	TRACK, privacy curtain track, with hooks, 90° angle, double curtain	1	1
2			
COMP950	COMPUTER, terminal, wall mounted with associated outlets	2	1
COUN901	DESIGN, council information slice	2	1
DISP203	DISPENSER, medical hand sanitizer, lever action, wall/unit mounted	2	1
DISP206	DISPENSER, soap, disposable single cartridge, lever action, wall/unit mounted	2	1
DISP242	DISPENSER, paper towel, wall/unit mounted	2	1
DISP309	DISPENSER, disposable gloves set of 3 and disposable apron, wall mounted	2	1
3			
CHAI017	CHAIR, upright, upholstered, stacking	3	2
HOLD110	HOLDER, sack, with lid foot operated, small, freestanding	3	2
MONT901	MONITOR, vital signs, multi-parameter, with accessories	3	1
TRLY910	TROLLEY, supplies, 870x750x450mm	3	2
TRLY981	TROLLEY PATIENT, with brakes	3	1

AREA:-
P21+ ED repeatable Room, dual entry
3/4 sided couch access, nia 13.2-14.4sqm

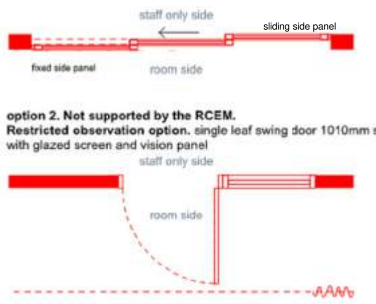
LOCAL CHOICE:-
+ staggered curtain, glazed sliding screen, door, glazed screen or combination (RCEM supported option combines the glazed sliding doors and staggered curtains)
+ overhead ceiling mounted hoist
+ examination light mobile, wall or ceiling mounted
+ cwhb surface mounted or recessed ips
+ w/m IT computer station
+ small shelf for local consumables
+ vertical or horizontal medical trunking

OPTIONS impacting on room size:-
+ leaf and a half in-ward opening doors with vision panels
+ any fixed storage cupboards and/or worktop (impact dependant on depth and extent)
+ patient trolley size if larger or with more attachments (design based on 750mm x 2100mm patient trolley)

LOCAL CHOICE OPTIONS FOR REAR OF BAY (staff only access):-

option 1. Royal College Emergency Medicine (RCEM) supported option.
glazed sliding doors with single privacy track curtains

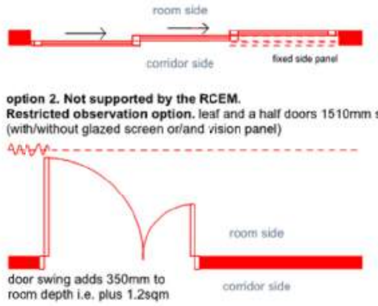
option 2. Not supported by the RCEM.
Restricted observation option. single leaf swing door 1010mm s.o. with glazed screen and vision panel



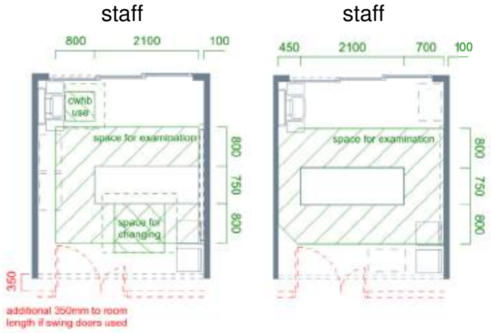
LOCAL CHOICE OPTIONS FOR FRONT OF BAY (patient and carer access):-

option 1. Royal College Emergency Medicine (RCEM) supported option.
glazed obscured sliding doors with single privacy track curtains

option 2. Not supported by the RCEM.
Restricted observation option. leaf and a half doors 1510mm s.o. (with/without glazed screen or/and vision panel)



accesss diagram
(not to scale)



space planning diagrams (not to scale)

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

REV	COMMENT					
	DRAWN BY	D_DATE	CHECKED BY	C_DATE	APPROVED BY	A_DATE

DRAWN BY	CHECKED BY	APPROVED BY	DATE

SCALES @ A2	ISSUING OFFICE	PROJECT NUMBER
1/50		

SIGN OFF
A - NO COMMENTS
B - MINOR COMMENTS
C - DO NOT USE

STATUS	PURPOSE OF ISSUE

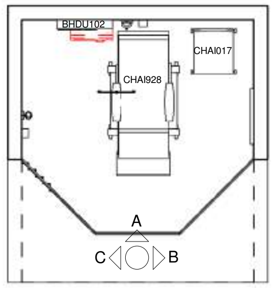
PROCURE 21

PROJECT
P21+ Repeatable Rooms

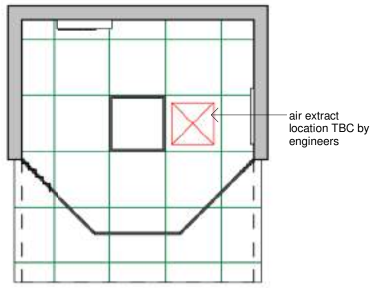
TITLE
Dual Entry Room

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER	REV
RRS-ZZ-00-A-GDA-DR-(35-05)-0002	

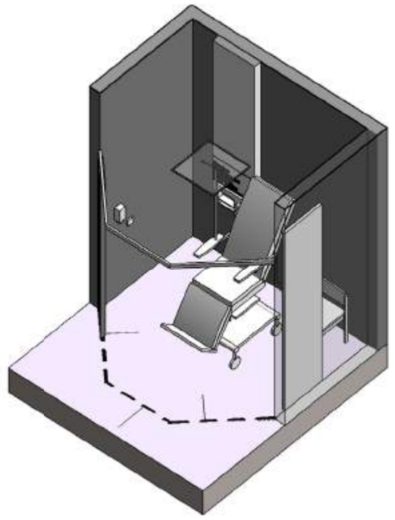


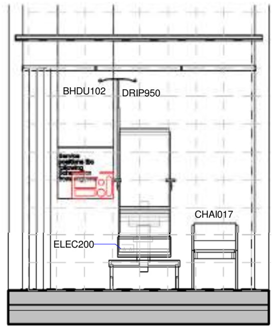
Floor Plan



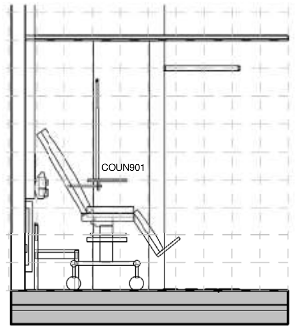
Reflected Ceiling Plan

MEP & Acoustic design to be agreed between Trust and Designers

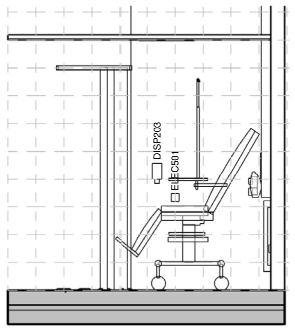




Elevation A



Elevation B



Elevation C

(35-05)-00-0003_Room Data Schedule

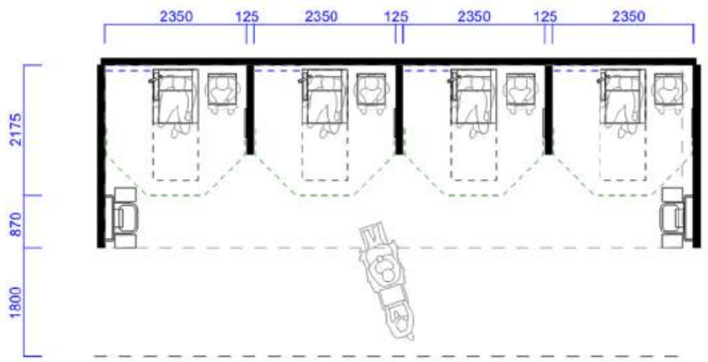
Number	Name	Department	Area	Occupancy	Room Activities	Room Design Notes	Primary Finish: Floor Finish	Primary Finish: Base Finish	Primary Finish: Wall Finish	Primary Finish: Ceiling Finish
003	Chair Centric Bay		5.1 m²		Patient may be ambulant, or in a wheelchair and accompanied by a relative or carer. Patient transferred to recliner chair, Taking blood, Patient resting. Administration of medication, incl intravenously, Monitor vital physiological signs. Taking and recording observations and monitoring by Staff. Staff access IT via device, c.o.w. or tablet.					

(35-05)-00-0003_Room Equipment Schedule

Furniture Item Code	Furniture Description	Furniture Group	Count
1			
BBF901	Bed Head Buffer, Vertical	1	1
BHDU102	MEDICAL TRUNKING, vertical, 3 medical gas outlets, 4 twin switched power socket outlets, 1 usb charger outlet, bedlight control switch, nurse and emergency call, 2 RJ45 data outlet plates	1	1
ELEC200	ELECTRIC, double socket outlet, horizontal, switched, 140mm (l) x 85mm (w)	1	1
ELEC501	ELECTRIC, staff emergency call push button, 85mm (l) x 85mm (h)	1	1
RRLF901	LIGHTING, lister 2	1	1
TRAC101	TRACK, privacy curtain track, with hooks, left handed curtain	1	1
TRAC102	TRACK, privacy curtain track, with hooks, right handed curtain	1	1
2			
COUN901	DESIGN, council information slice	2	1
DISP203	DISPENSER, medical hand sanitizer, lever action, wall/unit mounted	2	1
3			
CHAI017	CHAIR, upright, upholstered, stacking	3	1
CHAI928	CHAI928, Seine high comfort patient chair with high comfort armrests and footrest.	3	1
DRIP950	MONITOR, IV stand attached to stretcher/chair	3	1
MONT901	MONITOR, vital signs, multi-parameter, with accessories	3	1

NOTE:
this is a local option, the minimum requirement is for the provision of nurse and emergency call facilities

demonstration of layout linear cluster of chair centric spaces
4 spaces in footprint of 30sqm incl 2 x cwhb



(not to scale)

AREA:-
Chair centric bay, nia 5.1sqm*
*excl space for cwhb, and circulation
local positioning of design council information slice
in sight-line of patient and carer.

LOCAL CHOICE:-
+ P21+ standard medical trunking, vertical incl usb charging point
+ vital signs monitor w/m
+ silentia screens in lieu of curtain
+ additional twin switched power socket outlet
+ 1 or 2 carer/visitor chairs
+ patient entertainment system

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed
on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES & MODEL REFERENCE FILES

REV | COMMENT
DRAWN BY | D_DATE | CHECKED BY | C_DATE | APPROVED BY | A_DATE

DRAWN BY | CHECKED BY | APPROVED BY | DATE

SCALES @ A2: 1/50 | ISSUING OFFICE | PROJECT NUMBER

SIGN OFF
A - NO COMMENTS
B - MINOR COMMENTS
C - DO NOT USE

STATUS | PURPOSE OF ISSUE

PROJECT
P21+ Repeatable Rooms

TITLE
Chair Centric Bay

CLIENT

PROJ-ZONE-LEVEL-ROLE-ORG-FILETYPE-CLASSIFICATION-NUMBER: RRS-ZZ-00-A-GDA-DR-(35-05)-0003 | REV

5.0 PLANNING STRATEGY

PRH - Meeting minutes with Telford and Wrekin Council
RSH - Meeting minutes with Shropshire Council

Town Planning

The design team have engaged with the Planning Departments for each site to outline the proposed scale and configuration of the proposals in each option. No significant issues were raised during these preliminary meetings. A Planning Consultant will be appointed during FBC to lead discussions with the Planning Department and assemble a Planning Application.

Environmental Impacts

An Environmental Consultant has been working within the Technical Team, to assess the environmental impact of the proposed schemes and produce the scope and extent of arborocultural and environmental surveys required at FBC. All of the relevant information has been assembled to submit an EIA Screening request to the Local Authority.

AHR Architects Ltd
1st Floor
Victoria House
Victoria Quay
Shrewsbury SY1 1HH
United Kingdom

T +44 (0)1743 283 000
F +44 (0)1743 232 717
shrewsbury@ahr-global.com
www.ahr-global.com

Minutes

Issue date 27 June 2016
Reference 160621_Telford&Wrekin Planners

Project SaTH - SSP
Subject SaTH - SSP - PRH Developments
Date 21 June 2016
Place Telford and Wrekin Offices
Time 11.30am
Pages 3 including cover
Notes by Keeley Sutton

Present Alison Evans, AHR
Keeley Sutton, AHR
Kristie Goffe, Telford and Wrekin Council
Matt Thomas, Telford and Wrekin Council

Apologies N/A

Distribution Ben Brookes, Ryder Hunt
Louise Jones, SaTH
Kate Shaw, SaTH
Ross Mushet, SaTH

Next meeting TBC

Architecture

INVESTORS IN PEOPLE

Item	Description	Action	Date
1.00	**Shrewsbury and Telford Hospital Trust – Sustainable Services Review**		
1.10	**Princess Royal Hospital Development**		
1.11	The aim of the meeting is to outline the current SOC proposals for Princess Royal Hospital.		
1.12	AE outlined the current position of the project and the programme for the next coming months. In summary SOC was issued in March, OBC is due to be issued in September with Public Consultations happening towards the end of the year. The preferred site will be selected after the public consultation.		
1.13	KS detailed the proposals for each of the options and the differences between the ‘Hot’ and ‘Warm’ Proposals and site implications.		
1.14	PRH ‘Hot’ development is a 2-storey development, containing Emergency Department, Urgent Care Centre, Ambulatory Emergency Care, associated wards and supporting auxiliary services.		
1.15	Other external works will include a multi-storey car park, new landscaping to enhance the entrance way and retaining walls due to the change in levels.		
1.16	KG confirmed the volume of additional car parking will need to be reviewed. Information on existing capacity and turnover rates will be required		
1.17	It was discussed that within the last major planning application at PRH (the Women and Children’s Centre) the staff were directed through the secondary entrance into the site. KG advised that a study is currently underway to address the pm peak traffic challenges on the primary road outside PRH. The assessment should show what any additional movements will be and how these can counteracted.		
1.18	AE confirmed that a Transport Consultant will be appointed to advise on site-wide traffic and transport issues. . AE also advised that an Environmental Consultant, Planning Consultant, BREEAM assessor and a Helipad Consultant are soon to be appointed who will an active part of the dialogue with the Planning Department. It was noted the Environmental Consultant will undertake Ecology and Arborocultural Surveys.		

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Item	Description	Action	Date
1.19	MT suggested there are TPO's on site near to where the multi-storey car park is currently indicated.		
1.20	MT noted that the trees to the boundary are a prominent feature of the site as they hide the hospital well from the main road.		
1.21	AE and KS thanked the Planning Officers for their time.		

AHR Architects Ltd
1st Floor
Victoria House
Victoria Quay
Shrewsbury SY1 1HH
United Kingdom

T +44 (0)1743 283 000
F +44 (0)1743 232 717
shrewsbury@ahr-global.com
www.ahr-global.com

AHR

Minutes

Issue date 2nd August 2016
Reference 160725_Shropshire Planners

Project SaTH - SSP
Subject SaTH - SSP - RSH Developments
Date 25th July 2016
Place AHR Offices
Time 1430
Pages 3 including cover
Notes by Keeley Sutton

Present Keeley Sutton, AHR
Tim Rogers, Shropshire Council

Apologies N/A

Distribution Ben Brookes, Ryder Hunt
Louise Jones, SaTH
Kate Shaw, SaTH
Ross Mushet, SaTH
Alison Evans, AHR

Next meeting TBC

Architecture

INVESTORS IN PEOPLE

Item	Description	Action	Date
1.00	**Shrewsbury and Telford Hospital Trust – Sustainable Services Review**		
1.10	**Royal Shrewsbury Hospital Development**		
1.11	The aim of the meeting is to outline the current SOC proposals for Royal Shrewsbury Hospital.		
1.12	KS outlined the current position of the project and the programme for the next coming months. In summary SOC was issued in March, OBC is due to be issued in September with Public Consultations happening towards the end of the year. The preferred site will be selected after the public consultation.		
1.13	KS detailed the proposals for each of the options and the differences between the 'Hot' and 'Warm' Proposals and site implications.		
1.14	RSH 'Hot' development is a 3-storey development, Emergency Department, Urgent Care Centre, Ambulatory Emergency Care, associated wards and supporting auxiliary services.		
1.15	Other external works will include a multi-storey car park, new landscaping to enhance the entrance way and retaining walls due to the change in levels.		
1.16	TR questioned the closeness of the neighbours to the site and to the new development. Suggested that it needs to be a minimum of 23m from the back of the closest house to the development. KS confirmed the distance is more than 23m.		
1.17	TR confirmed that 3 storeys view from the north of the site would be acceptable.		
1.18	TR discussed the Blue Light entrance and traffic on the main road to the hospital. There is a concern that if RSH was the 'Hot' site and there's an accident on that road there would be an issue in ambulances entering the site. The Blue Light entrance will need to be reviewed. Surveys will need to be carried out including traffic movements within the site and neighbouring roads.		
1.19	Visibility to the existing junctions and any proposed junctions will need to be reviewed. TR also commented that the existing entrance only works due to the roundabout compared to the other existing service entry point to the site that is only a junction where the hospital doesn't have a right of way.		
1.20	TR requested the car parking numbers to be reviewed in order to confirm the additional requirements. Then the height of the multi-storey car park can be reviewed.		

Date 2nd August 2016
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Subject SaTH - SSP - RSH Developments
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Item	Description	Action	Date
1.21	TR confirmed further discussions will need to be had with the councils Environmental and Ecology department to confirm any issues to the environment. Andy Wiggley and Sue Swales.		
1.22	KS confirmed that a Transport Consultant will be appointed to advise on site-wide traffic and transport issues. KS also advised that an Environmental Consultant, Planning Consultant, BREEAM assessor and a Helipad Consultant are soon to be appointed who will an active part of the dialogue with the Planning Department. It was noted the Environmental Consultant will undertake Ecology and Arboriculture Surveys.		
1.23	KS thanked the Planning Officer for their time.		

VOLUME 2: STRUCTURE AND CIVILS

CAPITA

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

Comparative study of structural forms

May 2016

We | Listen Create Deliver

Quality Management

Job No	CS087958		
Project	The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme		
Location	Shropshire		
Title	Comparative study of structural forms		
Document Ref	CS087958 – CS - 01	**Issue / Revision**	2
File reference	P:\CS087958 SaTH Sustainable Services\003-CE Documents\Reports\SaTH Sustainable Services - Comparative study of structural forms CE.docx		
Date	25/05/16		
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Prepared by 2	A James	Signature (for file)	
Prepared by 3		Signature (for file)	
Checked by		Signature (for file)	
Checked by 1		Signature (for file)	
Authorised by		Signature (for file)	

Revision Status / History

Rev	**Date**	**Issue / Purpose/ Comment**	**Prepared**	**Checked**	**Authorised**
1	02/06/16	Preliminary for comment	DM	RAJ	EAF
2	25/10/16	Introduction revised	DM	RAJ	EAF

Contents

1. Introduction

Capita Property and Infrastructure have been commissioned by the Shrewsbury and Telford Hospital NHS Trust to undertake civil and structural work in connection with the proposed Sustainable Service Programme (SSP). In conjunction with the study on the site abnormals report (CS087958-SA-01) a high level study on the potential structural building solutions has been undertaken to assist the Architect in outline decisions on key factors such as building heights.

This report provides a description of the different options considered for the structural frame to the new build element of the proposed development and an associated qualitative assessment of the advantages and disadvantages of each in the context of a healthcare building.

Outline design advice in respect of slab thicknesses, beam sizes, structural zones, etc. is presented for each option in order to assist in the generation of the most suitable solution (to suit building adjacencies/planning heights). Also presented is a hypothetical grid spacing (to suit potential space planning/flexibility of space) but no recommendations are made to adopt a particular frame type; all are considered equally feasible and the most suitable choice is very much a subjective one, discipline driven.

The final selection of the super-structure frame can only be made as part of holistic assessment which considers the coordinated requirements of architecture, acoustics and servicing, as well as meeting the commercial aspirations of the development i.e. the cheapest frame option may not provide the best overall solution for the building or present the quickest delivery period.

In the comparative study table in section 5 the ‘Relative Total Frame Weight’ for each option is presented. This is intended to assist when evaluating the floor system’s effect on the total structural solution including the impact on the foundations.

For each of the frame types considered it is assumed that the stability systems will be the same ie. internal vertically braced bays to the dividing walls/lift shafts and in other strategic locations on plan are proposed to provide the building’s resistance to lateral forces (wind and notional horizontal loads). Lateral diaphragms (horizontal bracing) as necessary can be achieved through structural decks/concrete at floor levels and plan bracing in the structural zone at roof levels.

2. Design Constraints

Typical design constraints which inform the choice of structural form are as follows:

2.1 Building Grid

In the case of medical facilities it is possible to establish a regular and frequent grid which allows for an economic structure given any of the principle frame types. Room use will allow repetition of grid spacings in zonal areas.

2.2 Building form/transfer structures

The study does not cover the use of precast concrete crosswall construction or downstand reinforced concrete due to their inflexibility with respect of future uses of the buildings. Post tensioned concrete slabs are included in the study but due to their high costs and the low number of storeys present, whilst offering ‘skinny’ slabs, may not offer the most commercially attractive solution. Given the flexibility of the space required and the modest number of storeys it is likely that any transfer structure required will be very local and not a general requirement.

2.3 Storey height

The storey height is also an important consideration, especially if there is a restriction on the overall height of the building to suit the requirements of planning or also any issues associated with loss of light in neighbouring facilities.

For a fixed storey height, the more slender the floor construction can be made the greater the floor to ceiling height that can be achieved and therefore the better the quality of the space inside the building. Also refer to point 2.6.

2.4 Ventilation strategy and ease of services integration

The nature and size of the services will also significantly affect the floor to ceiling height. This issue is somewhat compounded in a medical environment as the services strategies are so intense and space/depth hungry. A concrete flat slab solution (without downstands) offers the greatest flexibility for services routing and potentially the highest ceilings (as well assisting in secondary issues such as acoustics and thermal requirements) whereas downstand beams reduce flexibility and there will be a significant impact on ceiling height if a duct has to pass below a beam. An ‘office’ type solution such as integrated services (regular beam castellations) is more challenging to achieve in a hospital building as the services are all varying in size and run in the same directions at regular centres.

2.5 Appearance if exposed to view

Generally internal structure in a hospital is deemed as very much a functional rather than aesthetic requirement and therefore ceilings can be prevalent but if the client and user are comfortable with having the structure exposed to view, this could support a natural ventilation strategy or provide a saving on finishes costs. Attention to detail in the 'exposed to view' finishes of the structure is essential if this approach is to be carried off successfully. This is also the case for staircases and cores etc.

2.6 Adjacencies to the existing buildings

Where there is direct linkage between a new and existing hospital facility this can be critical in development of the most appropriate structural strategy. Whilst small level differences can generally be accommodated through use of short, low gradient ramps, more significant level differences will lead to longer ramps (and associated corridors) which will create areas of 'dead' space only required to deal with the level change. Consequently level floor interfaces are ideal but the challenge then becomes how the new structural depth relates to the existing and then the knock on effect on the ceiling levels and therefore floor to ceiling heights.

3. Design Assumptions

The following is a list of design assumptions which have been incorporated within the study. These are based on typical hospital requirements and will require confirmation of acceptance from the design team.

3.1 Loadings

Dead Load	→	Selfweight	=	As per construction
	→	Finishes	=	$0.10kN/m^2$
	→	Services	=	$0.25kN/m^2$
	→	Ceilings	=	$0.15kN/m^2$
Live Load	→	Imposed	=	$4.00kN/m^2$ (max load for circulation areas)
	→	Partitions	=	$1.00kN/m^2$ for lightweight

Cladding Line Load = 8.0kN/m

3.2 Services Distribution

For the purpose of this report it is assumed that the service distribution will be below the structure, within a maximum 700mm zone. Obviously this is very much subject to the services strategy and to be confirmed by the Services consultant following their design appraisal.

3.3 Steel Grade

It is assumed that all steel will be grade S355 JR to all primary structural members.

3.4 Concrete Grade

It is assumed that all concrete will be grade C28/35 to all primary structural elements.

3.5 Metal Decking

Where applicable it is assumed that all metal decking will be Kingspan MD50, 1.0mm thick. It should be noted that the decking thickness and mesh requirements will be to suit the subcontractor design.

3.6 Fire Resistance

It is assumed that all structural elements will be required to maintain a 1 hour fire resistance period. This will be subject to confirmation by a fire engineering specialist, and will be achieved by cover to concrete reinforcement or coating of steelwork to the relevant specialist's details.

3.7 Stability System

It is assumed that the building will be classified as a braced frame, with braced bays, moment frames or structural shear walls incorporated as required. Also precast wall structures can be used as stability elements as required.

3.8 Natural Frequency

It is assumed that typically the structure's minimum natural frequency will be restricted to 4.0Hz to provide an adequate resistance to structure borne vibrations due to human/structure interactions. In floors for the theatres areas, however, enhancements to the structure will be made to suit the vibration and response factor requirements stipulated in the HTM.

3.9 Ceiling Construction

It is assumed that the structure and services will be enclosed by a ceiling construction within a 100mm zone. This strategy is to be confirmed by the Architects following their design appraisal.

4. Options proposed

The following structural options have been investigated:

1. Steel frame with 130mm in-situ slab on composite metal decking
2. Steel frame with 150mm in-situ slab on composite metal decking
3. Steel frame with precast ‘Hollowcore’ slabs and structural topping
4. Reinforced concrete frame with flat slab floors
5. Reinforced concrete frame with post tensioned slabs

It should be noted that the acoustic, fire protection, services, finishes and ceiling zones need to be factored into the structural zone to fully appreciate and compare the various options. In addition all dimensions quoted within the report are subject to normal building tolerances.

In addition the following exclusions are made within the steelwork weight estimates.

1. Trimming to service risers and voids
2. Secondary steelwork in the elevation and at roof level
3. Secondary steelwork to staircases and lift shafts (if required)

Staircases are to be precast concrete flights with precast or in-situ landings or steel with steel treads for infill. Fire fighting shafts are to be provided to requisite levels of fire resistance.

As the grid is yet to be developed a very arbitrary grid of 7.2m x 9.6m has been utilised. Modifications to this grid can readily be fed back into the design to generate revisions to profiles depths/weights etc.

4.1 Options 1&2 – Steel frame with composite slab

This option represents the conventional steel frame solution and thus is probably the cheapest of the steel frame alternatives. A grid of primary and secondary steel beams supports an in-situ concrete slab on composite metal decking, see indicative figure 1 below. The steelwork is designed to act compositely with the slab to maximise the efficiency of the design. (please note the plan is indicative and does not reflect the proposed layout)

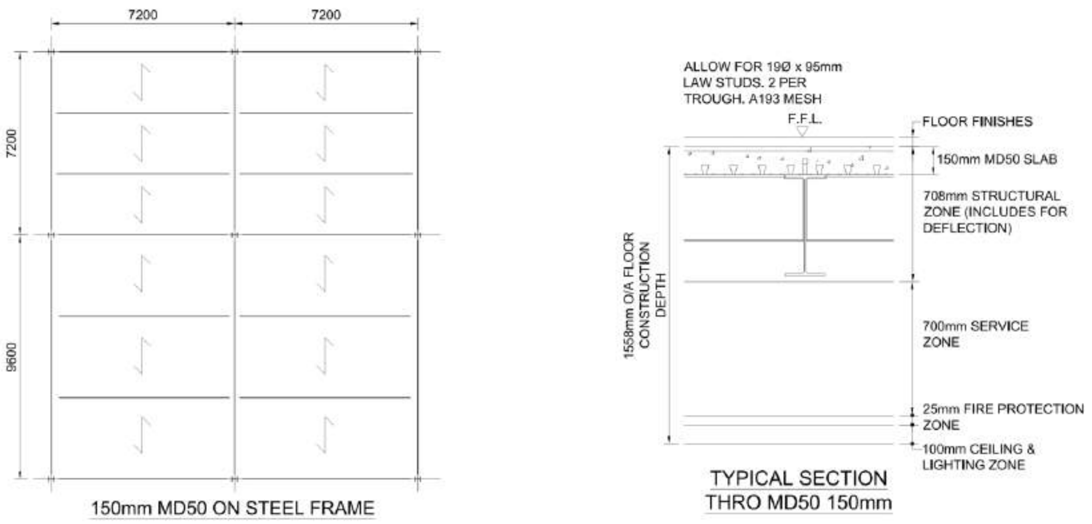

Figure 1 – General arrangement and section for a steel frame and composite slab solution

Option 1 –

A **130mm** thick slab on a 50mm deep re-entrant profile deck is the minimum thickness required structurally for the grid arrangement proposed. It should be noted however that this may not provide the required degree of acoustic separation between floors, in which case a thicker slab or a floating floor construction may be required. Also the totally density of the slab is such that the natural frequency will need detailed interrogation for compliance with healthcare requirements.

Option 2 –

Experience has suggested a **150mm** MD50 slab (re-entrant as described above) will provide sufficient mass to provide acoustic attenuation for air-borne noise without any additional treatment, though this must be tested by an acoustic engineer to ensure compliance. This depth and profile (ie. mass/density) has also proved to meet typical natural frequency requirements.

Metal decking is generally supplied with a galvanised finish which must be considered if the structure is to be exposed to view.

As the floor beams are relatively shallow and span in both directions there is little opportunity for integrating services within the depth of the beams. A separate services zone is therefore required below the steelwork. Column lines either sides of corridors would however allow for shallower beams to be used above the corridor itself thus minimising the impact of this constraint on the floor to ceiling heights and allowing key service routing down corridor lines although the onward challenge of this would be vertical consistency of corridor lines through the building.

4.2 Option 3 - Steel frame with precast ‘Hollowcore’ slabs and structural topping

This option comprises a grid of relatively deep primary floor beams in one direction with much shallower tie beams in the other direction, see figure 2 below.

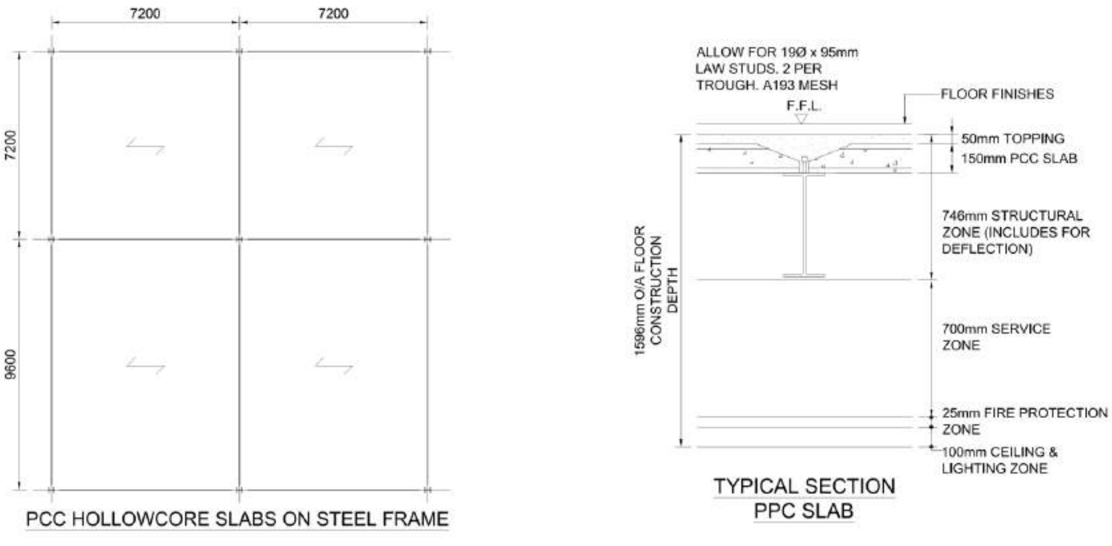

Figure 2 – General arrangement and section for a steel frame hollowcore slab solution

The floor slab comprises as 150mm deep pre-cast concrete unit with a structural concrete topping (nominally 50mm thick) to create a 200mm thick slab overall. The pre-cast units come with a natural pre-camber thus the actual topping thickness reduces towards the centre of the bays.

Hollowcore units are mass produced standard products, thus providing a cheaper alternative to the other precast items studied. However the quality of the surface finish is not as good (generally only Class A to BS8110) thus some allowance needs to be made for site finishing works if they are to be exposed to view.

The fact that the deep beams only span in one direction assists with the services integration and coordination. In the symmetrical grid layout, the double line of columns allows for a shallower beam depth above the corridor, enabling services distribution along the length of the block. In the non-symmetrical grid layout, services up to around 250mm diameter could be accommodated by web openings in the primary beams. Anything much larger than this would have to pass underneath the steelwork.

4.3 Option 4 -Reinforced concrete frame with flat slab floors

This is potentially the preferred concrete frame option. The arrangement and section for this option are detailed in figure 3 below. The flat slab solution is designed such that the slab is split into spanning ‘bands’ within the depth of the slab which act as beams, the reinforcement layout reflecting this. Consequently this solution benefits from having no downstands over the floor area.

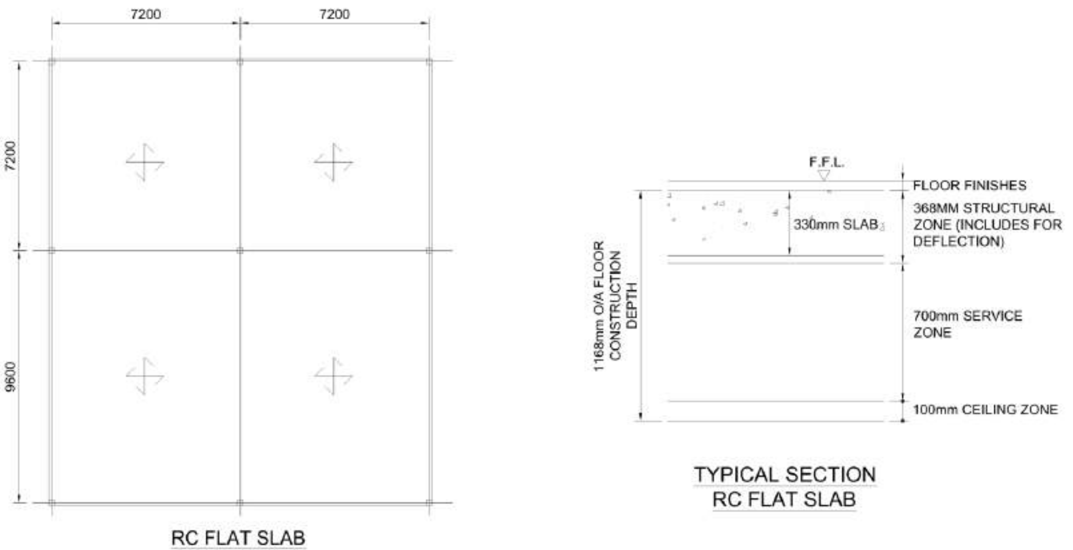

Figure 3 – General arrangement and section for a concrete frame and flat slabs

The floor slab would comprise a 275-300mm thick traditionally reinforced flat slab section.

A range of surface finishes can be achieved on the slab soffits depending on the care with which the construction is carried out.

The flat slab solution obviously provides the most flexibility for services routing and the greatest floor to ceiling heights for a given storey height.

4.4 Option 5 - Reinforced concrete frame with post tensioned floors

This solution lends itself to efficient construction of bay regularity of multiple stories, due to the nature of its specialist design and installation requirements. The arrangement and section for this option are detailed in figure 3 below. The post tensioned slab solution is designed such that the slab is reinforced with tendons tensioned in typically one direction at generous centres (1.2-1.5m) over the slab. As a flat slab solution this benefits from having no downstands over the floor area.

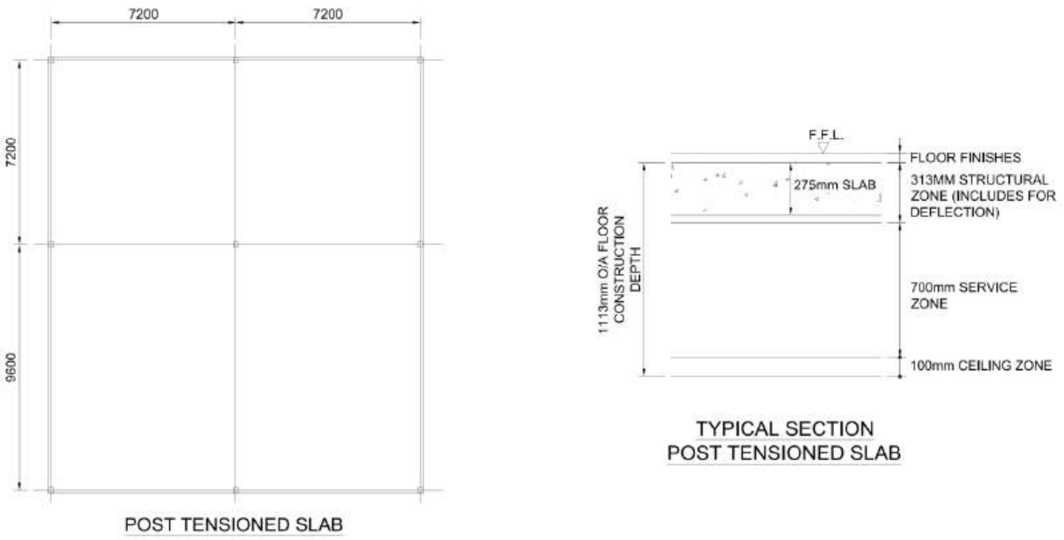

Figure 4 – General arrangement and section for a concrete frame and post tensioned slabs

The floor slab can typically be as shallow as 75-85% the depth of a standard reinforced concrete flat slab.

A range of surface finishes can be achieved on the slab soffits depending on the care with which the construction is carried out.

As the flat slab solution this obviously provides the most flexibility for services routing and the greatest floor to ceiling heights for a given storey height. Also this solution allows bigger areas of free space to allow placement of holes/vertical services etc.

5. Assessment of options

	130mm MD50 Steel Frame	150mm MD50 Steel Frame	Precast Hollowcore Slab Steel Frame	RC Flat Slab	RC Post tensioned slab
Relative Total Frame Weight	100% (344kg/m^2)	114% (392kg/m^2)	115% (396kg/m^2)	192% (660kg/m^2)	150% (500kg/m^2)
Steel Weight	45kg/m^2	45kg/m^2	34kg/m^2	110kg/m^3 (Reinforcement)	40kg/m^3 (Reinforcement)
Structural Zone	690mm	708mm	746mm	368mm	313mm
Advantages	• Cheapest structural form. • Quick construction period. • Most lightweight option (least amount of embodied energy). • Permanent formwork resolves temporary lateral diaphragm. • Rapid formwork installation. • Small column sizes. • Cheapest foundation solution.	• Inherent acoustic mass. • Cheap structural form. • Lightweight option. Permanent form work resolves temporary lateral diaphragm. • Rapid formwork installation. • Small column sizes. • Cheap foundation solution.	• Reasonably cost effective option though not as cheap as using metal decking. • Extremely quick construction period (less elements than a composite decked solution). • Pre-cast units provide instant working platform. • Small column sizes. • Moderate foundation solution.	• Monolithic construction (inherent temporary stability) • Inherent fire and acoustic resistance. • Simple (single plane) formwork. • Shorter lead-in time than steel frames. • Greater ability to incorporate late changes. • Copes with intricate shapes better than steel. • Reduced construction depth than downstand beams solution gives improved floor to ceiling heights.	• Monolithic construction (inherent temporary stability) • Inherent fire and acoustic resistance. • Simple (single plane) formwork. • Shorter lead-in time than steel frames. • Greater ability to incorporate late changes. • Copes with intricate shapes better than steel. • Reduced construction depth than downstand beams solution gives improved floor to ceiling heights. • Bigger area for bigger mid-span holes • Less reinforcement tan conventional solution

	130mm MD50 Steel Frame	150mm MD50 Steel Frame	Precast Hollowcore Slab Steel Frame	RC Flat Slab	RC Post tensioned slab
Disadvantages	• Soffit cannot generally be exposed. • Deep structure, increased floor construction thick. • Reduced floor to ceiling height. • Requires additional fire protection. • Requires additional acoustic separation between floors. • Painting may be required for durability • Galvanised sofit generally provided but can be supplied with a PPC finish at premium.	• Soffit cannot generally be exposed. • Deep structure, increased floor construction thick. • Reduced floor to ceiling height. • Requires additional fire protection. • Increased foundations due to increased structure self weight. • Painting may be required for durability • Galvanised sofit generally provided but can be supplied with a PPC finish at premium.	• Deepest Structural zone of all options but applies in one direction thus by careful coordination can integrate the services • Difficult to accommodate post construction modifications to the layout. • Requires early coordination of risers and slab penetrations, due to prefabrication process. • May required additional acoustic treatment. • Steelwork requires additional fire protection. • Painting be required for durability. • Post-construction rubbing up of soffit may be required if exposed to view. • Less flexible than composite deck solution for forming slab penetrations without trimming.	• Longer site involvement than steel frames. • Generally more costly than simple steel frames. • Difficult to incorporate post construction changes. • Larger columns than steel. • Heavier frame thus height foundation costs. • Post construction rubbing up of soffit required if exposed to view. • More temporary works required	• Not necessarily commercially viable over 1 or 2 floors • Retrofit changes attract more design consequences than conventional solution • Longer site involvement than steel frames. • Generally more costly than simple steel frames. • Difficult to incorporate post construction changes. • Larger columns than steel. • Heavier frame thus height foundation costs. • Post construction rubbing up of soffit required if exposed to view. • More temporary works required

6. Conclusions and recommendations

At this stage of the project all five of the frame types proposed are considered acceptable for the Hospital Extension.

The decision as to which frame type to adopt needs to balance purely commercial considerations against the client's aspirations for the appearance of the structure where it is exposed to view. It may well be that the more specialist solutions of post tensioned concrete may be precluded for commercial reasons leaving a more conventional system the most appropriate solution.

The coordinated requirements for finishes, fire protection, acoustics, service zones and ceilings need to be considered alongside the structural options in order to provide an assessment of which option is best suited to the overall building design. The floor to ceiling heights that can be achieved for a given storey height can only be determined once all these issues have been taken into account. Obviously the existing floor to floor heights are critical here.

It is feasible that different frame types and grid layouts could be adopted for the building to suit requirements for various disciplines and end users, though this must be assessed commercially.

CAPITA

Capita Property and Infrastructure Ltd
Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel +44 (0)161 486 1521

Sustainable Services Programme - Site Abnormals

The Shrewsbury and Telford Hospital NHS Trust

01/08/16

Quality Management

Job No	CS087		
Project	Sustainable Services Programme - Site Abnormals		
Location	Shrewsbury		
Title	The Shrewsbury and Telford Hospital NHS Trust		
Document Ref	CS087958-SA-01	**Issue / Revision**	2
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Prepared by 1	D Middleton	Signature (for file)	
Checked by	A James	Signature (for file)	RA James.
Authorised by	E A Fuller	Signature (for file)	Anne Fuller

Revision Status / History

Rev	**Date**	**Issue / Purpose/ Comment**	**Prepared**	**Checked**	**Authorised**
1	01/08/16	Preliminary Issue	DM	RAJ	EAF
2	25/10/16	Revised to suit latest options	DM	RAJ	EAF
3	18/11/16	Naming revised and further drawings added	DM	RAJ	EAF

Contents

Appendices

1. Introduction

Capita Engineering have been commissioned by The Shrewsbury and Telford Hospital NHS Trust to undertake Civil and Structural services in connection with the proposed Sustainable Services Programme for Princess Royal Hospital at Telford (PRH) and Royal Shrewsbury Hospital (RSH).

Simplistically the Trust's proposal can be separated into three specific development options, namely options 'B', 'C1' and 'C2'.

These options relate to provision of Emergency facilities at one hospital (either Telford or Shrewsbury) and supporting Planned services at the hospital without this provision.

The specific options can be further defined as follows;

<u>Option B</u>
Emergency at PRH
Planned at RSH

<u>Option C1</u>
Emergency at RSH
Planned at PRH

<u>Option C2</u>
Emergency RSH
Planned at PRH

Within this document the hospital with the Emergency facilities is referred to as 'The Emergency Site' site and the hospital with the Planned facilities is referred to as 'The Planned Site'.

The following document considers the site 'abnormals' for the development of all potential solutions to allow a high level cost appraisal to be undertaken for all three options. 'Abnormals' can be classed as any unusual physical on site features which will require addressing as part of the development - for example poor ground, significant level changes, impact of existing services etc.

The information contained within this document is based on all information made available (both existing and proposed) as of 12th August 2016. Where gaps in this information exist certain sensible Engineering assumptions have been made which will be ratified as the scheme develops, further information becomes available and the proposed solutions crystallise.

2. Royal Shrewsbury Hospital, Shrewsbury

2.1 Ground Conditions

The following suits all options (B, C1 & C2) and is a précis of the full geo-environmental report which is included in Appendix 'H' of this document

2.1.1 Foundations and Slabs

The ground conditions encountered during the intrusive investigation comprised topsoil locally or made ground deposit. Made ground is variable across the site (both granular and cohesive) and was encountered in a number of the exploratory holes and all of the hand dug pits. Gravel within the made ground typically comprises of fragments of mudstone, sandstone, brick and concrete with occasional fragments of wood, paper, textile and plastic. Glacial till deposits comprises of both cohesive and granular strata below the made ground.

For the proposed foundations to structural elements to buildings (columns/shear and core walls) generally conventional ground bearing solutions should be considered. Due to the variable depths of the made ground over the glacial till the depth of suitably competent strata will vary, the minimum depth being 0.75m. Allowance should be made for additional lean mix concrete down to greater depth (2.0m) under pad foundations where competent clay strata is slightly deeper.

For building slabs these can typically be considered as ground bearing. Provision should be made for local removal of any made ground and soft spots etc. and all formations should be proof rolled and any soft, loose or deleterious material should be removed and replaced with properly compacted granular fill.

Under the proposed multi storey car park (proposed for the RSH options C1 and C2) lies an old 'pond' which was infilled during construction of the hospital (refer to maps in the site investigation Phase 2 report). Using the closest window sampling results the material used appears to be site won clay mixed with a mixture of rubble/ash. For the purposes of the high level cost exercise for OBC and without prescriptive delineation it should be assumed at this stage that the new car park will be formed using an appropriate piling system.

2.1.2 Pavements and Roads

In consideration of the ground conditions encountered, the pavement subgrade exposed at formation levels may comprise natural sand or clay or granular made ground deposits.

Given the anticipated CBR values the pavement and road build ups are not considered to be 'abnormal' and standard appropriate structural build ups should be adopted. However, the design value will need to be reviewed and confirmed by suitable in-situ testing at formation levels following earthwork operations and prior to pavement construction.

Notwithstanding this, the formation at all levels should be proof-rolled prior to pavement construction, and any soft zones thus revealed should be excavated out, with the resulting excavation in-filled with appropriately graded engineered granular fill.

For the provision of sub-bases to external areas consideration of 'site won' material could be made. Sorting and screening to remove deleterious materials and crushing of oversized items (concrete blocks, blocks of masonry, etc.) should however be undertaken where necessary in order to facilitate and improve the compaction of such materials during placement.

Granular materials should be used preferentially in areas beneath proposed structures. The use of cohesive materials should therefore be considered more appropriate as general fill (in landscape areas for example) where settlements are less critical.

2.2 Geo-environmental conditions

The following section is relevant to all options (B, C1 and C2)

2.2.1 Contamination

Sampling and testing of the soils has been undertaken at the site to quantify the level of contamination that could potentially be exposed at the surface in the proposed development.
The level of contamination in the soil can be considered negligible.

In terms of the proposed commercial end-use the shallow soils at the site do not present a significant risk to human health or controlled waters and are therefore considered suitable for use across the site without further remediation.

Groundwater samples have not been tested as part of this investigation. Given the negligible level of soil contamination, the site soils are not considered to present a risk to controlled waters.

2.2.2 Groundwater

On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.00m should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep.

Groundwater should not be expected in shallow excavations for foundations or services. However, it is possible that perched groundwater could be present in the made ground overlying the natural strata. It is considered that this could be dealt with by localised pumping.

2.2.3 Gas

The preliminary monitoring dataset indicated the site to fall into Characteristic Situation 1 (CS1).

Subsequent ongoing monitoring identified that no significantly elevated concentrations of methane or carbon dioxide were recorded on the site and therefore no gas protection measures would be required for the proposed new structures.

2.3 Existing Services/Structures

The following section is relevant to all options (B, C1 and C2)

As the time of writing no ‘holistic’ site wide drainage information has been made available. Discreet drainage details (for various pieces of building work undertaken at the hospital since its initial construction) have however been viewed but unfortunately these are insufficient to form an accurate picture across the site. What appears apparent based on site knowledge is that the main drainage runs from the site fall as parallel outfalls onto the two hospital entrance points on Mytton Road.

At the time of writing no CCTV survey has been undertaken to understand the position and condition of the existing drainage although we understand that this will be undertaken as part of the next phase of works.

With the above in mind a suitably contingent approach should be made with regard to drainage diversion work associated with the new build element for all options as well as any possible replacement of existing drainage in poor condition (again for all options). Refer to section 2.5 for details of drainage works to facilitate the proposed refurbishments and section 2.7 for details of on site drainage storage.

There is an existing service duct which runs adjacent to the existing energy centre and Estates department into the main building which we believe (whilst still live) is in poor repair. We assume that for all options this duct may be removed and replaced with a new underground structure to house the services. Such a structure would be either a precast or insitu concrete accessible buried service trench designed to meet the requirements of the external site use above. For more details of the requirements for works to these particular ducts refer to DSSR details.

Refer to DSSR drawings and details for information relating to on site services other than those described above.

There is no specific evidence of any existing structures (foundations) around the site through both site investigation and the historical map. The potential at this stage, however, for local foundations to former (now removed) smaller structures should not be discounted.

2.4 Structural interfaces

The following section is relevant to all options (B, C1 and C2)

Where new build elements ‘abut’ the existing building structures consideration should be made of how the two separate structures relate to one another. All new build elements will be designed as stand alone, ie. no structural support will be taken off any existing building structures. This is the case for both the substructure and the superstructure.

Site investigation works undertaken in 2016 have shown the existing footings to be ground bearing on the clay strata with a top of foundation at somewhere between 600mm and 900mm. The proposed foundations will be similar in type but either ‘pulled back’ from the existing foundations and cantilever foundations adopted or where this is not possible existing foundations will be tight against the existing and underpinning adopted to alleviate any additional surcharge loads/differential settlement.

Where the new superstructures meet the existing (for both buildings and link bridges) the structural frame lines will (again) be 'pulled back' from the existing building and superstructure support systems cantilevered to meet the existing frames. Suitably specified movement joints will meet the requirements of all anticipated vertical and horizontal movements between the two structures.

2.5 Refurbishment

The following section is relevant to all options (B, C1 and C2)

Exact civil and structural works to refurbishments for all options at this stage are unclear but the current proposal is such that the existing frames will typically remain 'as built' and no key structural elements removed or significantly altered. In essence the proposed modifications will work around the existing structure post demolition of internal non-structural fabric (soft strip).

Some contingency, however, should be allowed for where minor structural works are potentially required (small openings in slabs, restraints to existing modified wall panels, new internal frames etc.). Also where the new build meets the existing buildings knocking through is likely to require new additional support, especially where the stacked precast external wall panels have been utilised, where the stacking is such that the panels are vertically self supporting.

Prior to refurbishment works a full structural condition survey of the areas to be modified should be undertaken, to both check the suitability of the existing structure to receive any changes/additions in loads as well as its general condition (ie. presence of HAC, high sulphate levels etc.).

Internal modifications will also potentially require revisions to the existing drainage. Such revisions are likely to be capping off existing drainage and chasing out of the existing ground floor slabs and introduction of new internal runs to serve new relocated toilets and wash basins. Suitable provision for such works should be made within the cost plan.

2.6 Site Ownership

The following section is relevant to all options (B, C1 and C2)

It is assumed that there are no specific site boundary or 'red line' issues which affect any civil or structural details (ie. party wall, structural adjacencies etc.)

2.7 Drainage

An assessment of the likely storage requirements for all options has been undertaken (these can be applied to each of the options B, C1 and C2) using the very latest discharge restrictions and standard requirements likely to be enforced by the planning authority and building control. The following is an assessment of the requirements for storage areas and interceptors;

<u>‘Option C1’ – RSH ‘The Emergency Site’</u>

<u>Main Building (assumed impermeable plan area = 10500m²)</u>
- Attenuation storage area 540m³. Geo-Cellular ‘YESS’ Versavoid storage system.

<u>New outpatients (assumed impermeable plan area = 2500m²)</u>
- Attenuation storage area 130m³. Geo-Cellular ‘YESS’ Versavoid storage system.

<u>Car Park</u>
- Assumed no affect on discharge rates
- Interceptor type ‘Stormceptor’ bypass separator, 100 series class 1 model 204 C1-SC (NSB4)

<u>‘Option C2’ – RSH ‘The Emergency Site’</u>

<u>Main Building (assumed impermeable plan area = 10500m²)</u>
- Attenuation storage area 540m³. Geo-Cellular ‘YESS’ Versavoid storage system.

<u>New outpatients (assumed impermeable plan area = 2500m²)</u>
- Attenuation storage area 130m³. Geo-Cellular ‘YESS’ Versavoid storage system.

<u>Car Park</u>
- Assumed no affect on discharge rates

<u>‘Option B’ – RSH ‘The Planned Site’</u>

- Assumed no affect on discharge rates

2.8 Flood Risk

The following section is relevant to all options (B, C1 and C2)

Referring to the last available Flood Risk Assessment and Capita Symonds summary report (see Appendix A) the site is identified as being in Flood Zone 1 and as such it is unlikely any works to building levels or containment measures will require consideration. A new flood risk assessment should, however, be carried out to the latest statutory guidance and legislation in support of the planning submission.

2.9 Demolition

The following section is relevant to all options (B, C1 and C2)

The current scheme includes demolition of existing buildings. At an appropriate time a full deconstruction statement will be developed alongside (where required) commissioning of existing surveys to facilitate production of a subcontractors method statement for demolition works.

In the meantime, some points which should be considered;

- Proximity of traffic and pedestrians
- Working from height
- Cantilever Structures
- Live services
- Possible presence of HAC concrete
- Asbestos
- Working above the basement
- Potential deep tanks
- Re-use of demolished material under new hardstanding areas

2.10 Topography/Retention

Refer to drawing numbers CST-CE-XX-GR-DR-C-200-012, 013, 015 & 016 in Appendix B for a plan of the existing site (and levels) with the proposed new build added – the drawings show the retaining wall solution requirements for options C1 and C2. This has allowed a high level assessment of likely retention required to facilitate the new build and this is shown diagrammatically on the drawings. Option B (RSH – Planned site) has no significant retention requirements as it is essentially refurbishment of the existing facility.

2.11 Cut and Fill

Refer to Appendix C for the cut and fill drawing numbers CST-CE-XX-GR-DR-C-200-011 & 014 with associated volumes - with the proposed new build added. The drawings show the requirements for options C1 and C2. This has allowed a high level assessment of cut/fill required to facilitate the new build and this is shown diagrammatically on the drawings. For costing purposes some sensible assumptions have been made on areas where no topographical information exists. Option B (RSH – Planned site) has no significant cut/fill requirement as it is mainly refurbishment of the existing facility.

In terms of any material to be disposed from site, this can generally be classed as ‘non hazardous waste’.

3. Princess Royal Hospital, Telford

3.1 Ground Conditions

The following suits all options (B, C1 & C2) and is a précis of the full report which is included in Appendix 'I' of this document.

3.1.1 Foundations and slabs

The ground conditions encountered during the intrusive investigation comprised made ground deposits overlying glacial deposits comprising clay, silt and sand.

Made ground was variable across the site (both granular and cohesive) and was encountered in a number of the exploratory holes. In-situ penetration testing indicated the variable nature of the materials.

For the proposed foundations to structural elements to buildings (columns/shear and core walls) generally conventional ground bearing solutions should be considered. Due to the variable depths of the made ground over the glacial till the depth of suitably competent strata will vary, the minimum depth being 0.75m with a maximum circa 1.5m deep.

For building slabs these can typically be considered as ground bearing. Provision should be made for local removal of any made ground and soft spots etc. and all formations should be proof rolled and any soft, loose or deleterious material should be removed and replaced with properly compacted granular fill.

3.1.2 Pavements and Roads

In consideration of the ground conditions encountered, the pavement subgrade exposed at formation levels may comprise natural sand or clay or granular made ground deposits.

Given the anticipated CBR values the pavement and road build ups are not considered to be 'abnormal' and standard appropriate structural build ups should be adopted. However, the design value will need to be reviewed and confirmed by suitable in-situ testing at formation levels following earthwork operations and prior to pavement construction.

Notwithstanding this, the formation at all levels should be proof-rolled prior to pavement construction, and any soft zones thus revealed should be excavated out, with the resulting excavation in-filled with appropriately graded engineered granular fill.

For the provision of sub-bases to external areas consideration of 'site won' material could be made. Sorting and screening to remove deleterious materials and crushing of oversized items (concrete blocks, blocks of masonry, etc.) should however be undertaken where necessary in order to facilitate and improve the compaction of such materials during placement.

Granular materials should be used preferentially in areas beneath proposed structures. The use of cohesive materials should therefore be considered more appropriate as general fill (in landscape areas for example) where settlements are less critical.

3.2 Geo-environmental conditions

The following section is relevant to all options (B, C1 and C2)

3.2.1 Contamination

Sampling and testing of the soils has been undertaken at the site to quantify the level of contamination that could potentially be exposed at the surface in the proposed development. The level of contamination in the soil can be considered negligible.

In terms of the proposed commercial end-use the shallow soils at the site do not present a significant risk to human health or controlled waters and are therefore considered suitable for use across the site without further remediation and/or mitigation.

Groundwater samples have not been tested as part of this investigation. Given the negligible level of soil contamination, the site soils are not considered to present a risk to controlled waters.

3.2.2 Groundwater

On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.00m should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep.

Groundwater should not be expected in shallow excavations for foundations or services. However, it is possible that perched groundwater could be present in the Made Ground overlying the natural strata. It is considered that this could be dealt with by localised pumping.

3.2.3 Gas

The preliminary monitoring dataset indicated the site to fall into Characteristic Situation 1 (CS1).

Subsequent ongoing monitoring identified that no significantly elevated concentrations of methane or carbon dioxide were recorded on the site and therefore no gas protection measures would be required for the proposed new structures.

3.3 Existing Services/Structures

The following section is relevant to all options (B, C1 and C2)

Capita have been party to utilities drawing number 2011.00899.UM1-Utility Survey – an underground utilities scan for all the main services as existing. This includes the existing drainage layout. This is included in Appendix D.

At the time of writing no site wide CCTV survey has been undertaken to understand the condition of the existing drainage, as well as ratify the drawn information but there have been areas of the site subject to CCTV surveys (Womens and Children) which were consistent with drawn records. We understand a full site CCTV survey will be undertaken as part of the next phase of works.

The existing drainage is such that the existing system is a separate foul and surface water system which runs in parallel east along the north and south faces of the building and they discharge externally to the east and south of the site. The runs to the south of the existing building are such that extensive drainage diversion works (for all options) will be required with local sizes and gradients checked against the diverted flows in conjunction with storage design to suit the relevant planning requirements. Refer to section 2.7 for details of on site drainage storage.

Refer to section 2.5 for details of drainage works to facilitate the proposed refurbishments.

Refer to DSSR drawings and details for information relating to on site services other than those described above.

There is no specific evidence of any existing structures (foundations) around the site through both site investigation and the historical map. The potential at this stage, however, for local foundations to former smaller structures should not be discounted.

3.4 Structural interfaces

The following section is relevant to all options (B, C1 and C2)

Where the new build structure meets the existing building structures consideration should be made of how the two separate structures relate to one another. All new build elements will be designed as stand alone, ie. no structural support will be taken off any existing building structures. This is the case for both the substructure and the superstructure.

Site investigation works undertaken in 2016 (and investigation undertaken in 2012 as part of the Womens and Childrens Unit) have shown the existing footings to be ground bearing on the clay strata with a top of foundation at somewhere between 300mm and 1000mm. The proposed foundations will be similar in type but either ‘pulled back’ from the existing foundations and cantilever foundations adopted or where this is not possible existing foundations will be tight against the existing and underpinning adopted to alleviate any additional surcharge loads/differential settlement. This is also the case for the infilled courtyards.

Where the new superstructures meet the existing the structural frame lines will (again) be ‘pulled back’ from the existing building and superstructure support systems cantilevered to meet the existing frames. Suitably specified movement joints will meet the requirements of all anticipated vertical and horizontal movements between the two structures. Again, this is also the case for the infilled courtyards.

3.5 Refurbishment

The following section is relevant to all options (B, C1 and C2)

Civil and structural works to refurbishments (for both options) at this stage are obviously unclear but the current proposal is such that the existing frames will typically remain ‘as built’ and no key structural elements removed or significantly altered. In essence the proposed modifications will work around the existing structure post demolition of internal non-structural fabric (soft strip).

Some contingency, however, should be allowed for where minor structural works are potentially required (small openings in slabs, restraints to existing modified wall panels, new internal frames etc.). Also where the new build meets the existing buildings knocking through is likely to require new additional support to existing cavity walls/wall panels.

Prior to refurbishment works a full structural condition survey of the areas to be modified should be undertaken, to both check the suitability of the existing structure to receive any changes/additions in loads as well as its general condition (ie. presence of HAC, high sulphate levels etc.).

Internal modifications will also potentially require revisions to the existing drainage. Such revisions are likely to be capping off existing drainage and chasing out of the existing ground floor slabs and introduction of new internal runs to serve new relocated toilets and wash basins. Suitable provision for such works should be made within the cost plan.

3.6 Site Ownership

The following section is relevant to all options (B, C1 and C2)

It is assumed that there are no specific site boundary or 'red line' issues which affect any civil or structural details (ie. party wall, structural adjacencies etc.)

3.7 Drainage

An assessment of the likely storage requirements for all options has been undertaken, using the very latest discharge restrictions and standard requirements likely to be enforced by the planning authority and building control. The following is an assessment of the requirements for storage areas and interceptors;

'Option B' – PRH 'The Emergency Site'

Building (assumed impermeable plan area = 8135m²)
- Attenuation storage area 420m³. Geo-Cellular 'YESS' Versavoid storage system.

Car Park (assumed impermeable plan area = 2950m²)
- Attenuation storage area 120m³. Geo-Cellular 'YESS' Versavoid storage system.
- Interceptor type 'Stormceptor' bypass separator, 100 series class 1 model 206 C1-SC (NSB6)

'Option C1' – PRH 'The Planned Site'

Main Building (assumed impermeable plan area = 4000m²)
- Attenuation storage area 200m³. Geo-Cellular 'YESS' Versavoid storage system.

Car Park (assumed impermeable plan area = 1200m²)
- Attenuation storage area 600m³. Geo-Cellular 'YESS' Versavoid storage system.
- Interceptor type 'Stormceptor' bypass separator, 100 series class 1 model 206 C1-SC (NSB6)

‘Option C2’ – PRH ‘The Planned Site’

Main Building (assumed impermeable plan area = 6000m²)
- Attenuation storage area 150m³. Geo-Cellular ‘YESS’ Versavoid storage system.

Car Park (assumed impermeable plan area = 1200m²)
- Attenuation storage area 600m³. Geo-Cellular ‘YESS’ Versavoid storage system.
- Interceptor type ‘Stormceptor’ bypass separator, 100 series class 1 model 206 C1-SC (NSB6)

3.8 Flood Risk

The following section is relevant to all options (B, C1 and C2)

Referring to the last available Flood Risk Assessment (Halcrow report dated September 2007) and Capita Symonds summary report (see Appendix E) the site is identified as being in Flood Zone 1 and as such it is unlikely any works to building levels or containment measures will require consideration. A new flood risk assessment should, however, be carried out to the latest statutory guidance and legislation in support of the planning submission.

3.9 Demolition

The following section is relevant to all options (B, C1 and C2)

The current scheme includes demolition of existing remote accommodation buildings. At an appropriate time a full deconstruction statement will be developed alongside (where required) commissioning of existing surveys to facilitate production of a subcontractors method statement for demolition works.

In the meantime, some points which should be considered;

- Proximity of traffic and pedestrians
- Working from height
- Cantilever Structures
- Live services
- Possible presence of HAC concrete
- Asbestos
- Working above the basement
- Potential deep tanks
- Re-use of demolished material under new hardstanding areas

3.10 Topography/Retention

Refer to drawing numbers CST-CE-XX-GR-DR-C-200-002, CST-CE-XX-GR-DR-C-200-004 and CST-CE-XX-GR-DR-C-200-006 in Appendix F for a plan of the existing site (and levels) with the proposed new build added – the drawings show the requirements for all options. These have allowed a high level assessment of likely retention required to facilitate the new build and this is shown diagrammatically on the drawings.

3.11 Cut and Fill

Refer to Appendix G for the cut and fill drawing numbers CST-CE-XX-GR-DR-C-200-001, CST-CE-XX-GR-DR-C-200-003 and CST-CE-XX-GR-DR-C-200-005 with associated volumes - with the proposed new build added. The drawings show the requirements for all options. This has allowed a high level assessment of cut/fill required to facilitate the new build and this is shown diagrammatically on the drawings.

In terms of any material to be disposed from site, this can generally be classed as ‘non hazardous waste’.

Appendix A - Royal Shrewsbury Hospital - Capita Symonds Flood Risk Assessment Summary

Outline Flood Risk Assessment

PPS25 requires that all six sources of flooding are considered when assessing flood risk. This section identifies the sources and potential mechanisms of flooding (including historic incidents), and explores the probability of these sources of flooding actually occurring at the site.

FLUVIAL FLOODING
According to the EA flood mapping the development site lies within Flood Zone 1, i.e. outside the extents of the 1 in 1000 year flood event, and is therefore considered to be at low risk of fluvial flooding. The site is also located approximately 500m from the nearest fluvial flooding source.

FLOODING FROM THE SEA
Given the location of the site, the risk of flooding from coastal or tidal waters is considered to be low.

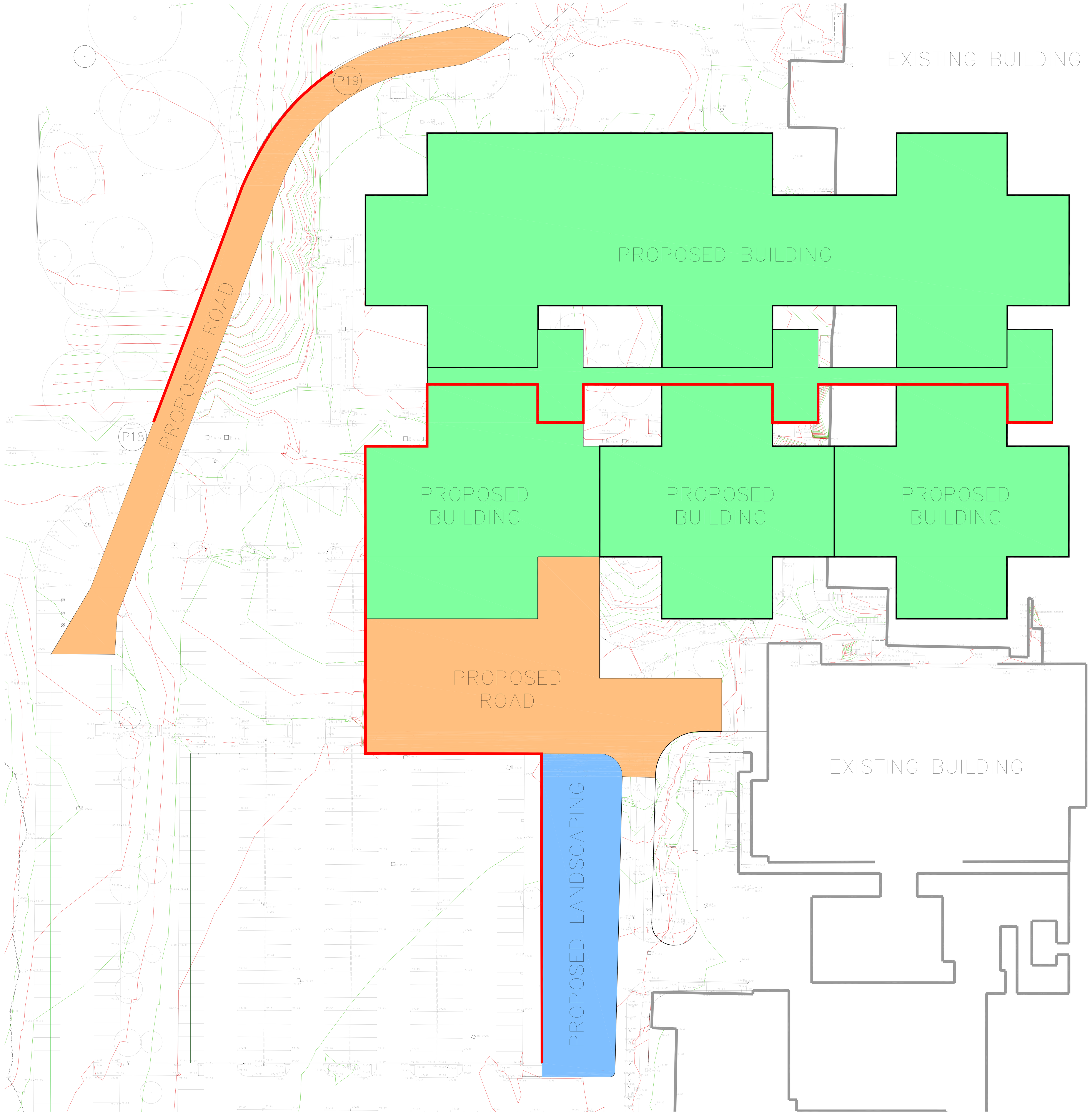
FLOODING FROM LAND (OVERLAND FLOW)
The topography of the site and the surrounding area do not indicate the presence of the risk of overland run off entering the site.

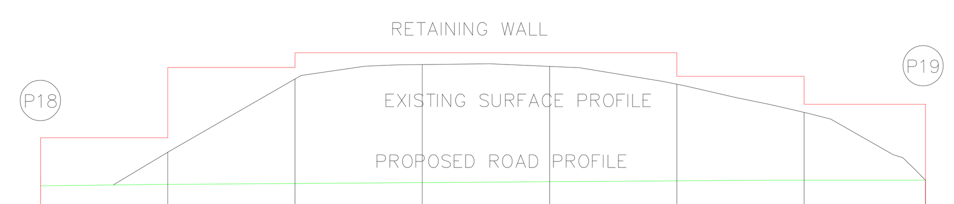
FLOODING FROM GROUND WATER
The intrusive site investigation encountered ground water in 2 specific boreholes. The water located was found to be at a depth of approximately 2.5m and any ‘near ground’ water due to rises in the level will likely discharge into the Brook south of the site (see Site Investigation report). It is therefore unlikely this will represent a flooding risk.

FLOODING FROM SEWERS
The site is directly not connected to the public sewer network but drains there via the main hospital network. Given the fact no historic issues on the site have been identified it is considered that the risk of flooding from this source is low.

FLOODING FROM ARTIFICIAL SOURCES
The site is not located close to any artificial sources, hence it is considered that the risk of flooding from this source is low.

Appendix B - Royal Shrewsbury Hospital - Retaining Wall Details





CHAINAGE	PROPOSED SURFACE LEVEL 1	RETAINING WALL HEIGHT (ABOVE PROPOSED PROFILE)
0.00M	79.273M	1.105M
10.0M	79.320M	1.255M
20.0M	79.368M	4.050M
30.0M	79.4151M	4.600M
40.0M	79.464M	4.600M
50.0M	79.500M	4.600M
60.0M	79.500M	3.660M
70.0M	79.500M	2.530M

General Notes

1. Do not scale from this drawing. Work from figured dimensions only.
2. All dimensions are in mm unless noted otherwise.
3. All drawings to be read in conjunction with all architects, engineers and specialist drawings & details.

Drawing Notes

1. This drawing is based on information received 31.05.16.
2. Cut & fill has been graded in 1m segments as per the elevation table.

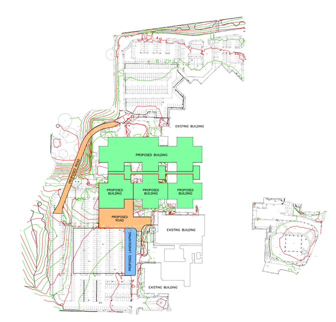
Key

Retaining Wall

Major Contour

Minor Contour

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue
INFORMATION

Status
-

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Royal Shrewsbury Hospital

Drawing
Proposed Site Earthworks
Option C2 - The Emergency Site
Earth Retention - Sheet 2 of 2

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 24/08/2016

Drawing Identifier — BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
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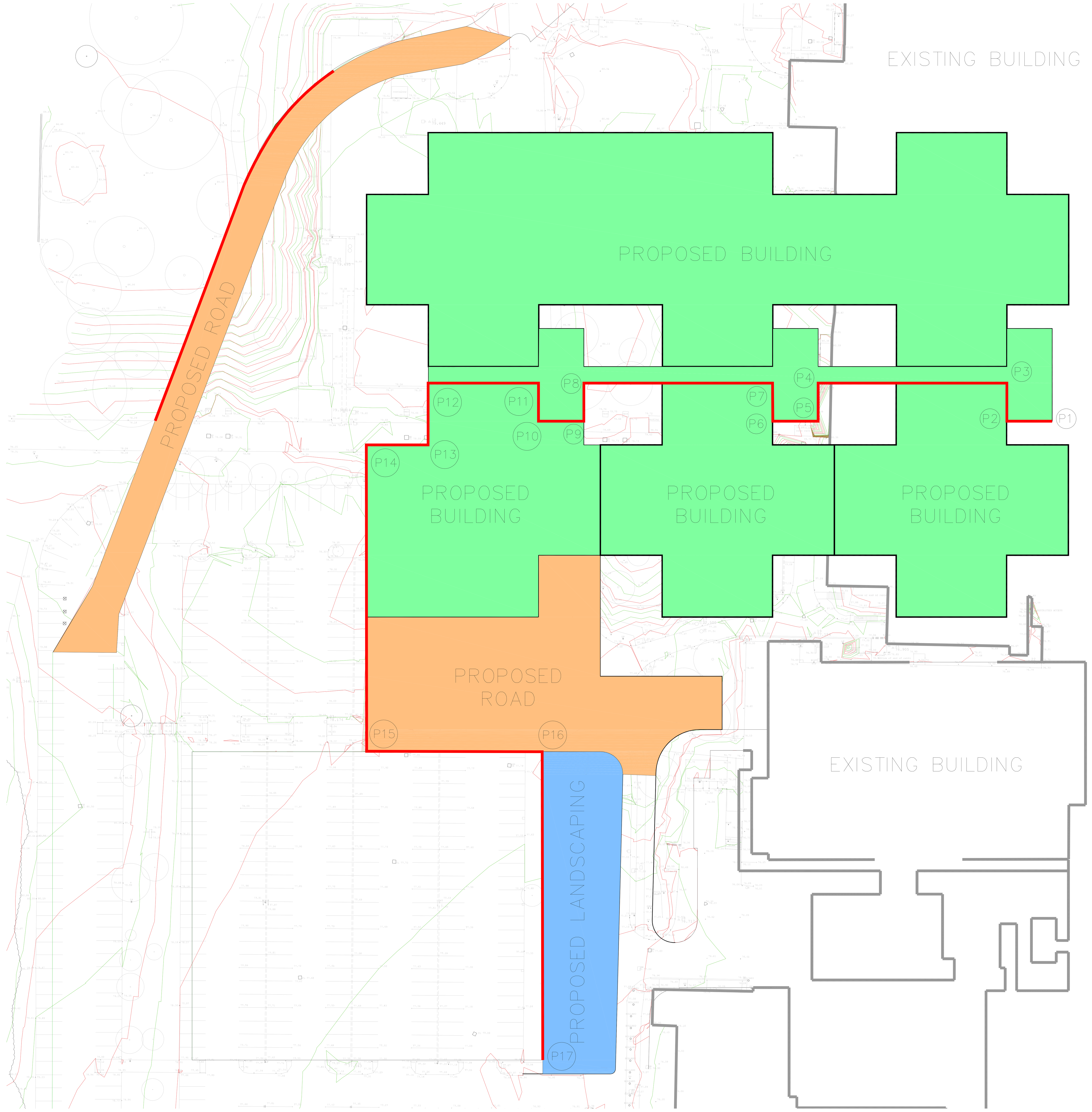
CAPITA
Engineering
Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
www.capitaproperty.co.uk
Capita Property and Infrastructure Ltd.



RETAINING WALL

PROPOSED SURFACE LEVEL 1

PROPOSED SURFACE LEVEL 0

P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 P17

CHAINAGE	PROPOSED SURFACE LEVEL 1	RETAINING WALL HEIGHT (ABOVE PROPOSED LEVEL 0)
0.00M	80.410M	4.950M
8.2M	80.410M	1.925M
16.5M	80.410M	4.950M
20.0M	80.410M	4.950M
40.0M	80.410M	4.950M
50.7M	80.410M	4.950M
57.6M	80.410M	4.950M
60.0M	80.410M	4.950M
66.0M	80.410M	4.950M
72.9M	80.410M	4.950M
80.0M	80.410M	4.950M
100.0M	80.410M	4.950M
107.1M	80.410M	4.950M
114.0M	80.410M	4.950M
120.0M	80.410M	4.950M
122.40M	80.410M	4.950M
129.1M	80.410M	4.950M
140.0M	80.410M	4.950M
149.1M	80.410M	4.950M
160.0M	80.410M	4.950M
160.3M	80.236M	4.950M
171.5M	80.373M	4.950M
180.0M	80.180M	4.950M
200.0M	79.723M	4.950M
220.0M	79.447M	4.055M
227.1M	79.452M	4.055M
240.0M	79.387M	4.055M
258.7M	79.450M	4.055M
260.0M	79.464M	4.305M
280.0M	78.780M	3.590M
300.0M	78.180M	3.145M
320.0M	77.625M	2.170M
340.0M	76.856M	1.400M
352.9M	76.356M	0.895M

General Notes

1. Do not scale from this drawing. Work from figured dimensions only.
2. All dimensions are in mm unless noted otherwise.
3. All drawings to be read in conjunction with all architects, engineers and specialist drawings & details.

Drawing Notes

1. This drawing is based on information received 31.05.16.
2. Cut & fill has been graded in 1m segments as per the elevation table.

Key

Retaining Wall

Major Contour

Minor Contour

Key Plan

Rev	Description / By / Chk'd / App'd	Date
P1	Issued For OBC.	18.11.16

Purpose of Issue: INFORMATION

Status: -

Client: Shrewsbury & Telford NHS Trust

Project: Sustainable Services Royal Shrewsbury Hospital

Drawing: Proposed Site Earthworks Option C1 - The Emergency Site Earth Retention - Sheet 1 of 2

Scale @ A1: 1:500 | Drawn: D Baker | Checked: D Middleton | Approved: D Middleton

Project No. CS087958 | Date 24/08/2016

Drawing Identifier (project origin zone level file type role uniclass and number revision) BS1192 / Uniclass Compliant

CST -CE -XX -GR-DR-C-200-015 P1

CAPITA
Engineering
Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
www.capitaproperty.co.uk
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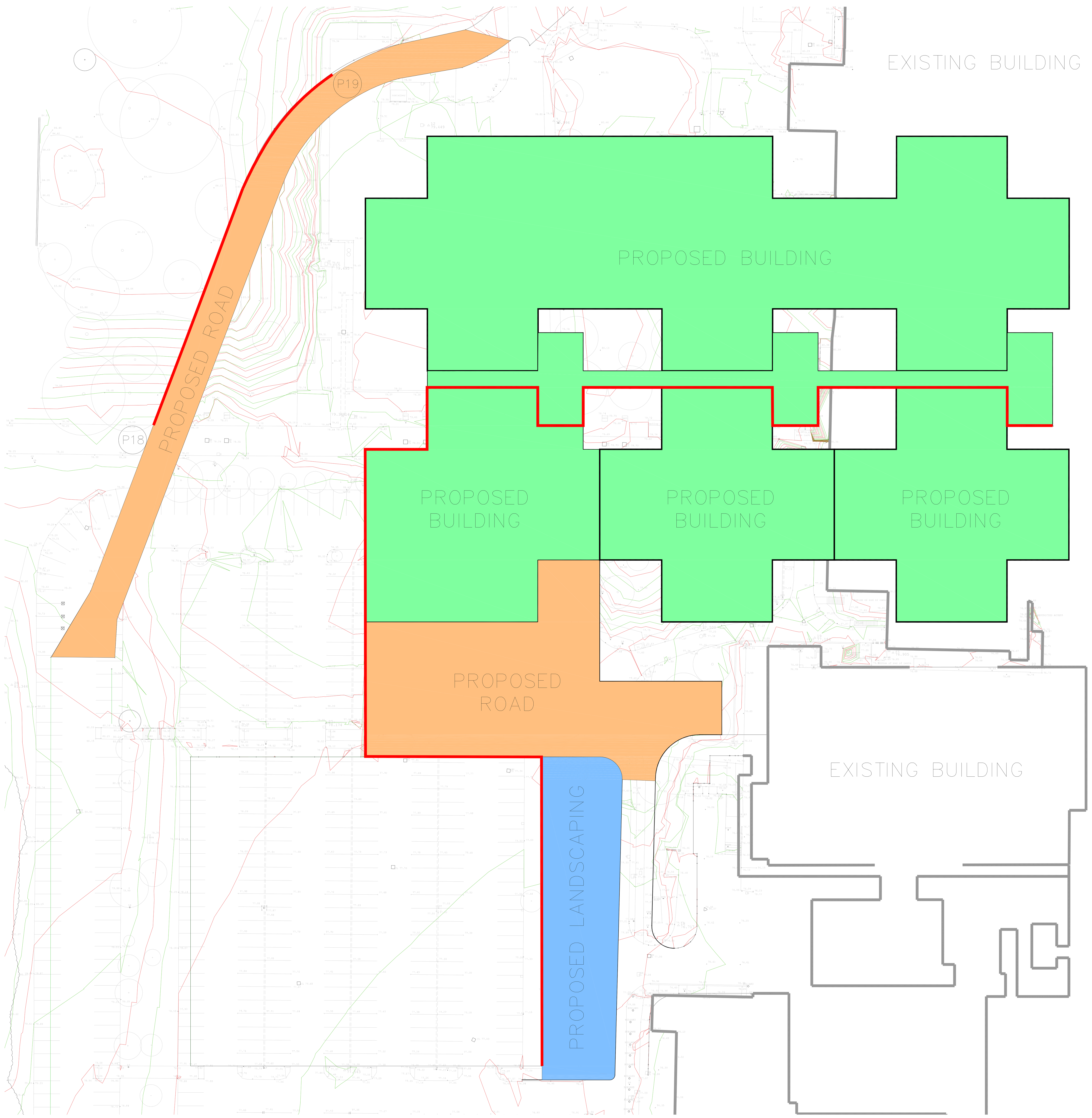

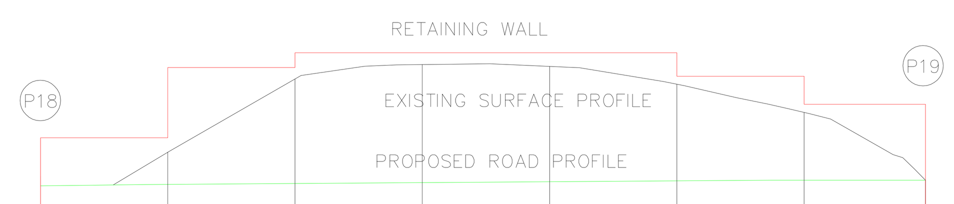

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0.00M	79.273M	1.105M
10.0M	79.320M	1.255M
20.0M	79.368M	4.050M
30.0M	79.4151M	4.600M
40.0M	79.464M	4.600M
50.0M	79.500M	4.600M
60.0M	79.500M	3.660M
70.0M	79.500M	2.530M

General Notes

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2. All dimensions are in mm unless noted otherwise.
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Drawing Notes

1. This drawing is based on information received 31.05.16.
2. Cut & fill has been graded in 1m segments as per the elevation table.

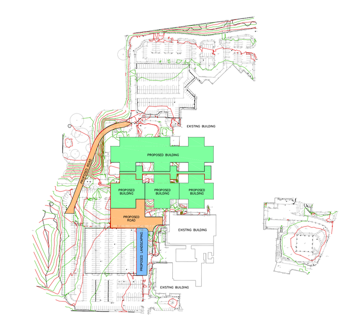
Key

Retaining Wall

Major Contour

Minor Contour

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P1	Issued For OBC.	18.11.16

Purpose of Issue
INFORMATION

Status
-

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Royal Shrewsbury Hospital

Drawing
Proposed Site Earthworks
Option C1 - The Emergency Site
Earth Retention - Sheet 2 of 2

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 24/08/2016

Drawing Identifier BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
CST -CE -XX -GR-DR-C-200-016 P1

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Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
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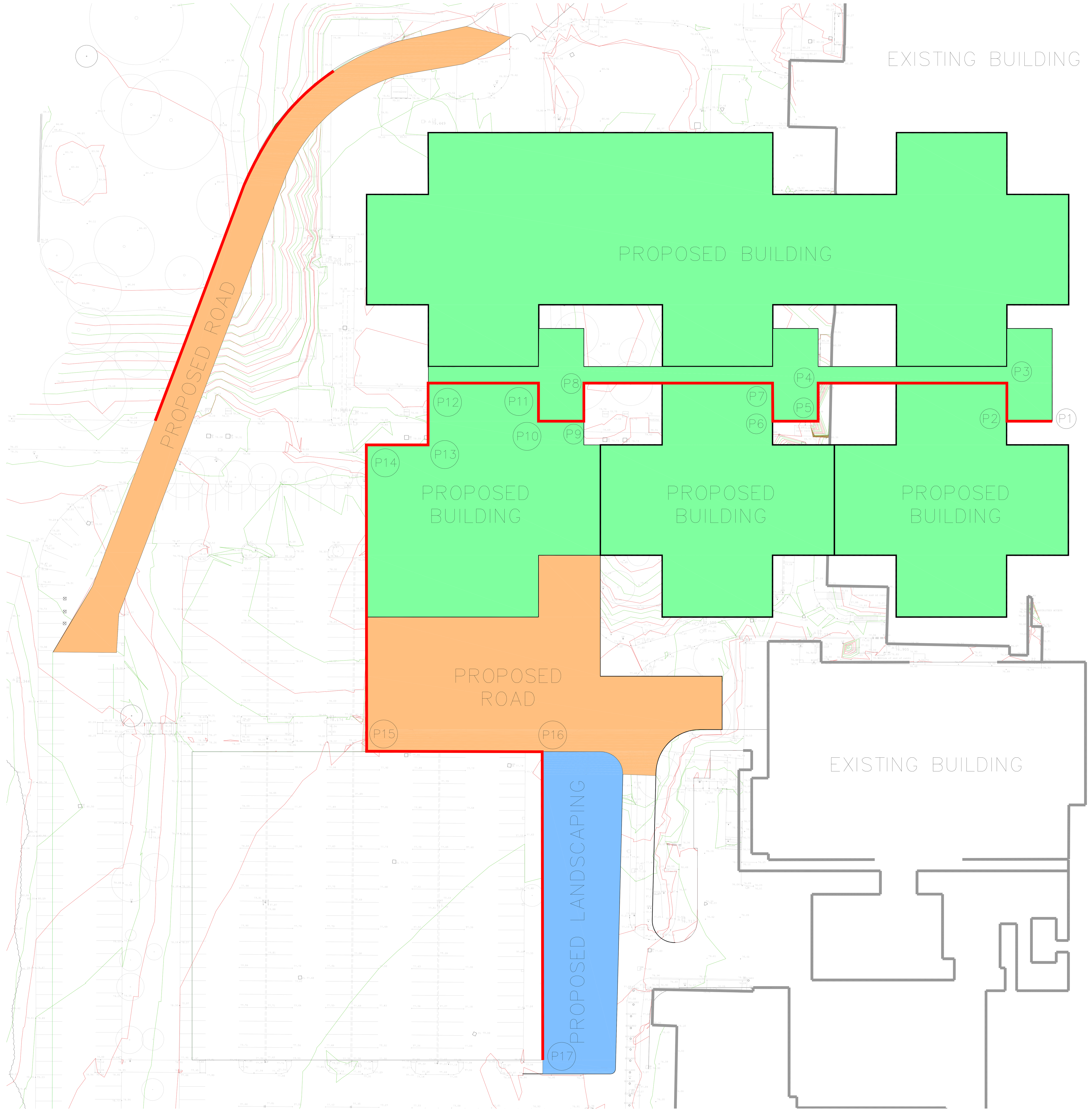

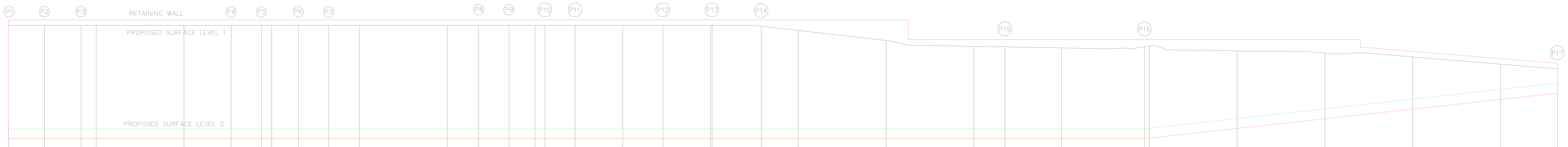

CHAINAGE	PROPOSED SURFACE LEVEL 1	RETAINING WALL HEIGHT (ABOVE PROPOSED LEVEL 0)
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8.2M	80.410M	1.925M
16.5M	80.410M	4.950M
20.0M	80.410M	4.950M
40.0M	80.410M	4.950M
50.7M	80.410M	4.950M
57.6M	80.410M	4.950M
60.0M	80.410M	4.950M
66.0M	80.410M	4.950M
72.9M	80.410M	4.950M
80.0M	80.410M	4.950M
100.0M	80.410M	4.950M
107.1M	80.410M	4.950M
114.0M	80.410M	4.950M
120.0M	80.410M	4.950M
122.40M	80.410M	4.950M
129.1M	80.410M	4.950M
140.0M	80.410M	4.950M
149.1M	80.410M	4.950M
160.0M	80.410M	4.950M
160.3M	80.236M	4.950M
171.5M	80.373M	4.950M
180.0M	80.180M	4.950M
200.0M	79.723M	4.950M
220.0M	79.447M	4.055M
227.1M	79.452M	4.055M
240.0M	79.387M	4.055M
258.7M	79.450M	4.055M
260.0M	79.464M	4.305M
280.0M	78.780M	3.590M
300.0M	78.180M	3.145M
320.0M	77.625M	2.170M
340.0M	76.856M	1.400M
352.9M	76.356M	0.895M

General Notes

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Drawing Notes

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Key

Retaining Wall
Major Contour
Minor Contour

All other design team elements, where indicated, have been imported from the consultant's drawings and reference should be made to the individual consultant's drawings for exact setting out, size and type of component.

Discrepancies and / or ambiguities within this drawing, between it and information given elsewhere, must be reported immediately to the architect for clarification before proceeding.

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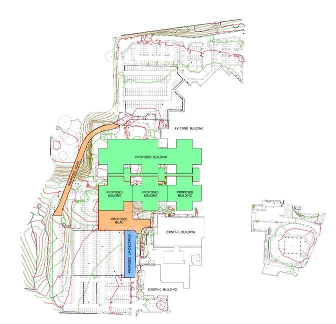
Key Plan



Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Royal Shrewsbury Hospital

Drawing
Proposed Site Earthworks
Option C2 - The Emergency Site
Earth Retention - Sheet 1 of 2

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958
Date 24/08/2016

Drawing Identifier (project origin zone level file type role uniclass and number) — BS1192 / Uniclass Compliant — revision
CST -CE -XX -GR-DR-C-200-012 P2

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Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
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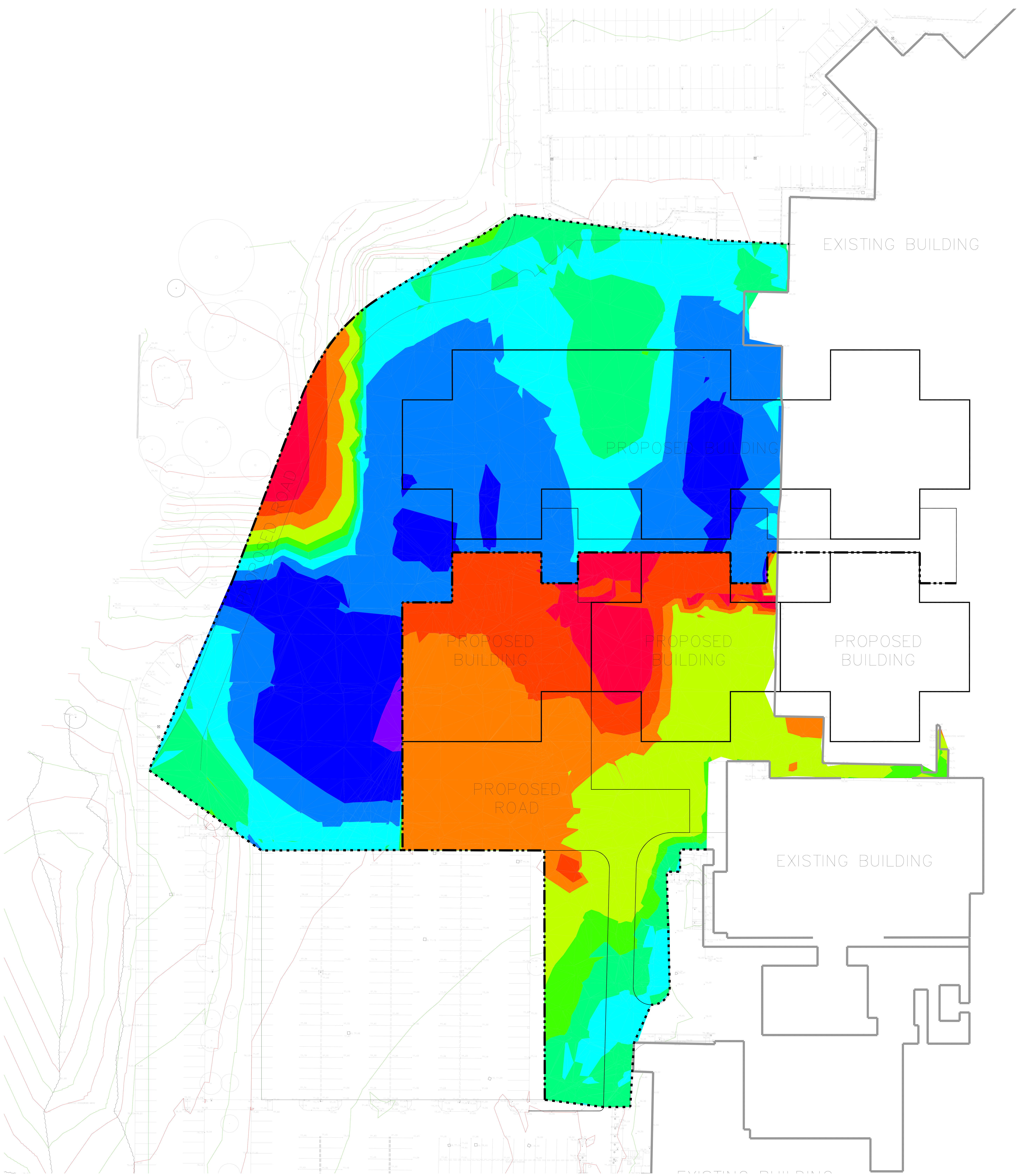
Appendix C - Royal Shrewsbury Hospital - Cut & Fill Analysis



General Notes

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Drawing Notes

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2. Cut & fill has been graded in 1m segments as per the elevation table.

Key

Retaining Wall
Major Contour
Minor Contour
Tie-in Point to Existing

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-4.74	-4.00	663.43	
2	-4.00	-3.00	1379.66	
3	-3.00	-2.00	2173.92	
4	-2.00	-1.00	2065.00	
5	-1.00	-0.50	453.35	
6	-0.50	0.00	1916.18	
7	0.00	0.50	2931.18	
8	0.50	1.00	3741.25	
9	1.00	2.00	1939.59	
10	2.00	2.92	66.97	

Volume Summary

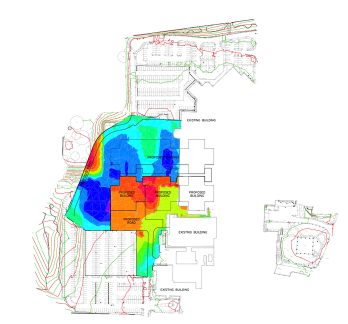
Name	Type	Cut Factor	Fill Factor	2D Area (sq.m)	Cut (Cu.M)	Fill (Cu.M)	Net (Cu.M)
Comp	Full	1.000	1.000	17330.53	16985.03	6290.68	10694.35

NB: Cut and fill figures only represent an existing topographical surface comparison with the proposed finished ground level. Extra allowance should be made for localized cut to proposed building foundations, poor ground, services & drainage etc.

0 5m 10m 25m 50m

Scale Bar 1:500

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P1	Issued For OBC.	18.11.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Royal Shrewsbury Hospital

Drawing
Proposed Site Earthworks
Option C1 - The Emergency Site
Cut & Fill

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 24/08/2016

Drawing Identifier BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
CST -CE -XX -GR-DR-C-200-014 P1

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Engineering
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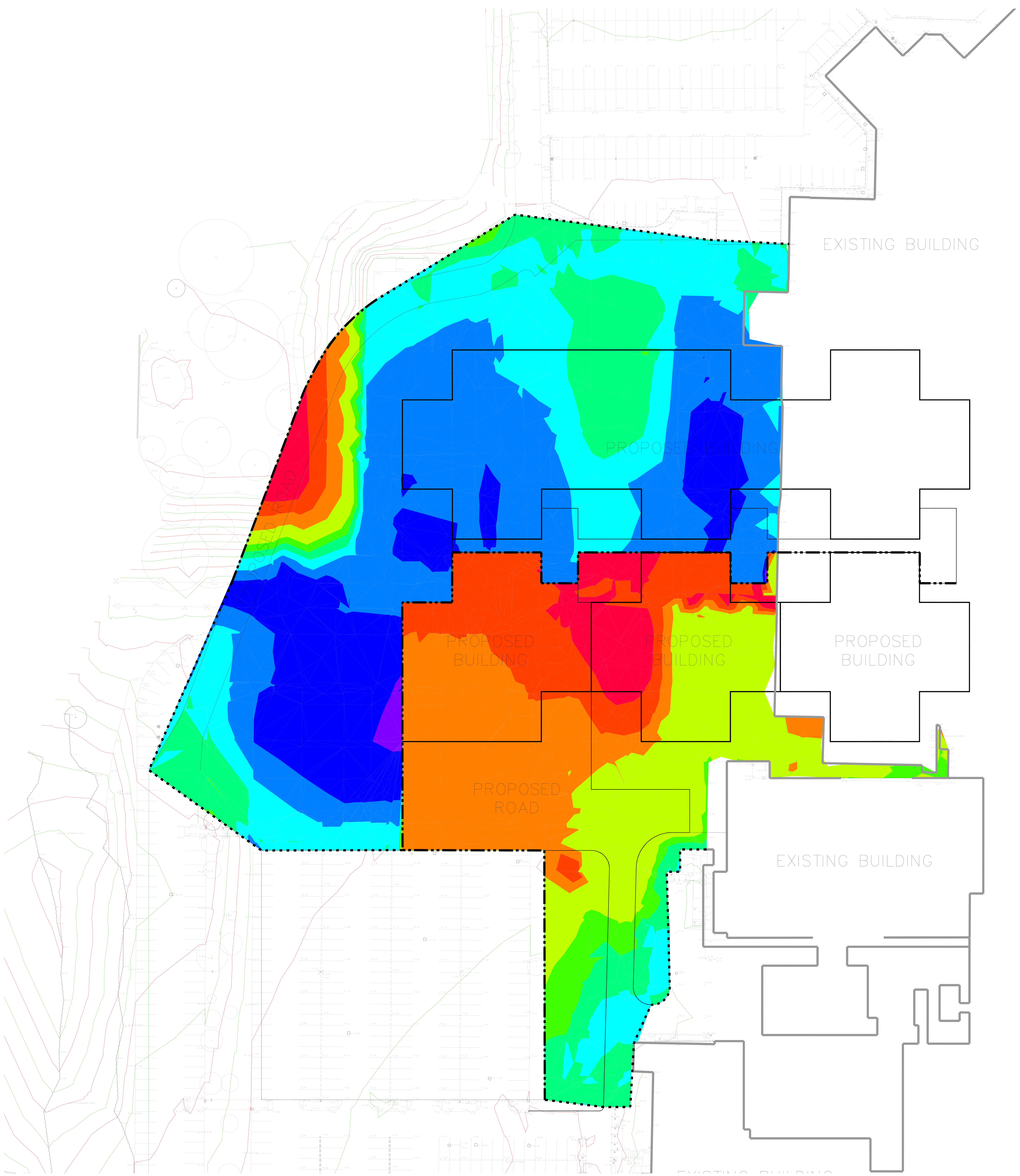

General Notes

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Drawing Notes

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2. Cut & fill has been graded in 1m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour
- Tie-in Point to Existing

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-4.74	-4.00	663.43	
2	-4.00	-3.00	1379.66	
3	-3.00	-2.00	2173.92	
4	-2.00	-1.00	2065.00	
5	-1.00	-0.50	453.35	
6	-0.50	0.00	1916.18	
7	0.00	0.50	2931.18	
8	0.50	1.00	3741.25	
9	1.00	2.00	1939.59	
10	2.00	2.92	66.97	

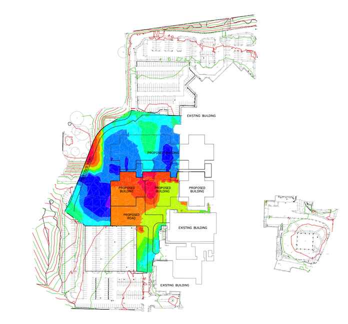
Volume Summary

Name	Type	Cut Factor	Fill Factor	2D Area (sq.m)	Cut (Cu.M)	Fill (Cu.M)	Net (Cu.M)
Comp	Full	1.000	1.000	17330.53	16985.03	6290.68	10694.35

NB: Cut and fill figures only represent an existing topographical surface comparison with the proposed finished ground level. Extra allowance should be made for localized cut to proposed building foundations, poor ground, services & drainage etc.

0 5m 10m 25m 50m
Scale Bar 1:500

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Royal Shrewsbury Hospital

Drawing
Proposed Site Earthworks
Option C2 - The Emergency Site
Cut & Fill

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958   Date 24/08/2016

Drawing Identifier: project origin zone level file type role unique number revision   BS1192 / Uniclass Compliant
CST -CE -XX -GR-DR-C-200-011 P2

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Appendix D - Princess Royal Hospital - Existing Services

KEY

AV	AIR VALVE	NP	NAME PLATE
AC	AIR CONDITIONING UNIT	OHC	OVERHEAD CABLE
AR	ASSUMED ROUTE	OSA	OFF SURVEY AREA
B/W	BARBED WIRE FENCE	PB	PILLAR BOX
BB	BELISHA BEACON	P/M	PARKING METER
BD	BACK DROP	PBM	PERMANENT BENCH MARK
BOL	BOLLARD	PGM	PERMANENT GROUND MARKER
BH	BORE HOLE	PO	POST OFFICE COVER
BT	BRITISH TELECOM	PR	PIPE RISER
BS	BUS STOP	P/R	POST AND RAIL FENCE
CR	CABLE RISER	P/W	POST AND WIRE FENCE
CATV	CABLE TV	PU	PUMP
CP	CATCH PIT	RI	RISER
C/L	CHAIN LINK FENCE	RWP	RAIN WATER PIPE
C/B	CLOSE BOARDED FENCE	RP	REFLECTOR POST
CON	CONCRETE	R/W	RETAINING WALL
COV	COVER	RS	ROAD SIGN
CC	COMMS CABINET	RE	RODDING EYE
C/I	CORRUGATED IRON FENCE	S/F	SAFETY FENCE
CL	COVER LEVEL	S/A	SOAKAWAY
CUL	CULVERT	SL	SOFFIT LEVEL
DP	DOWN PIPE	SC	SPEED CAMERA
ER	EARTH ROD	SP	SIGN POST
EB	ELECTRICITY BOX	ST	STOP TAP
EC	ELECTRICITY COVER	SV	STOP VALVE
EP	ELECTRICITY POLE	SS	SUPPORT STRUCTURE
EOT	END OF TRACE	STP	STUMP
FC	FUEL COVER	STN	STATION
FFL	FINISHED FLOOR LEVEL	S/R	STEEL RAILINGS
FH	FIRE HYDRANT	TBC	TO BE CONFIRMED
FS	FLAG STAFF	TBM	TEMPORARY BENCH MARK
GS	GAS VALVE	TFR	TAKEN FROM RECORDS
GP	GUIDE POST	TP	TELEGRAPH POLE
GPR	GROUND PENETRATING RADAR	TCB	TELEPHONE CALL BOX
G	GULLY	TS	TRAFFIC SIGNS
IC	INSPECTION COVER	TH	TRAIL PIT/HOLE
IL	INVERT LEVEL	UTGA	UNABLE TO GAIN ACCESS
I/R	IRON RAIL FENCE	UTL	UNABLE TO LOCATE
KO	KERB OUTLET	UTR	UNABLE TO RAISE
LP	LAMP POST	UTS	UNABLE TO SURVEY
LB	LITTER BIN	UTT	UNABLE TO TRACE
LH	LAMP HOLE	VDP	VEHICLE DETECTOR PADS
MH	MANHOLE	VP	VENT PIPE
MKR	MARKER	VTP	VERTICAL VENT PIPE
M/C	MULTIPLE CABLES	WO	WASH OUT
MT	MERCURY TELEPHONE COVER	W	WATER COVER
MTR	METER	WL	WATER LEVEL
NB	NOTICE BOARD	WM	WATER METER
MS	MILE STONE	WV	WHEEL VALVE
MB	MOORING BOLLARD	W/M	WIRE MESH FENCE

LEGEND

BT — BT — BT	BRITISH TELECOM
CATV — CATV	CABLE TELEVISION
	COMBINED DRAINAGE
	DUCTING
E — E — E	ELECTRICITY
FO — FO — FO	FIBRE OPTICS
	FOUL DRAINAGE
GAS — GAS — GAS	GAS
	PHOTOGRAPH
	SURFACE WATER
	SURVEY EXTENTS
T — T — T	TELECOMMUNICATIONS
W — W — W	WATER
UK — UK — UK	UNKNOWN TRACE
GPR — GPR — GPR	UNKNOWN GPR TRACE
	SURVEY STATION
	FENCE LINE

LEVEL DATUM INFORMATION:

ALL LEVELS RELATED TO ORDNANCE SURVEY DATUM.

CAVEAT

WHERE STATUTORY AUTHORITY PLANS HAVE BEEN USED, AEDAS GEOMATICS CANNOT BE HELD RESPONSIBLE FOR THEIR ACCURACY, AS THERE IS NO GUARANTEE IT IS THE MOST UP TO DATE

THE ACCURACY OF BOTH THE RADIO DETECTION EQUIPMENT AND THE GROUND PENETRATING RADAR, CAN ONLY BE ASSUMED TO BE +-10% OF THE LOCATED DEPTH, FOR BOTH X,Y AND Z HEIGHT INFORMATION.

WHILST AEDAS GEOMATICS PROVIDE SUITABLY TRAINED STAFF ON ALL PROJECTS AND OUR INVESTMENT IN THE LATEST DETECTION EQUIPMENT, LOCATED DATA MUST NOT BE ASSUMED EXHAUSTIVE AND DOCUMENT HS(G)47 MUST ALWAYS BE ADHERED TO IN ALL AREAS DURING ANY EXCAVATION WORKS.

ALL SURVEY WORKS ARE CARRIED OUT IN ACCORDANCE WITH THE RICS SURVEYS OF LAND, BUILDINGS AND UTILITY SURVEYS AT SCALES OF 1:500 AND LARGER, OF WHICH A COPY CAN BE MADE AVAILABLE ON REQUEST.

rev	description	date	dr by	ap by
original by R GARLICK		14/10/11		LM

Aedas
Geomatics

Aedas Building Consultancy Ltd
Norwich Union House
High Street
Huddersfield HD1 2LF
United Kingdom

T +44(0)1484 537411
F +44(0)1484 530332
E huddersfield@aedas.com
aedas.com

client
**AEDAS ARCHITECTS LTD
SHREWSBURY**

project
**ROYAL PRINCESS HOSPITAL
TELFORD**

drawing
**UNDERGROUND UTILITY SCAN
AS EXISTING**

	plot date 14/10/11
project number 2011.00899.UM1	scale 1:500
drawing number 03	rev / issue status INFORMATION

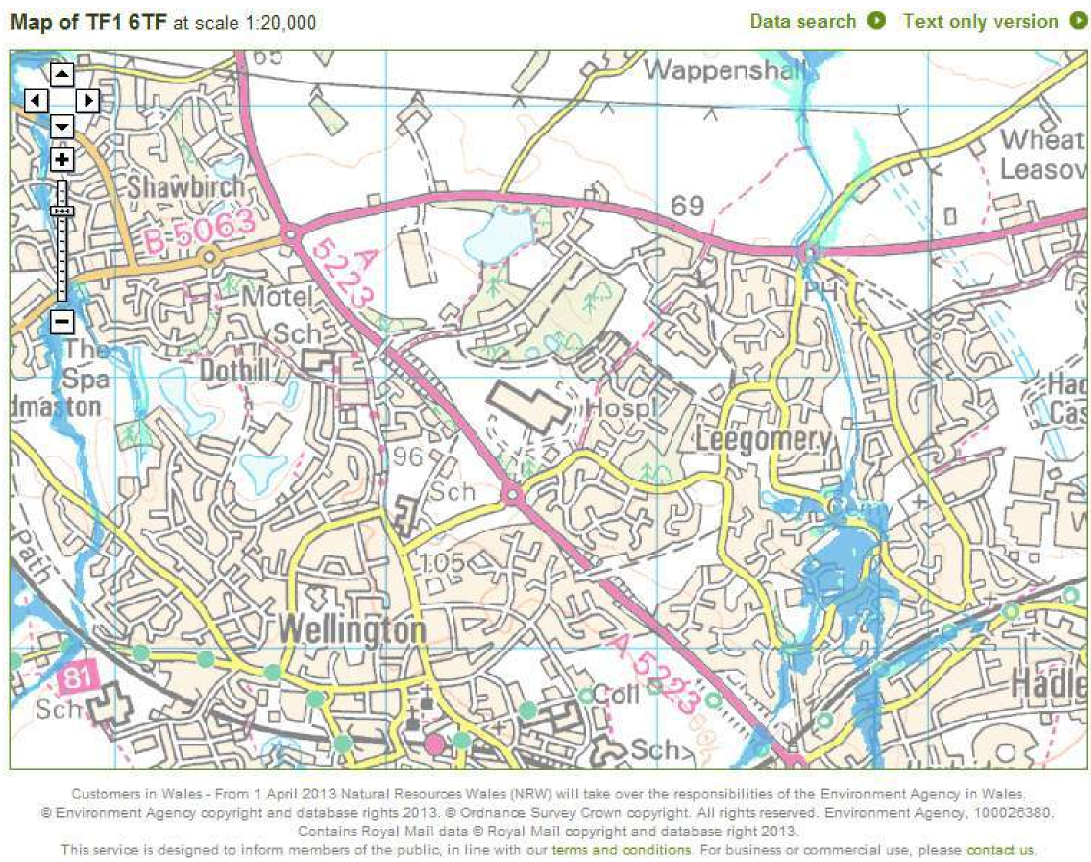
Appendix E - Princess Royal Hospital - Capita Symonds Flood Risk Assessment Summary

Flood Risk Assessment

PPS25 requires that all six sources of flooding are considered when assessing flood risk. This section identifies the sources and potential mechanisms of flooding (including historic incidents), and explores the probability of these sources of flooding actually occurring at the site.

FLUVIAL FLOODING

According to the EA flood mapping, see below plan, the development site lies within Flood Zone 1, i.e. outside the extents of the 1 in 1000 year flood event, and is therefore considered to be at low risk of fluvial flooding. The site is also located approximately 1000m from the nearest fluvial flooding source.



FLOODING FROM THE SEA

Given the location of the site, the risk of flooding from coastal or tidal waters is considered to be low.

FLOODING FROM LAND (OVERLAND FLOW)
The topography of the site and the surrounding area do not indicate the presence of the risk of overland run off entering the site.

FLOODING FROM GROUND WATER
The intrusive ground investigation has proven the site to be underlain by a sequence of layered sand and clay deposits representative of the Quaternary Drift geology. The underlying geology is classed as a Secondary Aquifers and is likely to be of limited permeability.

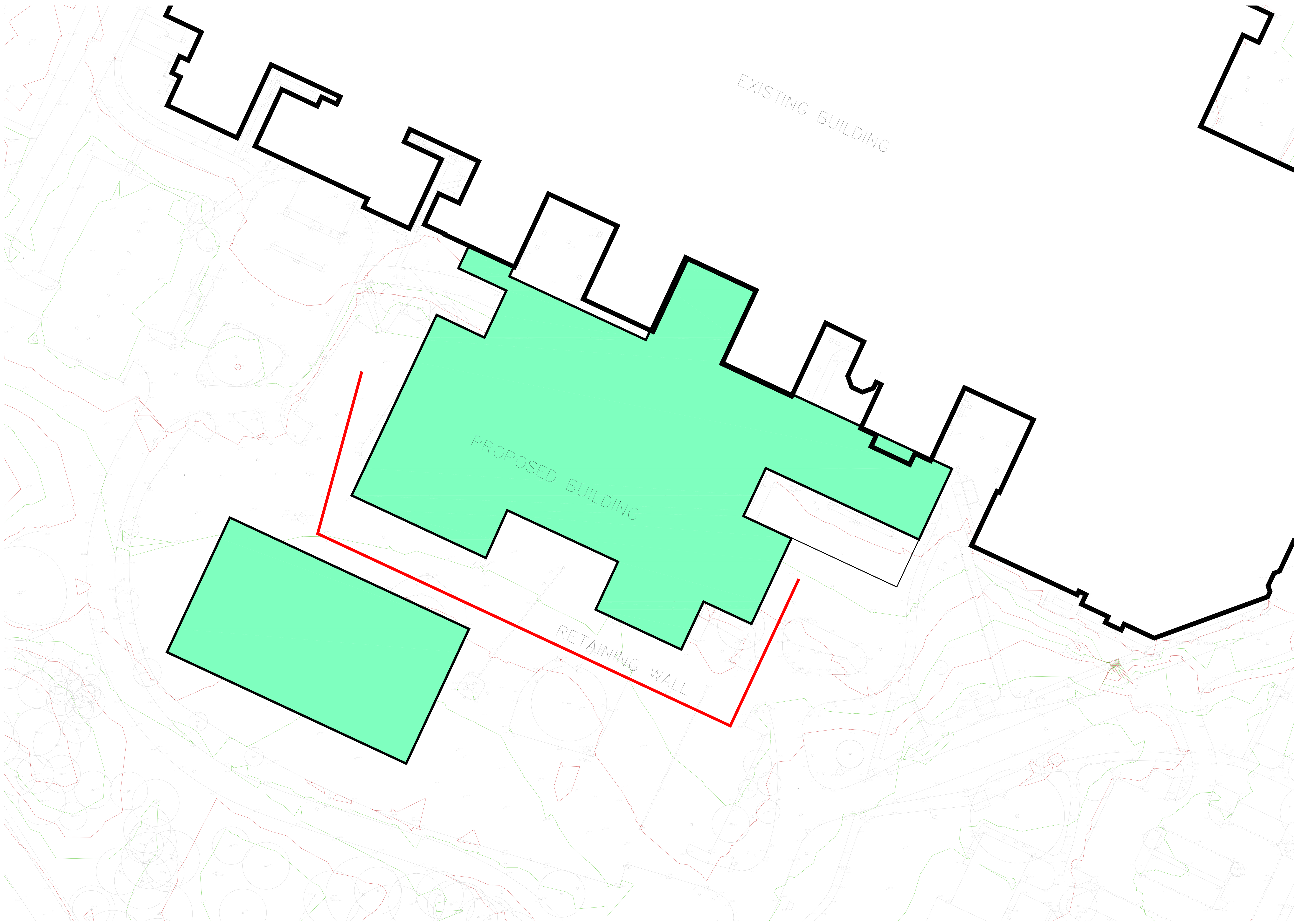
Monitoring of four surveillance wells installed for the development has identified that groundwater is likely to lie below 4m depth. One well did record water levels at 0.5m below ground level; however this is likely to be a local perched horizon rather than a consistent aquifer body.

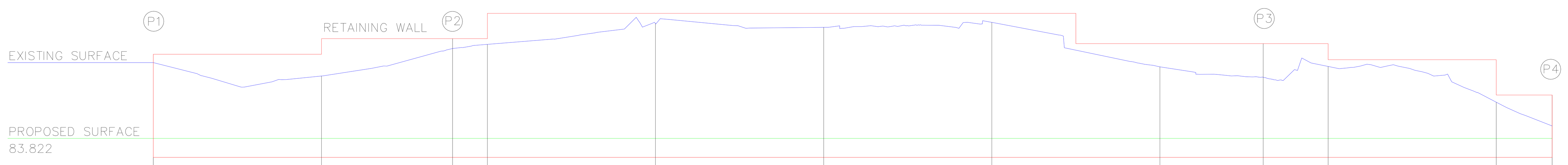
On the basis of the above we do not believe the site is susceptible to groundwater flooding which is in keeping with the Telford and Wrekin Preliminary Flood Risk Assessment which states there is no recorded history of groundwater flooding in the borough.

FLOODING FROM SEWERS
The site is directly not connected to the public sewer network but drains there via the main hospital network. Given the fact no historic issues on the site have been identified it is considered that the risk of flooding from this source is low.

FLOODING FROM ARTIFICIAL SOURCES
The site is not located close to any artificial sources, hence it is considered that the risk of flooding from this source is low.

Appendix F - Princess Royal Hospital - Retaining Wall Details





CHAINAGE	0.00M	20.0M	35.9M	40.0M	60.0M	80.0M	100.0M	120.0M	132.2M	140.0M	160.0M	166.6M
EXISTING SURFACE LEVEL	85.632M	85.312M	85.970M	86.065M	86.566M	86.472M	86.593M	85.530M	85.282M	85.540M	84.687M	84.121M
RETAINING WALL HEIGHT (ABOVE PROPOSED)	2.010M	2.380M	2.380M	2.980M	2.980M	2.980M	2.980M	2.260M	2.260M	2.260M	1.880M	1.035M

NB:

- Y -AXIS IS SCALED BY x5.
- ALL LEVELS ARE APPROXIMATE AND FOR COSTING PURPOSES ONLY.
- RETAINING WALL DEPTH BELOW PROPOSED SURFACE LEVEL IS 500mm.
- RETAINING WALL BASE DEPTH + STEM IS TO BE 400mm.

0 5m 10m 25m 50m

Scale Bar 1:500

General Notes

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Drawing Notes

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2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

Retaining Wall

Major Contour

Minor Contour

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Key Plan

Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Princess Royal Hospital

Drawing
Proposed Site Earthworks
Option C2 - The Planned Site
Earth Retention

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 17/08/2016

Drawing Identifier: project origin zone level file type role uniclass and number revision (BS1192 / Uniclass Compliant)
CST -CE -XX -GR-DR-C-200-004 P2

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Engineering
Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
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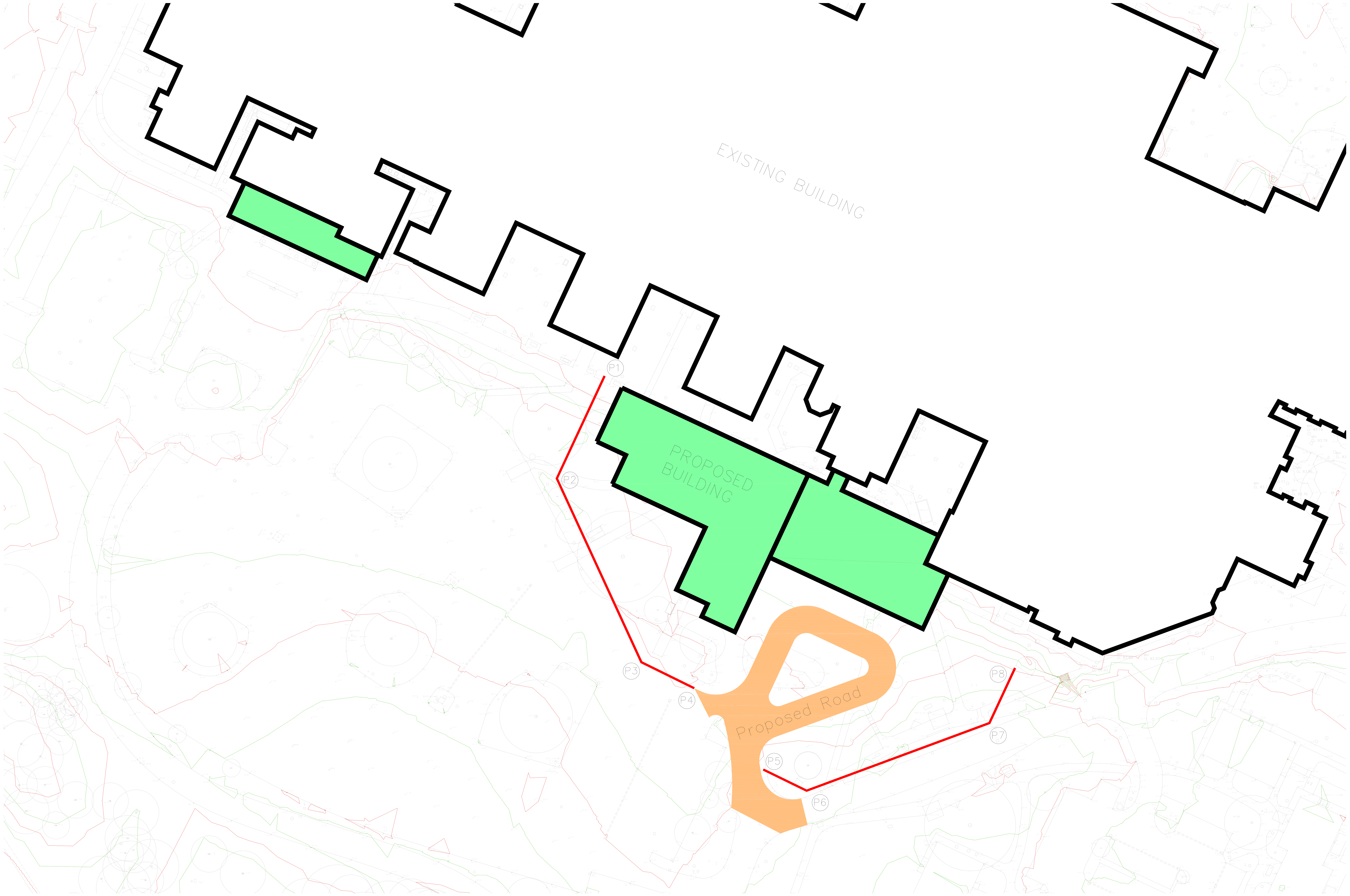
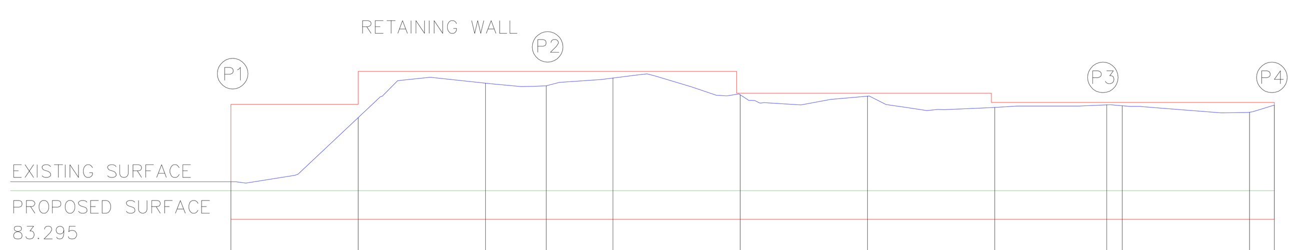
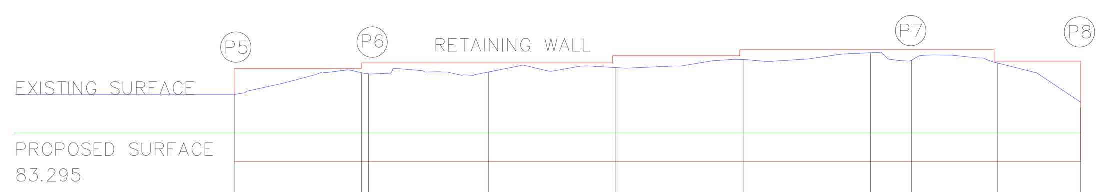




CHAINAGE	EXISTING SURFACE LEVEL	RETAINING WALL HEIGHT (ABOVE PROPOSED)
0.00M	84.00M	1.355M
10.0M	85.070M	1.355M
20.0M	85.548M	1.925M
24.770M	85.506M	1.925M
30.0M	85.622M	1.925M
40.0M	85.372M	1.535M
50.0M	85.340M	1.535M
60.0M	85.162M	1.385M
69.060M	85.207M	1.385M
70.0M	85.198M	1.385M
80.0M	86.088M	1.385M
82.880M	85.203M	1.385M



CHAINAGE	EXISTING SURFACE LEVEL	RETAINING WALL HEIGHT (ABOVE PROPOSED)
0.0M	86.346M	1.015M
10.0M	86.403M	1.100M
10.557M	86.384M	1.100M
20.0M	86.417M	1.100M
30.0M	86.486M	1.215M
40.0M	86.611M	1.310M
50.0M	86.717M	1.310M
53.219M	86.600M	1.310M
60.0M	86.557M	1.130M
69.060M	85.942M	1.130M

NB:
- Y - AXIS IS SCALED BY x5.
- ALL LEVELS ARE APPROXIMATE AND FOR COSTING PURPOSES ONLY.
- RETAINING WALL DEPTH BELOW PROPOSED SURFACE LEVEL IS 500mm.
- RETAINING WALL WIDTH IS 350mm.
- RETAINING WALL BASE DEPTH + STEM IS TO BE 400mm.

0 5m 10m 25m 50m
Scale Bar 1:500

General Notes

1. Do not scale from this drawing. Work from figured dimensions only.
2. All dimensions are in mm unless noted otherwise.
3. All drawings to be read in conjunction with all architects, engineers and specialist drawings & details.

Drawing Notes

1. This drawing is based on information recieved 31.05.16.
2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour

Key Plan

Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Princess Royal Hospital

Drawing
Proposed Site Earthworks
Option C1 - The Planned Site
Earth Retention

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958
Date 17/08/2016

Drawing Identifier: project, origin, zone, level, file type, role, uniclass and number, revision
BS1192 / Uniclass Compliant

CST -CE -XX -GR-DR-C-200-006 P2

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Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
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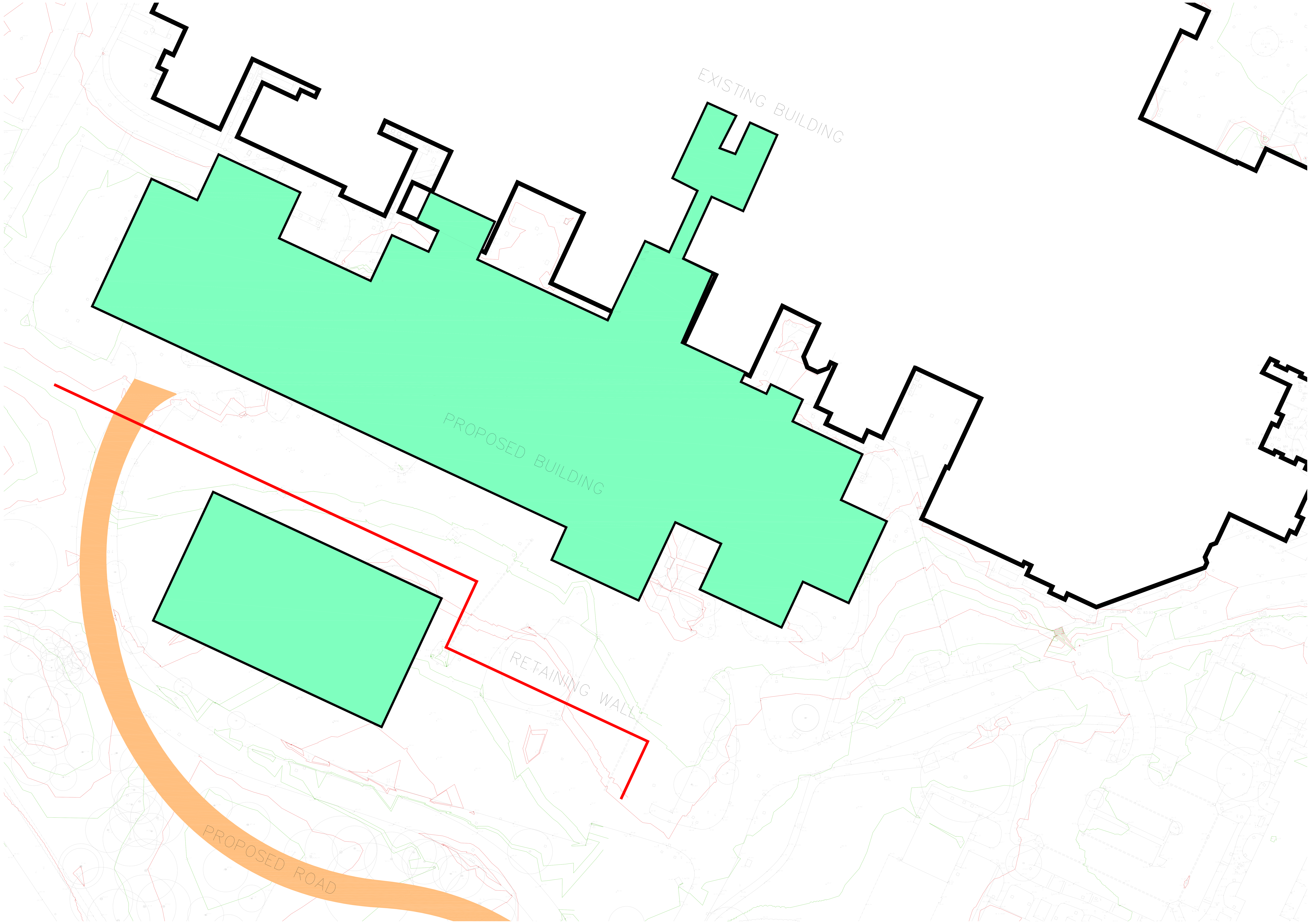

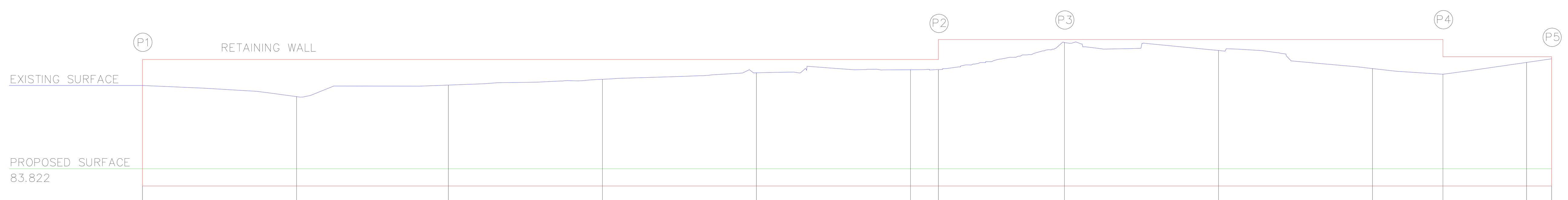

CHAINAGE	EXISTING SURFACE LEVEL	RETAINING WALL HEIGHT (ABOVE PROPOSED)
0.00M	84.907M	1.345M
20.0M	84.983M	2.840M
40.0M	85.282M	2.840M
60.0M	85.433M	2.840M
80.0M	85.602M	2.840M
100.0M	85.680M	2.840M
103.4M	85.681M	3.360M
120.0M	86.390M	3.360M
140.0M	86.182M	3.360M
160.0M	85.713M	3.360M
168.9M	85.563M	2.910M
180.0M	85.872M	2.910M
182.9M	85.963M	2.910M

NB:

- Y -AXIS IS SCALED BY x5.
- ALL LEVELS ARE APPROXIMATE AND FOR COSTING PURPOSES ONLY.
- RETAINING WALL DEPTH BELOW PROPOSED SURFACE LEVEL IS 500mm.
- RETAINING WALL BASE DEPTH + STEM IS TO BE 400mm.

0 5m 10m 25m 50m

Scale Bar 1:500

General Notes

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Drawing Notes

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2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour

Key Plan

Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Princess Royal Hospital

Drawing
Proposed Site Earthworks
Option B - The Emergency Site
Earth Retention

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 17/08/2016

Drawing Identifier BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
CST -CE -XX -GR-DR-C-200-002 P2

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Engineering
Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
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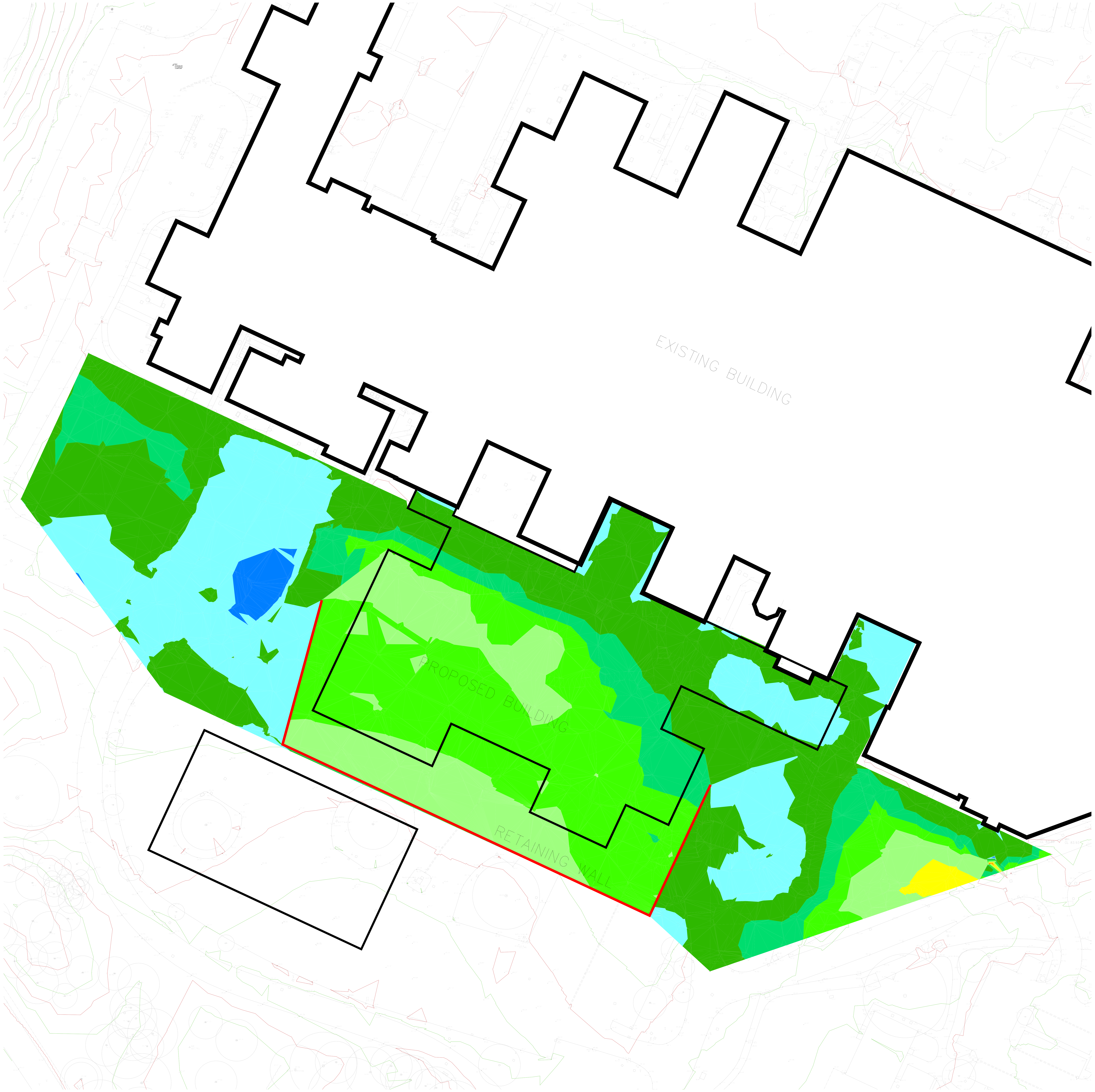
Appendix G - Princess Royal Hospital - Cut & Fill Analysis



General Notes

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2. All dimensions are in mm unless noted otherwise.
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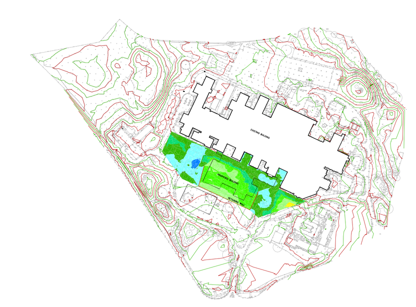
Drawing Notes

1. This drawing is based on information recieved 31.05.16.
2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour

Key Plan



Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−3.08	−3.00	0.00	
2	−3.00	−2.50	0.24	
3	−2.50	−2.00	88.74	
4	−2.00	−1.50	1965.66	
5	−1.50	−1.00	3322.86	
6	−1.00	−0.50	1503.72	
7	−0.50	0.00	4806.24	
8	0.00	0.50	3229.96	
9	0.50	1.00	177.71	
10	1.00	1.08	0.00	

Volume Summary

Name	Type	Cut Factor	Fill Factor	2D Area (sq.m)	Cut (Cu.M)	Fill (Cu.M)	Net (Cu.M)
Comparison	Full	1.000	1.000	15095.14	9744.05	558.02	9186.03 <Cut>

NB: Cut and fill figures only represent an existing topographical surface comparison with the proposed finished ground level. Extra allowance should be made for localized cut to proposed building foundations, poor ground, services & drainage etc.

0 5m 10m 25m 50m

Scale Bar 1:500

Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue
INFORMATION

Status
-

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Princess Royal Hospital

Drawing
Proposed Site Earthworks
Option C2 - The Planned Site
Cut & Fill

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 17/08/2016

Drawing Identifier — BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
CST -CE -XX -GR-DR-C-200-003 P2

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Engineering

Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
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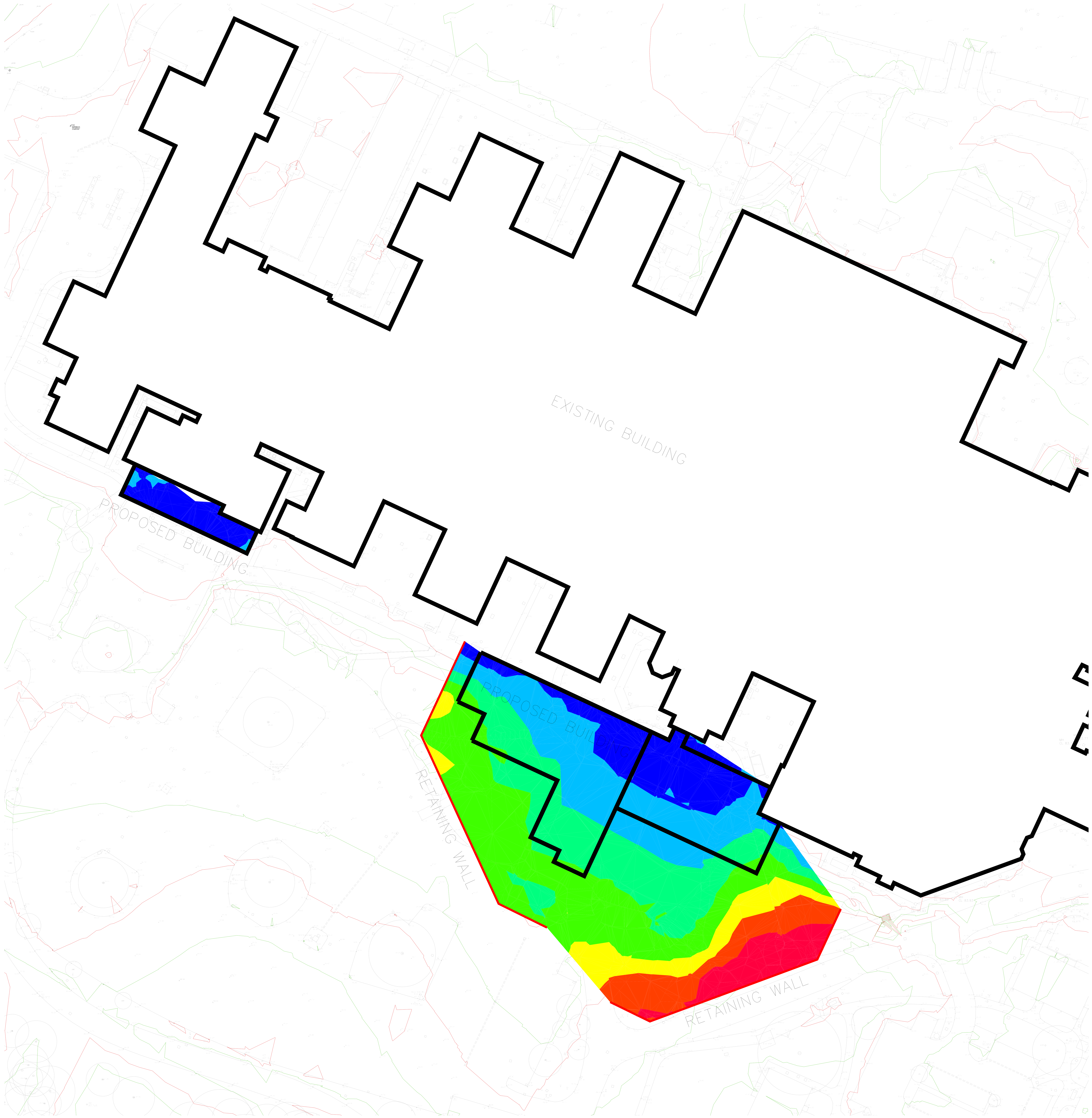

General Notes

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Drawing Notes

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2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-2.83	-2.50	284.20	
2	-2.50	-2.00	360.78	
3	-2.00	-1.50	365.83	
4	-1.50	-1.00	1334.37	
5	-1.00	-0.50	1100.61	
6	-0.50	0.00	994.91	
7	0.00	0.50	812.61	
8	0.50	1.00	0.00	

Volume Summary

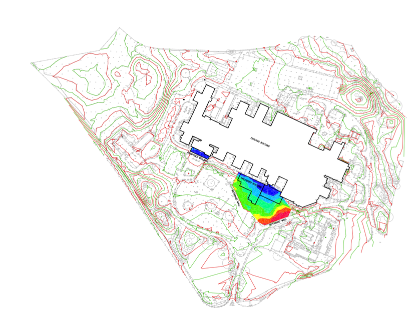
Name	Type	Cut Factor	Fill Factor	2D Area (sq.m)	Cut (Cu.M)	Fill (Cu.M)	Net (Cu.M)
Comparison	Full	1.000	1.000	5253.30	4900.43	96.92	4803.51<Cut>

NB: Cut and fill figures only represent an existing topographical surface comparison with the proposed finished ground level. Extra allowance should be made for localized cut to proposed building foundations, poor ground, services & drainage etc.

0 5m 10m 25m 50m

Scale Bar 1:500

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised.	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client: Shrewsbury & Telford NHS Trust

Project: Sustainable Services Princess Royal Hospital

Drawing: Proposed Site Earthworks Option C1 - The Planned Site Cut & Fill

Scale @ A1: 1:500 | Drawn: D Baker | Checked: D Middleton | Approved: D Middleton

Project No. CS087958 | Date 17/08/2016

Drawing Identifier (project origin zone level file type role uniclass and number revision) — BS1192 / Uniclass Compliant

CST -CE -XX -GR-DR-C-200-005 P2

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0161 486 1521
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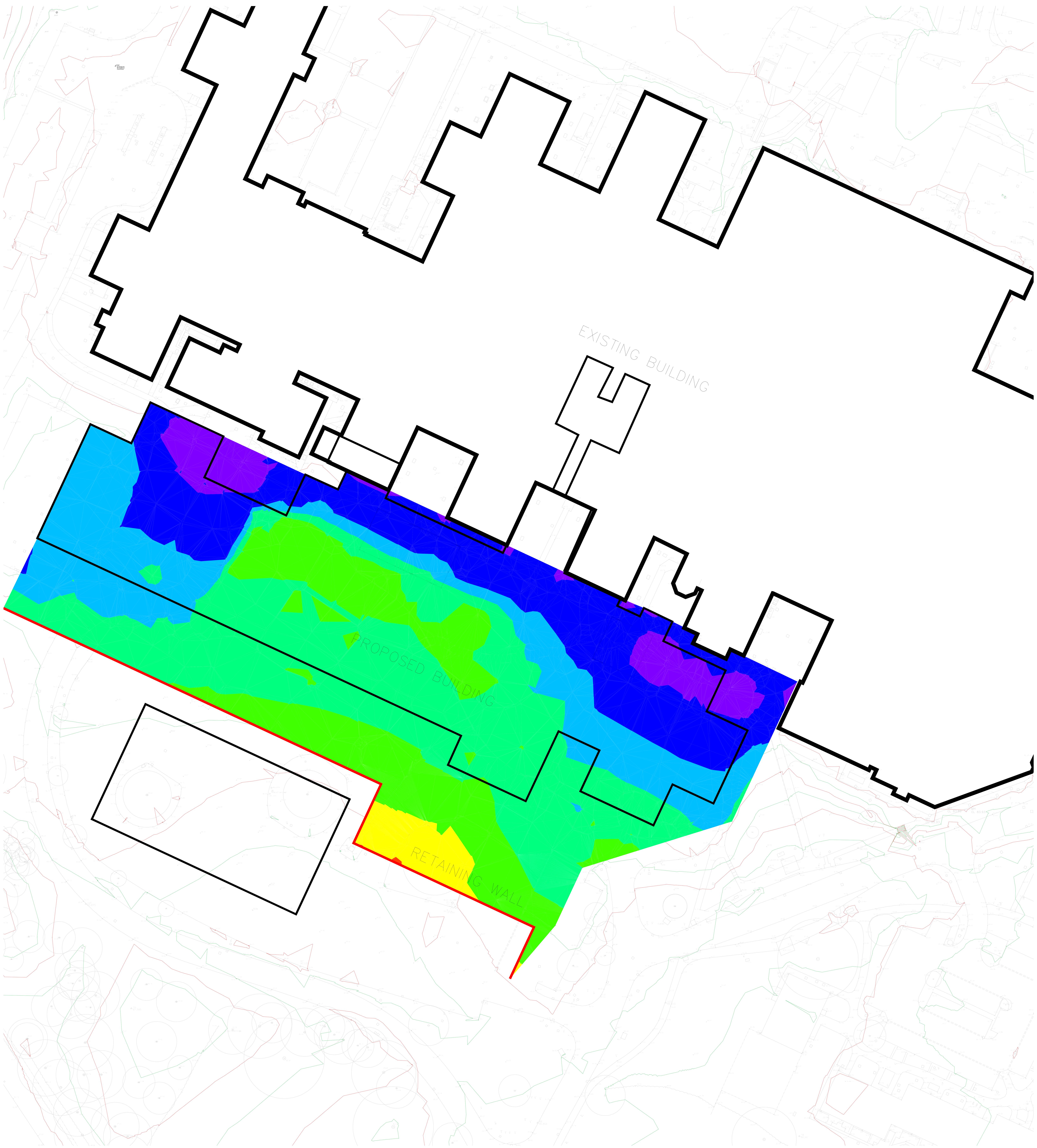

General Notes

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Drawing Notes

1. This drawing is based on information recieved 31.05.16.
2. Cut & fill has been graded in 0.5m segments as per the elevation table.

Key

- Retaining Wall
- Major Contour
- Minor Contour

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

To be developed.

MAINTENANCE / CLEANING

To be developed.

DECOMMISSIONING / DEMOLITION

To be developed.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-3.10	-3.00	0.00	
2	-3.00	-2.50	3.59	
3	-2.50	-2.00	357.57	
4	-2.00	-1.50	2188.81	
5	-1.50	-1.00	4238.98	
6	-1.00	-0.50	2342.07	
7	-0.50	0.00	2579.36	
8	0.00	0.50	709.42	

Volume Summary

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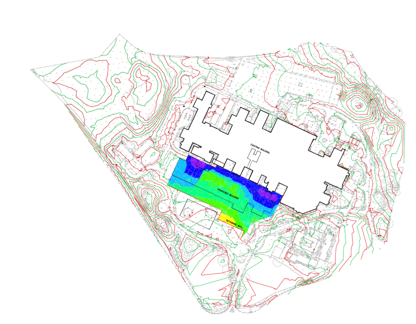
Comparison	Full	1.000	1.000	12419.79	12225.06	62.88	12162.18 <Cut>

NB: Cut and fill figures only represent an existing topographical surface comparison with the proposed finished ground level. Extra allowance should be made for localized cut to proposed building foundations, poor ground, services & drainage etc.

0 5m 10m 25m 50m

Scale Bar 1:500

Key Plan



Rev	Description / By / Chk'd / App'd	Date
P2	Issued For OBC. Drawing Title Revised	24.10.16
P1	Issued For OBC.	19.10.16

Purpose of Issue: INFORMATION
Status: -

Client
Shrewsbury & Telford NHS Trust

Project
Sustainable Services
Princess Royal Hospital

Drawing
Proposed Site Earthworks
Option B - The Emergency Site
Cut & Fill

Scale @ A1	Drawn	Checked	Approved
1:500	D Baker	D Middleton	D Middleton

Project No. CS087958 Date 17/08/2016

Drawing Identifier — BS1192 / Uniclass Compliant
project origin zone level file type role uniclass and number revision
CST -CE -XX -GR -DR-C-200-001 P2

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Engineering
Clemence House, 9 Mellor Road, Cheadle Hulme, SK8 5AT
0161 486 1521
www.capitaproperty.co.uk
Capita Property and Infrastructure Ltd.

Appendix H - Royal Shrewsbury Hospital - Geo-Environmental Intrusive Investigation & Assessment

Appendix I - Princess Royal Hospital - Geo-Environmental Intrusive Investigation & Assessment

Capita Property and Infrastructure Ltd
Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel +44 (0)161 486 1521

Appendix H - Royal Shrewsbury Hospital - Geo-Environmental Intrusive Investigation & Assessment

Commercial in Confidence

Royal Shrewsbury Hospital

Geo-Environmental Intrusive Investigation & Assessment

October 2016

We | Listen Create Deliver

Quality Management

Job No	CS/087963	**Client**	Rider Hunt Construction
Title	Geo-Environmental Intrusive Investigation & Assessment		
Project	Royal Shrewsbury Hospital		
Location	Royal Shrewsbury Hospital, Shrewsbury, Shropshire		
Document Ref	CS087963-RSH-GIIA	**Issue / Revision**	02
File reference	P:\CS087963 Shrewsbury and Telford Hospitals GEO\10 Reports\02 - Royal Shrewsbury Hospital\CS087963-RSH-GIIA-02.docx		
Date	13 October 2016		
Prepared by	Elizabeth Yeatman	Signature (for file)	
Checked by	Andrew Watts	Signature (for file)	
Authorised by	Dan Mason	Signature (for file)	

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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
01	10/08/16	Original Issue	EY	AW	DM
02	13/10/16	Updated Issue – with full gas risk assessment	EY	AW	DM

Contents

Appendices

1. Introduction

1.1 Appointment

1.1.1 Capita Property and Infrastructure Ltd (“Capita”) was commissioned by Rider Hunt Construction to undertake an intrusive Phase 2 Geo-Environmental Ground Investigation for the Royal Shrewsbury Hospital Site to support further development.

1.1.2 A site location and existing site layout plan is presented in Appendix A.

1.2 Proposed Development

1.2.1 The proposed development comprises extensions to the existing hospital buildings including the construction of a new main entrance in addition to a women and children’s ward, critical care unit, emergency department, ambulatory emergency care and urgent care centre.

1.2.2 The majority of the site is currently occupied by the existing hospital buildings and associated hardstanding and infrastructure.

1.3 Background & Context

1.3.1 Capita has previously issued a “Phase 1 Geo-Environmental Desk Study” report for the subject site and proposed development. The full report reference is as follows:

- Phase 1 Geo-Environmental Desk Study, Royal Shrewsbury Hospital, on behalf of AHR Architects. Capita Ref CS087963-P1DS-01; May 2016.

1.3.2 The conclusion of the Desk Study Report was that in general the contamination potential for the site (including ground gas, its current condition and with no mitigation measures considered) was generally LOW/LOW-MODERATE.

1.3.3 According to historical mapping, the subject site largely comprised fields, woodland and a boating lake until 1971 when the hospital was constructed. The surrounding area was also mainly occupied by farming until the 1950’s when substantial residential development occurred to the east, north and west of the site. No significant industry was located near to the site.

1.3.4 The site is indicated to be underlain by Alluvium and Glacial Till deposits comprising clay, silt, sand and gravel which is in turn is underlain by bedrock of the Kinnerton Sandstone Formation.

1.3.5 On the basis of the above, a comprehensive “Phase 2” intrusive investigation and assessment was recommended to address the development specific issues relating to the proposed development and to determine the risk status of the site.

1.4 Objective and Scope of Work

1.4.1 The objectives of this assessment were to obtain geotechnical design parameters for the proposed development and to establish the nature of the shallow ground conditions from a “land contamination” perspective (including ground gas). It was therefore necessary to:

1. Characterise the geological and hydrogeological conditions beneath the site;
2. Collect sufficient information to allow a development specific geotechnical appraisal to be undertaken;
3. Quantify the level of ground contamination present within any Made Ground and shallow strata across the site and assess this in terms of the proposed development;
4. Establish the ground gas regime at the site and assess this in terms of the proposed development;
5. Explore existing foundations where new buildings are to be connected; and
6. Provide recommendations for further detailed investigation and/or cost effective remediation/mitigation where required.

1.4.2 To achieve the objectives the following scope of work was defined and undertaken:

- 9no window sample boreholes including in-situ geotechnical testing;
- Formation of 5no hand dug foundation pits;
- Installation of 9no gas and groundwater monitoring wells;
- Sampling and laboratory testing of soil and groundwater for chemical and geotechnical purposes;
- Ground gas monitoring (6no visits over 3no months); and
- Provision of a combined factual and interpretive report.

2. Site Investigation

2.1 Intrusive Works

2.1.1 The intrusive investigation works were undertaken between 20th and 22nd June 2016 and comprised:

- Formation of 9no window sample boreholes including in-situ geotechnical testing;
- Formation of 5no hand dug foundation pits;

2.1.2 The site works were undertaken by Ian Farmer Associates (IFA) and exploratory holes were formed under the supervision and direction of a suitably qualified and experienced IFA engineer. The boreholes were formed to a maximum depth of 5.45mbgl and were generally located to give a reasonable site wide coverage over the future development area. A number of the exploratory hole locations were restricted to areas of soft landscaping due to the busy nature of the hospital car parks at the site.

2.1.3 WS101 was terminated due to a concrete obstruction at shallow depth.

2.1.4 In-situ strength tests comprising Standard Penetration Tests (SPT’s) were undertaken in the boreholes at regular intervals.

2.1.5 The hand dug foundation pits were formed to a maximum depth of 1.30mbgl and were distributed along sections of external walls where new buildings are proposed to connect.

2.1.6 Ian Farmer Associates Factual Report is presented in Appendix B. An exploratory hole location plan and corresponding exploratory hole logs are presented in the Appendices of the Factual Report.

2.2 Monitoring Well Installations

2.2.1 Monitoring wells were installed in all of the window sample boreholes, the details of which are shown on the exploratory hole logs presented in the IFA factual report in Appendix B.

2.2.2 Monitoring wells were constructed of 50mm diameter HDPE well screen. The annulus between the monitoring well and the borehole was filled with a pea gravel filter. The top of the borehole was sealed from the surface with a bentonite ‘plug’ and the top of the standpipe was fitted with a gas tap and lockable flush mounted well cover.

2.2.3 The installation configurations were selected to allow the characterisation of the ground gas regime in any Made Ground and the natural deposits and allow sampling for the assessment of groundwater quality if required.

2.3 Soil Sampling

2.3.1 Soil samples comprising disturbed (glass jar, tub and bulk bag) were collected from the exploratory holes at distinct changes in lithology and across a range of depths/strata across the site in order to be tested for a range of chemical parameters, as well as any soils exhibiting palpable visual and/or olfactory signs of contamination.

2.3.2 Soil samples were selected for laboratory analysis by a Capita engineer based on a review of the site findings and logs compiled by IFA.

2.3.3 Samples selected for chemical analysis were transferred to laboratory prepared glass jars and/or plastic tubs and stored in pre-chilled cool boxes prior to dispatch to the laboratory.

2.4 Geotechnical Testing

2.4.1 Soil samples were submitted for geotechnical laboratory analysis at Ian Farmers Associates, Washington.

2.4.2 In order to obtain geotechnical parameters for the proposed development soil samples were tested for one or more of the following:

- Moisture Content;
- Atterburg Limits; and
- Particle Size Distribution.

2.4.3 The results of the geotechnical testing are presented in the laboratory reports in the IFA Factual Report in Appendix B.

2.5 Chemical Testing

2.5.1 In order to quantify the level of contamination at the site, soil and groundwater samples were selected for laboratory analysis at Scientific Analysis Laboratories (SAL), Manchester.

2.5.2 The samples were tested for one or more of the following:

- Metals and Semi Metals: As, Cd, Cr, Cu, Ni, Pb, Hg, Se, and Zn;
- Non-metallic Inorganics: pH and water soluble sulphate (SO4);
- Poly Aromatic Hydrocarbons (PAHs – 16no);
- Total Petroleum Hydrocarbons; and
- Asbestos.

2.5.3 The results of the chemical testing are presented in Appendix C.

2.6 Gas and Groundwater Monitoring

2.6.1 Gas and groundwater monitoring wells were installed in all of the window sample boreholes.

2.6.2 In order to fully characterise the ground gas regime at the site in line with development proposals and current industry guidance (CIRIA C665), a programme of 6no visits over 3no months was initiated on 19th July 2016.

2.6.3 A dual phase interface probe was used to dip all wells however no NAPL was encountered.

2.6.4 The results of the gas and groundwater monitoring are presented in Appendix E and a gas risk assessment is provided in Section 6.

3. Ground Conditions

3.1 Stratigraphy

3.1.1 The ground conditions encountered during the intrusive investigation generally comprised Topsoil or Made Ground deposits overlying Glacial Till.

3.1.2 The stratigraphy encountered generally conforms to the published geological information pertaining to the site and is summarised in the following table:

Lithology	Depths to base of unit (mbgl)	Thickness Range (m)
Topsoil	0.20-0.70	0.20-0.70
Made Ground	0.30-2.20	0.30-2.20
Glacial Till	>5.45	>5.25

3.1.3 Topsoil or Made Ground deposits were encountered overlying Glacial Till deposits (proven to 5.45mbgl).

3.2 Topsoil

3.2.1 Topsoil was encountered in a number of exploratory holes where positioned in areas of soft standing. Topsoil was recorded to an average depth of 0.3mbgl and generally comprised clayey SAND with occasional gravel or firm sandy CLAY

3.3 Made Ground

3.3.1 Made Ground was encountered in a number of boreholes and all of the hand dug pits and comprised both granular and cohesive material. Where present Made Ground was encountered to a maximum depth of 2.20mbgl (WS105); however material interpreted as possible Made Ground was encountered to a depth of 4.50mbgl in WS105 and 3.00mbgl in WS109. The deeper made ground in WS105 may relate to an historic pond which was formerly present in this area and is indicated to have been infilled.

3.3.2 The Made Ground was variable comprising clayey gravelly SAND, clayey SAND, sandy GRAVEL, sandy gravelly CLAY. Gravel typically comprised fragments of mudstone, sandstone, brick and concrete with occasional fragments of wood, paper, textile and plastic.

3.3.3 In-situ penetration testing within the Made Ground gave N-values of between 9 and 15 indicating the variable nature of the materials.

3.3.4 4no samples of Made Ground were also submitted for chemical analysis, comprising water soluble sulphate and pH. The results were as follows:

Test	Range of Values

Sulphate	23-120 (mg/l)
pH	7.7-9.7

3.3.5 The concentrations of sulphate aqueous extract are considered low and the pH values measured show moderately alkaline conditions.

3.4 Natural Deposits

3.4.1 Natural deposits were encountered in all of the boreholes below either locally present Topsoil or Made Ground at depths of between 0.20 and 3.00mbgl. All boreholes were terminated in the Glacial Deposits.

3.4.2 Natural deposits comprised both cohesive and granular strata. Cohesive deposits comprised soft to stiff brown slightly gravelly, sandy CLAY. Granular strata typically comprised slightly gravelly medium to coarse SAND.

3.4.3 In-situ penetration testing within the Glacial Deposits gave N-values ranging from 4 to 34, highlighting the variability of the soils.

3.4.4 Geotechnical classification tests undertaken on 6no samples of natural deposits between depths 0.50m and 1.50mbgl indicated the following:

Test	Range of Values
Natural Moisture Content	10-16%
Liquid Limit	23-31%
Plastic Limit (%)	14-16%
Plasticity Index (%)	9-15%
Fraction <0.425mm (%)	78-92%
Modified Plasticity Index (%)	7-14%

3.4.5 The classification test results generally indicate the CLAY to be of low plasticity. The material has a modified plasticity index range of 7% to 14% and thus has a low shrinkage/swell potential.

3.4.6 4no samples of natural soils were also submitted for chemical analysis, comprising water soluble sulphate and pH. The results were as follows:

Test	Range of Values
Sulphate	21-46 (mg/l)
pH	7.1-8.5

3.4.7 The concentrations of sulphate aqueous extract are considered low and the pH values measured show near neutral to slightly alkaline conditions.

3.5 Observations

3.5.1 No palpable visual and/or olfactory evidence of gross contamination was recorded during the ground investigation.

3.6 Groundwater

3.6.1 Groundwater was recorded at 0.70mbgl in WS107 during hole formation. During subsequent monitoring, rest water levels were recorded in the standpipes at depths of between 0.37m and 3.25mbgl.

3.6.2 It should be appreciated that ground and groundwater conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

3.6.3 It should also be noted that groundwater levels may be affected by seasonal variations such as rainfall and that no account can be taken of such variations in this report due to the short monitoring period.

4. Geotechnical Appraisal

4.1 Proposed Development

4.1.1 The proposed development comprises extensions to the existing hospital buildings including the construction of a new main entrance in addition to a women and children's ward, critical care unit, emergency department, ambulatory emergency care and urgent care centre.

4.2 Ground Conditions

4.2.1 The ground conditions encountered during the intrusive investigation comprised Topsoil locally or Made Ground deposits (0.30m to 2.20m thick) overlying Glacial Till deposits comprising clay, sand and gravel (Proven to 5.45mbgl).

4.2.2 Made Ground was variable across the site (both granular and cohesive) and was encountered in a number of the exploratory holes and all of the hand dug pits. Gravel within the Made Ground typically comprised fragments of mudstone, sandstone, brick and concrete with occasional fragments of wood, paper, textile and plastic. In-situ penetration testing within the Made Ground gave N-values of between 9 and 15 indicating the variable nature of the materials.

4.2.3 Glacial Till deposits comprised both cohesive and granular strata. In-situ penetration testing within the Glacial Till gave N-values ranging from 4 to 34, highlighting the variability of the soils.

4.3 Site Preparation

4.3.1 General turnover of the uppermost Made Ground will be required locally (i.e. beneath the footprints of new buildings and along service routes) to allow the breaking out and removal of any potential former sub-structures. Concrete and masonry should be crushed to a suitable grading (e.g. 6F2) for re-use in the development (e.g. working platforms, road capping, temporary haulage roads etc.).

4.3.2 Excavations formed as a result of any demolition activities will require adequate backfilling to a specification suitable to the proposed use of the area in question.

4.3.3 Sorting and screening to remove deleterious materials and crushing of oversized items (concrete blocks, blocks of masonry, etc.) should be undertaken where necessary in order to facilitate and improve the compaction of site-won fill materials during placement. This process may generate a fraction which will not be suitable for re-use (including potentially deleterious materials such as timber) and as such these are likely to require offsite disposal.

4.3.4 Granular materials should be used preferentially in areas beneath proposed structures. The use of cohesive materials should therefore be considered more appropriate as general fill (in landscape areas for example) where settlements are less critical.

4.4 Foundations

Existing Foundations

4.4.1 A number of hand dug pits were formed adjacent to existing structures where new buildings are anticipated to connect.

4.4.2 Details of foundations encountered are presented on the sketches and photographs of the trial pits in the IFA report in Appendix B.

Proposed Foundations

4.4.3 The presence of variable thicknesses of Made Ground and variable strata beneath made ground indicates that a single foundation solution may not be appropriate across the whole site area.

4.4.4 Foundations in clay strata should be placed at a minimum depth of 0.75m based on clay of low volume change potential.

4.4.5 Dependent upon foundation loads spread foundations may be suitable across much of the site. Strata at shallow depths in WS102, 103, 106, 107, 108 and 110A comprised firm and stiff clay or medium dense sand.

4.4.6 Assuming firm clay at the base of foundation excavations, square pad foundations with dimensions 1 x 1m at depths around 1m may be designed to an allowable bearing capacity of 130kN/m2.

4.4.7 Strip foundations of widths around 1m on firm clay at depths of 1m may be designed to an allowable bearing capacity of 110kN/m2.

4.4.8 The allowable bearing capacities indicated above assume that excavations have been advanced to competent ground and would provide an adequate factor of safety against shear failure and limit total settlements to the order of 25mm.

4.4.9 Reinforcement may be incorporated into strip foundations to accommodate differential settlement between different clay and sand strata.

4.4.10 The materials encountered at shallow depth in WS104, 105 and 109 are not generally suitable for shallow spread foundations. In these areas a number of foundation options may be considered including extending excavations to competent ground and backfilling with mass concrete or piling.

4.4.11 It is recommended that a single foundation solution should be applied to each individual structure.

4.5 Floor Slabs

4.5.1 The design of the ground floor slab will be dependent on the location of the structure, anticipated floor loads and foundation method adopted.

4.5.2 Lightly loaded floors may be placed on formation prepared in competent natural strata where this was encountered at shallow depths.

4.5.3 In areas where soft or loose material was encountered at shallow depths ground floor slabs should be suspended. Alternatively a suitable thickness of material may be excavated and replaced with compacted granular fill to provide a capping layer beneath floor construction.

4.5.4 Formations should be proof rolled and any soft, loose or deleterious material should be removed and replaced with properly compacted granular fill.

4.6 Pavement and Road Design

4.6.1 In consideration of the ground conditions encountered, the pavement subgrade exposed at formation levels may comprise natural sand or clay or granular Made Ground deposits.

4.6.2 Pavement and road design should be based upon a suitable (equilibrium) CBR value for such formation soils. Reference has been made to Table 5.1 ‘Equilibrium Subgrade CBR Estimation’ in IAN 73/06 (Highways Agency, 2009) and from this it is recommended that new road pavement and road construction design should be based upon (an estimated) CBR value of about 3-5%.

4.6.3 However, the design value will need to be reviewed and confirmed by suitable in-situ testing at formation levels following earthwork operations and prior to pavement construction.

4.6.4 Notwithstanding this, the formation at all levels should be proof-rolled prior to pavement construction, and any soft zones thus revealed should be excavated out, with the resulting excavation in-filled with appropriately graded engineered granular fill.

4.7 Concrete Classification

4.7.1 Design/mix of buried concrete should be undertaken in accordance with the BRE Special Digest 1 (2005).

4.7.2 A summary of the soil and groundwater chemical results pertinent to concrete classification is presented in the following table.

Matrix	Test	Range of Values
Soil	pH	7.1 – 9.7
	Sulphate (water sol 2:1) (mg/l)	21 - 120

4.7.3 A review of the soil chemical results indicates that sulphate and pH results fall within “Design Sulphate Class” DS-1, and the “Aggressive Chemical Environment for Concrete” (ACEC) class for the site is considered to be AC-1. Design/mix of buried concrete should be undertaken in accordance with these classifications.

4.8 Excavations and Groundwater

4.8.1 On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.00m should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep, in accordance with Health and Safety Regulations.

4.8.2 Groundwater should not be expected in shallow excavations for foundations or services. However, it is possible that perched groundwater could be present in the Made Ground overlying the natural strata. It is considered that this could be dealt with by localised pumping.

5. Contamination Assessment

5.1 Introduction

5.1.1 In line with CLR11 (DEFRA & EA, 2004), a Generic Quantitative Risk Assessment (GQRA) has been undertaken to determine the significance of the measured concentrations of contaminants from the chemical analysis.

5.1.2 The GQRA comprises the comparison of the measured concentrations with Assessment Criteria (AC) which comprise "Suitable 4 Use Levels" (S4UL's) as published by LQM/CIEH (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3296. All rights reserved). Where no S4UL has been published, the preceding Generic Assessment Criteria values derived using the CLEA model adopting the appropriate assumptions and input parameters provided in the SR series of reports have been used.

5.1.3 S4UL's have been derived in line with developments in UK human health risk assessment since 2009, in particular the additional land uses and exposure assumptions presented in Defra's recent C4SL guidance. However, the S4ULs are all based on Health Criteria that represent minimal or tolerable levels of risks to health as described in the Environment Agency's SR2 guidance, ensuring that the resulting assessment criteria are 'suitable for use' under planning.

5.1.4 The proposed development on the site comprises the extension of hospital facilities. We have therefore undertaken a GQRA on the basis that the proposed development site falls under the "Commercial" land-use scenario as defined in SR3, reflecting the primary use by medical staff.

5.1.5 The relevant statistical tests have been undertaken where appropriate in accordance with guidance provided in CIEH & CLAIRE (2008).

5.1.6 The tables in Appendix D present the results of the GQRA and a summary of the findings is provided below.

5.2 Made Ground Analysis

5.2.1 4no samples of Made Ground have been analysed for potential contaminants of concern and where relevant assessed against the "Commercial" AC's.

5.2.2 pH was recorded between 7.7 and 9.7 which is representative of slightly alkaline conditions.

5.2.3 4no samples of Made Ground were tested for one or more of the following suites of determinands:

- Metals and Semi Metals: As, Cd, Cr, Cu, Ni, Pb, Hg, Se, and Zn;
- Non-metallic Inorganics: pH and water soluble sulphate (SO_4);
- Poly Aromatic Hydrocarbons (PAHs – 16no);
- Total Petroleum Hydrocarbons; and
- Asbestos ID.

5.2.4 All of the concentrations of metals passed their defined ACs.

5.2.5 All of the concentrations of total cyanide were recorded below the defined AC.

5.2.6 All of the PAH concentrations were recorded below the relevant AC.

5.2.7 All of the hydrocarbon concentrations were recorded below the relevant AC.

5.2.8 No asbestos was identified in the samples analysed.

5.3 Natural Ground Analysis

5.3.1 1no further sample of natural ground has been analysed for potential contaminants of concern and where relevant assessed against the “Commercial” ACs.

5.3.2 pH was recorded at 7.4 which is representative near neutral conditions.

5.3.3 All of the concentrations of metals and semi metals were recorded below the respective AC.

5.3.4 All concentrations of PAHs were recorded below the defined AC.

5.3.5 All of the hydrocarbon concentrations were recorded below the relevant AC.

5.3.6 No asbestos was identified in the natural soil sample.

5.4 Conclusions

5.4.1 Sampling and testing of the soils has been undertaken at the site to quantify the level of contamination that could potentially be exposed at the surface in the proposed development.

5.4.2 The level of contamination in the soil can be considered negligible.

5.4.3 In terms of the proposed commercial end-use the shallow soils at the site do not present a significant risk to human health or controlled waters and are therefore considered suitable for use across the site without further remediation and/or mitigation.

5.4.4 Groundwater samples have not been tested as part of this investigation. Given the negligible level of soil contamination, the site soils are not considered to present a risk to controlled waters. However should representative groundwater samples be available for sampling during the monitoring programme they will be collected and sent for chemical analysis.

6. Ground Gas Assessment

6.1 Methodology

6.1.1 Current guidance for the assessment of risk associated with the presence of hazardous ground gases (principally methane and carbon dioxide within ground gas) is provided in two key documents:

- Code of practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings. British Standard Institution (BS 8485: 2015); and
- Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).

6.1.2 The assessment presented herein is primarily based on the British Standard document.

6.1.3 Hazardous ground gases can be considered as a type of land contamination, and qualitative risk assessment is based on a conceptual model similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages). A semi-quantitative estimate of risk can be provided, based upon the qualitative risk model and gas monitoring results.

6.1.4 Based on the measured flow rates and measured hazardous gas concentrations, individual "hazardous gas flow rates" (Q_{hg}) can be derived for each monitoring point, from which the "site characteristic hazardous gas flow rate" (Q_{hgs}), and then the "Characteristic Situation" can be determined.

6.1.5 BS8485 provides guidance on the level of required gas protection based upon the characteristic situation and the type of development (e.g. non-managed property such as private housing, public buildings, commercial buildings or industrial buildings).

6.2 Ground Gas Conceptual Model

6.2.1 The proposed development comprises further hospital expansion, best characterised as a Type C Building. As such the sensitivity of the development has been deemed to be "Low".

6.2.2 On-site potential sources of ground gas generation have been identified on the basis of the desk study information. These comprise:

- Made Ground deposits which may give rise to the generation of hazardous ground gas; nevertheless the generation potential associated with Made Ground deposits is considered to be low; and
- Infilled boating lake on the western side of the site.

6.2.3 The overall risk is therefore considered "Low to Moderate" and a programme of gas monitoring, comprising 6no visits over a period of 3 months, has been completed to quantify the ground gas regime and allow a risk assessment to be completed.

6.3 Recorded Ground Gas Regime

6.3.1 Standpipes installed during the intrusive works have been monitored on 6no occasions between the 19h July and the 12th October 2016.

6.3.2 The gas monitoring data obtained is presented in Appendix E.

6.3.3 The data collected have been compiled to complete a gas risk assessment for the site. A summary of the results together with the calculated hazardous gas flow rates for each location and monitoring event is presented in the following table:

Monitoring Well	Max Flow (l/hr)	Max CH_4 (%v/v)	Max CO_2 (%v/v)	Max CH_4 Q_{hg} (l/hr)	Max CO_2 Q_{hg} (l/hr)	Characteristic Situation
WS102	<0.1	0.2	<0.1	0.0002	0.0001	1
WS103	<0.1	<0.1	2.2	0.0001	0.0022	1
WS104	<0.1	<0.1	4.7	0.0001	0.0047	1
WS105	Well collapsed, not serviceable					
WS106	<0.1	<0.1	1.7	0.0001	0.0017	1
WS107	3.7	<0.1	4.4	0.0037	0.0518	1
WS108	<0.1	<0.1	1.5	0.0001	0.0015	1
WS109	<0.1	<0.1	0.3	0.0001	0.0003	1
WS110a	<0.1	<0.1	2.7	0.0001	0.0027	1

Note: Where flow <0.1l/r and/or gas concentration <0.1% were recorded, a value of 0.1 has been assumed to calculate the Q_{hg}.

6.4 Assessment and Recommendations

6.4.1 The table below is reproduced from BS8485 and presents the relationship between thresholds in the monitoring data and “Characteristic Situations”.

Characteristic Situations

Characteristic Situation	Hazard Potential	Q_{hgs} (l/hr)	Additional Factors
1	Very Low	<0.07	Typically ≤1% CH_4 and ≤5%CO_2
2	Low	≥0.07, <0.7	Typical measured flow rate <70l/h
3	Moderate	≥0.7,<3.5	
4	Moderate to High	≥3.5, <15	
5	High	≥15,<70	
6	Very High	≥70	

6.4.2 The following maximum results have been compared with the criteria outlined above:

- Maximum flow = 3.7 l/hr

- Maximum Methane = 0.2 %v/v
- Maximum Carbon Dioxide = 4.7 %v/v
- Maximum Q_{hg} = 0.0518 l/hr (carbon dioxide)

6.4.3 The monitoring dataset indicates the site to fall into Characteristic Situation 1 (CS1).

6.4.4 No significantly elevated concentrations of methane or carbon dioxide were recorded at the site, and the calculated hazardous gas flow rates were all within CS1.

6.4.5 Under CS1 (‘Very Low’ gas risk) no gas protection measures would be required for the proposed structures.

7. Other Development Considerations

7.1 Waste Arisings

7.1.1 On the basis of the current information it is likely that the bulk of the Made Ground Materials would be classifiable as "Non-hazardous" and the natural soils classifiable as "Inert" for landfill disposal.

7.1.2 An appropriate waste characterisation can only be undertaken on the material due to be disposed of via further chemical testing which should be completed prior to making disposal arrangements. In all cases where excess soils require off-site disposal, the materials need to be managed under the appropriate legislation and consideration given to any remedial techniques that could be used to improve the soil.

7.1.3 For Inert Waste disposal (and in the event of Hazardous Waste disposal), allowance will need to be made for adequate Waste Acceptance Criteria (WAC) testing with appropriate consideration of the additional time and cost associated with this.

7.2 Health, Safety & Environment

7.2.1 Despite the findings of the testing there remains a potential for more-significantly impacted soils to be encountered; consideration should therefore be given to the level of PPE that should be provided to future site operatives.

7.2.2 All work on site should be conducted in accordance with appropriate Health and Safety guidance, with particular reference to HSG66 (HSE, 1991).

7.2.3 Care should be taken to minimise the risk of potentially contaminative incidents occurring during redevelopment. Good working practices should be adopted during construction works in order to minimise the risk of contamination occurring as a result of spillage or leakage of fuels, oils or chemicals stored or used at the site during re-development. All such materials should be sited on an impervious base within a bund and should be adequately secured. In particular, care should be taken to prevent fuel, oils or other mobile contamination sources from entering any surface water drains at the site.

7.2.4 Throughout any redevelopment works, due regard should be given to potential detrimental effects on the surroundings including noise, vibration, odour and dust.

7.3 Potable Water Supply

7.3.1 There are currently no (fully adopted) national standards for the protection of potable water supply pipes in potentially contaminated ground. However, the UKWIR has published guidance in this respect and site testing should be undertaken with due recognition of this guidance.

7.3.2 On the basis of the ground conditions encountered, specific protection measures are unlikely to be required for the subject site; it is recommended that consultation is undertaken with the local supplier to confirm this.

8. Conclusion & Recommendations

8.1 Background & Scope

8.1.1 Capita Property and Infrastructure Ltd ("Capita") was commissioned by Rider Hunt Construction to undertake an intrusive Phase 2 Geo-Environmental Ground Investigation for the Royal Shrewsbury Hospital Site to support further development.

8.1.2 The proposed development comprises extensions to the existing hospital buildings including the construction of a new main entrance in addition to a women and children's ward, critical care unit, emergency department, ambulatory emergency care and urgent care centre.

8.1.3 Capita has previously issued a "Phase 1 Geo-Environmental Desk Study" report for the subject site and proposed development. The full report reference is as follows:

- Phase 1 Geo-Environmental Desk Study, Royal Shrewsbury Hospital, on behalf of AHR Architects. Capita Ref CS087963-P1DS-01; May 2016.

8.1.4 The conclusion of the Desk Study Report was that in general the contamination potential for the site (including ground gas, its current condition and with no mitigation measures considered) was generally LOW/LOW-MODERATE. On this basis, a "Phase 2" intrusive investigation and assessment was recommended to address the development specific issues relating to the proposed development and to accurately determine the risk status of the site.

8.1.5 To achieve the objectives the following scope of work was defined and undertaken:

- 9no window sample boreholes including in-situ geotechnical testing;
- Formation of 5no hand dug foundation pits;
- Installation of 9no gas and groundwater monitoring wells;
- Sampling and laboratory testing of soil and groundwater for chemical and geotechnical purposes;
- Ground gas monitoring (6no visits over 3no months); and
- Provision of a combined factual and interpretive report.

8.2 Ground Conditions

8.2.1 The ground conditions encountered during the intrusive investigation comprised Topsoil locally or Made Ground deposits (0.30m to 2.20m thick) overlying Glacial Till deposits comprising clay, sand and gravel (Proven to 5.45mbgl).

8.2.2 Made Ground was variable across the site (both granular and cohesive) and was encountered in a number of the exploratory holes and all of the hand dug pits. Gravel within the Made Ground typically comprised fragments of mudstone, sandstone, brick and concrete with occasional fragments of wood, paper, textile and plastic. In-situ penetration testing within the Made Ground gave N-values of between 9 and 15 indicating the variable nature of the materials.

8.2.3 Glacial Till deposits comprised both cohesive and granular strata. In-situ penetration testing within the Glacial Till gave N-values ranging from 4 to 34, highlighting the variability of the soils.

8.2.4 No palpable visual and/or olfactory evidence of gross contamination was recorded during the ground investigation.

8.2.5 Groundwater strikes were only recorded in WS107 at a depth of 0.70mbgl. During subsequent monitoring, rest water levels were recorded in the standpipes at depths of between 0.37m and 3.25mbgl.

8.3 Geotechnical Appraisal

8.3.1 The presence of variable thicknesses of Made Ground and variable strata beneath made ground indicates that a single foundation solution may not be appropriate across the whole site area.

8.3.2 Foundations in clay strata should be placed at a minimum depth of 0.75m based on clay of low volume change potential.

8.3.3 Dependent upon foundation loads spread foundations may be suitable across much of the site. Strata at shallow depths in WS102, 103, 106, 107, 108 and 110A comprised firm and stiff clay or medium dense sand.

8.3.4 Assuming firm clay at the base of foundation excavations, square pad foundations with dimensions 1 x 1m at depths around 1m may be designed to an allowable bearing capacity of 130kN/m2.

8.3.5 Strip foundations of widths around 1m on firm clay at depths of 1m may be designed to an allowable bearing capacity of 110kN/m2.

8.3.6 The allowable bearing capacities indicated above assume that excavations have been advanced to competent ground and would provide an adequate factor of safety against shear failure and limit total settlements to the order of 25mm.

8.3.7 Reinforcement may be incorporated into strip foundations to accommodate differential settlement between different clay and sand strata.

8.3.8 The materials encountered at shallow depth in WS104, 105 and 109 are not generally suitable for shallow spread foundations. In these areas a number of foundation options may be considered including extending excavations to competent ground and backfilling with mass concrete or piling.

8.3.9 On the basis of the laboratory test results it is considered that a Design Sulphate Class for the site may be taken as DS-1. On this basis an ACEC class of AC-1 would be appropriate.

8.3.10 Pavement and road design should be based upon a suitable (equilibrium) CBR value for the formation soils. Reference has been made to Table 5.1 ‘Equilibrium Subgrade CBR Estimation’ in IAN 73/06 (Highways Agency, 2009) and from this it is recommended that new road pavement and road construction design should be based upon (an estimated) CBR value of about 3-5%.

8.4 Ground Contamination

8.4.1 Based on sampling and testing of the site soils the level of contamination in the soil can be considered negligible.

8.4.2 In terms of the proposed commercial end-use the shallow soils at the site do not present a significant risk to human health or controlled waters and are therefore considered suitable for use across the site without further remediation and/or mitigation.

8.5 Ground Gas

8.5.1 The monitoring dataset indicates that the site falls into Characteristic Situation 1 (CS1), based on Q_{hg}.

8.5.2 No significantly elevated concentrations of methane or carbon dioxide were recorded at the site.

8.5.3 Under CS1 (‘Very Low’ gas risk), no gas protection measures would be required for the proposed structures.

8.6 Drainage

8.6.1 On the basis of the findings presented in this report, the ground conditions at the site are unlikely to provide sufficient infiltration to allow Soakaway drainage to be utilised in the proposed development.

8.7 Development Considerations & Waste Soil

8.7.1 It is likely that the development of the site will generate Non-Hazardous waste soils (Made Ground) and inert material (natural soils). Segregation of the various materials will be critical to minimise disposal costs.

9. References

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Appendix A Figures and Drawings

Notes

THIS DRAWING READ IN CONJUNCTION WITH

Rev	Description	Date	Dr by	App by
01	Consultant Issue	23.05.16	KS	AE

original by: **KW**
date created: **12.02.16**
Approved by: **AE**

AHR Architects Ltd
First Floor
Victoria House
Victoria Quay
Shrewsbury
SY1 1HH
United Kingdom

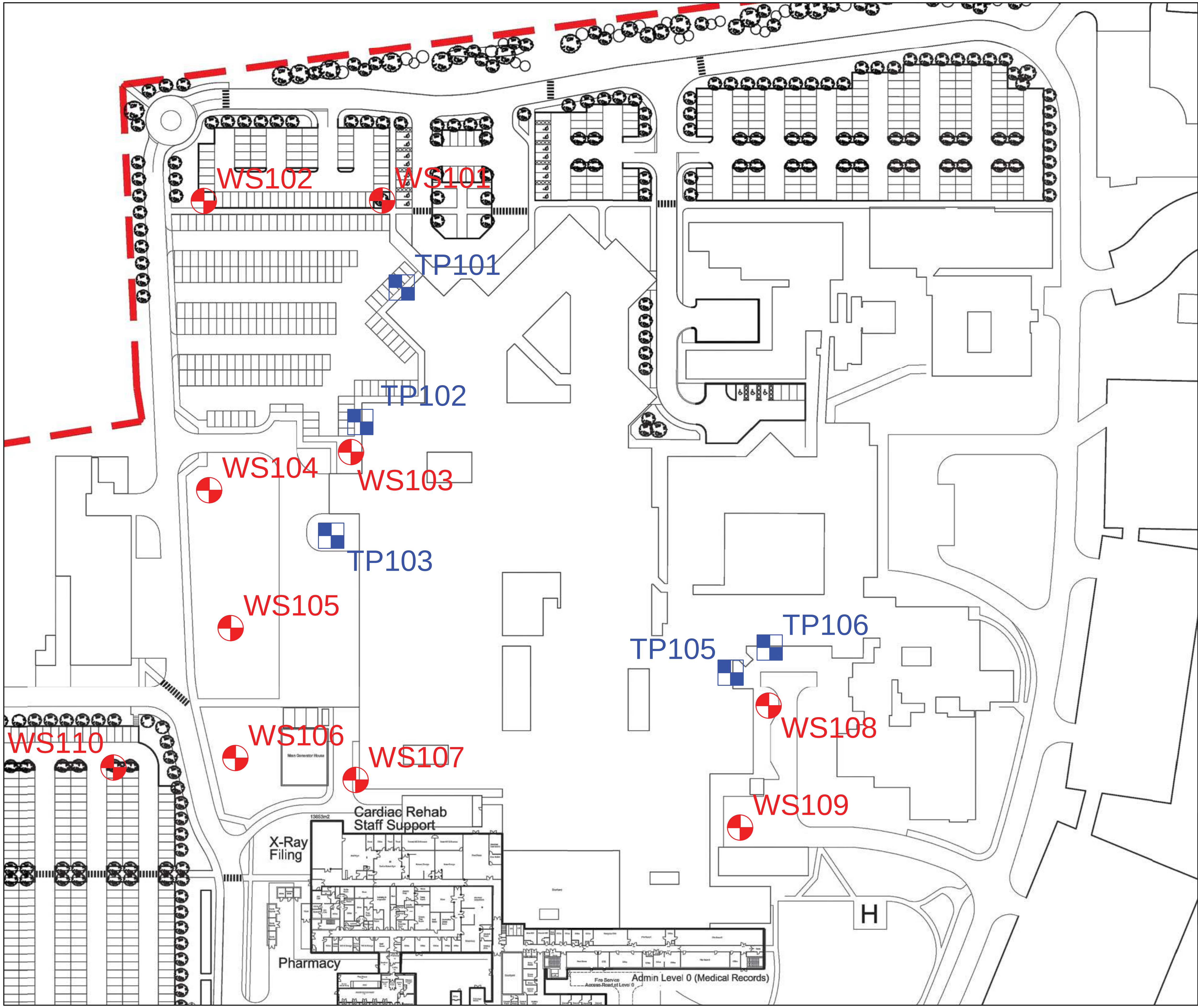
T +44(0)174 3283000
F +44(0)174 3232717
E shrewsbury@ahr-global.com
www.ahr-global.com

client
Shrewsbury and Telford NHS Trust

project
Sustainable Services
Royal Shrewsbury Hospital

drawing
Existing Level 0

project number	scale		
2015 . 00839 . 001	1:1000	@A1	
drawing number	**rev**	**issue status**	
RSH-AHR-00-00-DR-A-20-006	01	INFORMATION	



GENERAL NOTES

Do not scale from this drawing. Work from figured dimensions only. All dimensions are in millimetres u.n.o.

No deviation from the details shown on this drawing will be allowed without prior permission in writing.

All drawings are to be read in conjunction with all architects, engineers and specialist drawings and details.

Key

Hand Dug Trial Pit

Window Sample Borehole

Rev	Date	Revision	By	Checked	Authorised
A	06.16	Hole locations adjusted	KR	EY	DM

Client:

Rider Hunt Construction

Project:

Royal Shrewsbury Hospital

Title:

Exploratory Hole Location Plan

CAPITA

Property and Infrastructure, Engineering

MANCHESTER
Clemence House, 9 Mellor Road
Cheadle Hulme, Cheshire, SK8 5AT
Tel: (+44) 0161 486 1521
www.capitaproperty.co.uk

Offices also at:
Bristol, Redditch, Berkhamsted
London, Sheffield, Southampton
Watford, Glasgow
Special Projects: Cheadle Hulme

Drawn at	Scale @ A3	Date
MANCHESTER	NTS	August 2016
Drawn	Checked	Authorised
KR	DM	DM

Project No.:	Drawing No.:	Revision:
CS087963	002	Rev A

Appendix B IFA Report

CAPITA

ROYAL SHREWSBURY HOSPITAL

REPORT ON GROUND INVESTIGATION

Contract: 41916v1

Date: August 2016

Ian Farmer Associates (1998) Limited
14-15 Rufford Court, Warrington, Cheshire
WA1 4RF
Tel: 01925 855440
e-mail: warrington@ianfarmer.co.uk

REPORT ON GROUND INVESTIGATION

carried out at

ROYAL SHREWSBURY HOSPITAL

Prepared for

CAPITA
6 Bowood Court,
Warrington
WA2 8QZ

Contract No: 41916v1

Date: August 2016

Ian Farmer Associates (1998) Limited
17 Rivington Court, Warrington, Cheshire
WA1 4RT
Tel: 01925 855440
e-mail: warrington@ianfarmer.co.uk

Issue & Revision Record			
Contract Number:	**41916**		
Contract Name:	**Royal Shrewsbury Hospital**		
Client:	**Capita**		
Engineer:	**Capita**		
Report Title:	**Report on Ground Investigation.**		
Version	**Issue Date**	**Report / revision details**	**Distribution**
V1	05/08/2016	Draft report on ground investigation.	PDF copy to Capita

EXECUTIVE SUMMARY

It is proposed to re-develop areas of the existing Shrewsbury Royal Hospital site.

On the instructions of Capita an investigation was undertaken to determine ground conditions for re-development.

The geological map indicates the site to be underlain by Glacial Till. Bedrock comprises the Kinnerton Sandstone Formation of the Triassic Period.

The site work was carried out between 20th and 22nd June 2016.

Site work comprised nine window sample boreholes and five hand excavated trial pits.

Made ground was encountered to depths p to 2.20m with possible made ground locally encountered to depths p to 4.50m.

Natural strata comprised a variable sequence of clay and sand. The consistency of the clay varied from soft through firm to stiff. The sand varied from loose to medium dense.

The presence of variable thicknesses of made ground and variable strata beneath made ground indicates that a single foundation solution may not be appropriate across the whole site area.

Dependent upon foundation loads spread foundations may be suitable across much of the site. Assuming firm clay at base of foundation excavations square pad foundations with dimensions 1 x 1m at depths about 1m may be designed to an allowable bearing capacity about 130kN/m^2. Strip foundations of widths about 1m on firm clay at depths about 1m may be designed to an allowable bearing capacity about 110kN/m^2.

Reinforcement should be incorporated in strip foundations to accommodate differential settlement between different clay and sand strata.

The materials encountered are locally not suitable for shallow spread foundations. In these areas a number of foundation options may be considered including extending excavations to competent ground and backfilling with mass concrete or piling.

A Design Sulphate Class for the site may be taken as DS-1. AC-1 would be appropriate.

CONTENTS

1.0 INTRODUCTION

1.1 It is proposed to re-develop areas of the existing Shrewsbury Royal Hospital site.

1.2 On the instructions of Capita, a ground investigation was undertaken to determine ground conditions for the re-development.

1.3 A copy of this report may be submitted to the relevant authorities to enable them to carry out their own site assessments and provide any comments.

1.4 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.5 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.6 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location and Description

2.1.1 The site is located at the existing Royal Shrewsbury Hospital.

2.1.2 The site may be located by Grid Reference SJ 464 128.

2.1.3 A site location plan is included in Appendix 1, Figure A1.1.

2.1.4 The site is located about the central and northwest parts of the existing hospital site.

2.1.5 The site comprised car parking areas, hospital buildings and soft landscaping areas.

2.2 Geological Setting

2.2.1 Details of the geology underlying the site have been obtained from the British Geological Survey web mapping database (Contains British Geological Survey materials © NERC 2016).

2.2.2 The site is underlain by superficial deposits of Glacial Till.

2.2.3 Bedrock beneath the site comprises the Kinnerton Sandstone Formation of the Triassic Period.

2.2.4 The site is within an urban area and, although not indicated as present on the site from the geological maps, the possibility that Made Ground exists on site cannot be discounted.

3.0 SITE WORK

3.1 The site work was carried out between 20th and 22nd June 2016.

3.2 The locations of exploratory holes were indicated on drawings provided by the Engineer.

3.3 The site work was carried out on the basis of the practices set out in BS 10175:2011+A1:2013, ref. 7.2, BS 5930:2015 ref. 7.23 and ISO 1997:2007, ref 7.4.

3.4 The locations of the exploratory holes were restricted by existing buildings and services.

3.5 Boreholes WS02 to WS10 and WS10A were undertaken by drive-in window sampler technique and five hand pits designated TP101, 102, 103, 105 and 106 were dug by hand. The positions of the exploratory holes are shown on Figure A1.2 in Appendix 1.

3.6 The depths of boreholes and trial pits, descriptions of strata encountered and comments on groundwater conditions are given in the exploratory hole records presented in Appendix 2.

3.7 Representative disturbed samples were taken at the depths shown on records and despatched to the laboratory. Standard penetration tests, ref. 7.4 were carried out in the boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

3.8 Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

3.9 Trial pits were excavated to investigate existing foundations. Photographic records of trial pits are presented in Appendix 5.

3.10 Perforated standpipes, surrounded by pea shingle and protected by a stopcock cover were installed in boreholes as detailed in the records.

3.11 The ground levels at the borehole and hand pit locations were not determined.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 Soil samples for testing were prepared in accordance with BS1377: Part One: 1990 ref. 7.7 and representative sub-samples were taken for testing. The following tests were carried out:

- 6 No. Moisture content
- 6 No. Atterberg Limits
- 1 No. Particle Size Distribution by wet sieve
- 8 No. Water soluble sulphate
- 8 No pH value

4.1.2 The results of the soil tests are presented in Appendix 3, Test Report 41916/1

4.1.3 The results of the sulphate and pH tests are presented in Appendix 3, Test Report 16-72283.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Sequence

5.1.1 The sequence encountered generally comprised made ground over a variable sequence of clay and sand.

5.2 Made Ground

5.2.1 Made ground and topsoil was encountered to depths in the overall range 0.20 to 2.20m.

5.2.2 WS103, 104, 106, 107, 110 and 110A encountered topsoil from ground level to depths between 0.20 and 0.70m.

5.2.3 WS108 and 109 encountered a thin layer of tarmac at surface.

5.2.4 Made ground variably comprised clay, sand and gravel. Anthropogenic fragments including concrete, brick, ash, plastic were noted within made ground.

5.2.5 Six SPT 'N' values between 6 and 15 were recorded within made ground.

5.2.6 WS105 encountered possible made ground of slightly sandy, slightly gravelly clay between 2.20 and 4.50m.

5.2.7 WS109 encountered possible made ground of slightly sandy, slightly gravelly clay between 1.45 and 3.00m.

5.2.8 WS110A was terminated at a depth of 0.80m on a concrete obstruction.

5.3 Natural Deposits

5.3.1 Natural deposits were encountered directly beneath the made ground within all locations at depths in the overall range 0.20 to 2.20m.

5.3.2 Natural deposits variably comprised clay and sand.

5.3.3 WS102 to 105 and 107 to 109 predominantly encountered clay. The material was generally described as slightly sandy, slightly gravelly clay.

5.3.4 The consistency of clay varied from soft through firm to stiff.

5.3.5 Soft and firm clay were encountered in WS104, 105 and 107 whereas firm and stiff clay were encountered in the remaining boreholes.

5.3.6 Sand layers were encountered in WS102 (1.70 to 1.90m) and WS107 (2.95 to 3.60m).

5.3.7 WS102 to 105 and 107 to 109 were terminated within clay at depths of 5.45m.

5.3.8 WS106 encountered sand between 0.30 and 3.10m beneath topsoil. Clay was encountered between 3.10 and 4.00m with further sand between 4.00m and the base of the hole at 5.45m.

5.3.9 WS110A encountered gravel between 0.30 and 0.65m beneath topsoil. Clay was encountered between 0.65 and 1.80m with sand between 1.80 and 4.20m. This in turn overlies further clay between 4.20m and the base of the hole at 5.45m.

5.3.10 Thirty two SPT 'N' values were obtained in clay with values between 4 and 34.

5.3.11 'N' values in clay less than 10 were recorded at depths up to 4m in WS104 and at 5.00m in WS105.

5.3.12 'N' values in clay do not appear to vary systematically with depth.

5.3.13 Plastic limits between 14 and 16% were obtained on six samples of clay with plastic index values between 9 and 15. Water contents varied between 10 and 16%.

5.3.14 Based on the measured plastic index values the material may be classified as low volume change potential as defined by the National House Building Council, ref 7.8.

5.3.15 SPT 'N' values may be used to provide an approximation of Cu values in clay (see Appendix 4).

5.3.16 The Cu values in the overall range of $20kN/m^2$ to $170kN/m^2$ may be derived from SPT 'N' values where full penetration was achieved. These have been based on an f_1 value about 5.

5.3.17 The derived Cu values are consistent with soft, firm, stiff and very stiff strata.

5.3.18 Seven SPT 'N' values in sand ranged from 9 to 24 indicating loose and medium dense strata.

5.3.19 Particle size distribution testing of material from WS106 at 0.50m reported very sandy gravel with a fines content of 33%.

5.4 Existing building foundations

5.4.1 TP101, 102, 103, 105 and 106 were excavated adjacent to existing buildings.

5.4.2 TP101, 102, 103, and 106 were excavated wholly in made ground to depths up to 1.30m. TP105 encountered firm clay at 0.37m and was terminated within this material at 0.70m.

5.4.3 Details of foundations encountered are presented on the sketches and photographs of trial pits in Appendix 5.

5.5 Groundwater

5.5.1 Groundwater was noted at 0.70m in WS107.

5.5.2 TP102 was terminated at a depth of 0.90m due to the presence of water.

5.5.3 Groundwater was not encountered in the remaining exploratory holes.

6.0 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS IN RELATION TO THE PROPOSED DEVELOPMENT

6.1 Proposed Development

6.1.1 It is proposed to re-develop areas of the existing Shrewsbury Royal Hospital site.

6.1.2 No details of the proposed re-development have been provided the comments and recommendations below should therefore be reviewed as development details become available.

6.1.3 The comments and discussion below do not fall within the requirements of EC7 (ref. 7.4) and are offered for guidance.

6.2 Foundations

6.2.1 The presence of variable thicknesses of made ground and variable strata beneath made ground indicates that a single foundation solution may not be appropriate across the whole site area.

6.2.2 Foundations in clay strata should be placed at a minimum depth of 0.75m based on clay of low volume change potential.

6.2.3 Dependent upon foundation loads spread foundations may be suitable across much of the site. Strata at shallow depths in WS102, 103, 106, 107, 108 and 110A comprised firm and stiff clay or medium dense sand.

6.2.4 Assuming firm clay at base of foundation excavations square pad foundations with dimensions 1 x 1m at depths about 1m may be designed to an allowable bearing capacity about 130kN/m^2.

6.2.5 Strip foundations of widths about 1m on firm clay at depths about 1m may be designed to an allowable bearing capacity about 110kN/m^2.

6.2.6 The allowable bearing capacities indicated above assume that excavations have been advanced to competent ground and would provide an adequate factor of safety against shear failure and limit total settlements to the order of 25mm.

6.2.7 Reinforcement may be incorporated in strip foundations to accommodate differential settlement between different clay and sand strata.

6.2.8 The materials encountered at shallow depth in WS104, 105 and 109 are not generally suitable for shallow spread foundations. In these areas a number of foundation options may be considered including extending excavations to competent ground and backfilling with mass concrete or piling.

6.2.9 It is recommended that a single foundation solution should be applied to each individual structure.

6.3 Ground Floor Slabs

6.3.1 The design of the ground floor slab will be dependent on the location of the structure, anticipated floor loads and foundation method adopted.

6.3.2 Lightly loaded floors may be placed on formation prepared in competent natural strata where this was encountered at shallow depths.

6.3.3 In areas where soft or loose material were encountered at shallow depths ground floor slabs should be suspended. Alternatively a suitable thickness of material may be excavated and replaced with compacted granular fill to provide a capping layer beneath floor construction.

6.3.4 Formations should be proof rolled and any soft, loose or deleterious material should be removed and replaced with properly compacted granular fill.

6.4 Excavations

6.4.1 On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.00m should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep, in accordance with Health and Safety Regulations.

6.4.2 Groundwater should not be expected in shallow excavations for foundations or services. However, it is possible that perched groundwater could be present in the Made Ground overlying the natural strata. It is considered that this could be dealt with by localised pumping.

6.5 Chemical Attack on Buried Concrete

6.5.1 The site has been classified in accordance with BRE Special Digest 1, ref. 7.12, as natural ground without the presence of pyrite and laboratory testing undertaken accordingly. It is recommended that the guidelines given in BRE Special Digest 1, ref. 7.12, be adopted.

6.5.2 It is recommended that the groundwater should be regarded as mobile.

6.5.3 The results of chemical testing indicate soluble sulphate concentrations in the soil between 21 and 120mg/l as 2:1 water/soil extract, with pH values between 7.1 and 9.7.

6.5.4 On the basis of the laboratory test results it is considered that a Design Sulphate Class for the site may be taken as DS-1. On this basis an ACEC class of AC-1 would be appropriate.

7.0 REFERENCES

7.1 CLR 4, 'Sampling strategies for contaminated land'. Report by The Centre for Research into the Built Environment, the Nottingham Trent University, DoE, 1994.

7.2 British Standards Institute: BS 10175 'Code of practice for the investigation of potentially contaminated sites', BSI 2011+A1:2013.

7.3 BS 5930:1999+A2:2010 '*Code of practice for site investigations*', British Standards Institute, 2010.

7.4 ISO 1997, Part 2:2007, 'Eurocode 7 – Geotechnical Design – Part 2, Ground Investigation and Design'

7.5 ISO 22476 – 3:2005, 'Geotechnical Investigation and Testing – Field Testing' Part 3, Standard Penetration Test.

7.6 ISO 22475-1:2006, 'Geotechnical Investigation and Testing – Sampling Methods and Groundwater Measurements' Part 1: Technical Principles for Execution.

7.7 ISO 14688 Part 1:2002 and Part 2:2004, 'Geotechnical Investigation and Testing – Identification and Classification of Soil'.

7.8 National House-Building Council, Standards, Chapter 4.2, 2003 'Building Near Trees'.

7.9 Stroud, M.A. 'The Standard Penetration Test in Insensitive Clays and Soft Rocks', Proceedings of European Symposium on Penetration Testing, Stockholm, 1974.

7.10 Stroud, M.A. and Butler, F.G. 1975 'The Standard Penetration Test and Engineering Properties of Glacial Materials', Symposium of Engineering Behaviour of Glacial Materials, Birmingham University.

7.11 British Code of Practice for Foundations, BS 8004:1986

7.12 Building Research Establishment, Special Digest 1, 'Concrete in Aggressive Ground', 2005.

For and on behalf of Ian Farmer Associates (1998) Limited

H. Hadwin
BSc (Hons) MSc FGS
Engineering Geologist

T. Downes
BSc (Hons) MSc FGS
Principal Engineering Geologist

APPENDIX 1

DRAWINGS

VOLUME 3: MECHANICAL, ELECTRICAL AND PLUMBING

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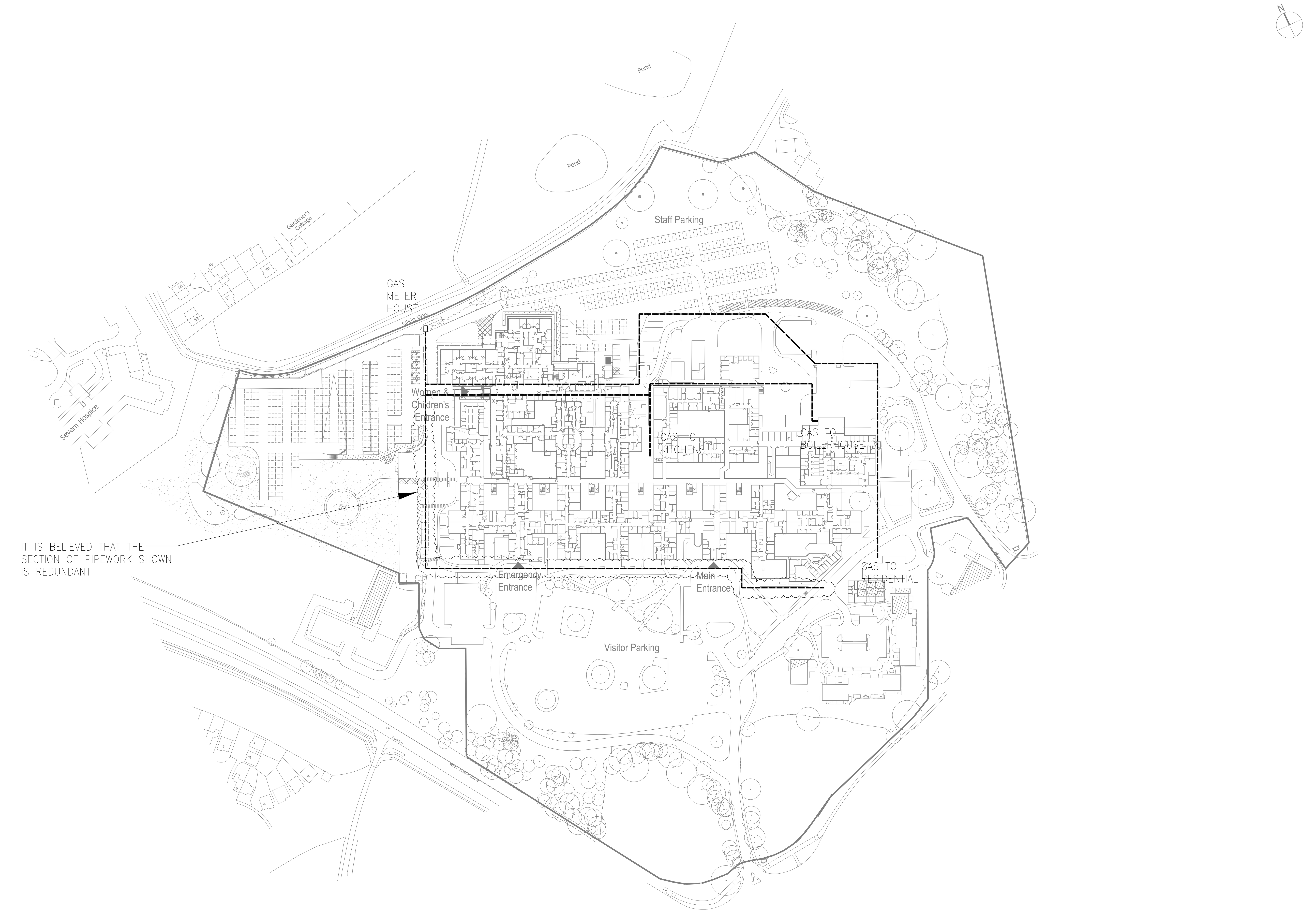

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
NATURAL GAS SERVICES LAYOUT

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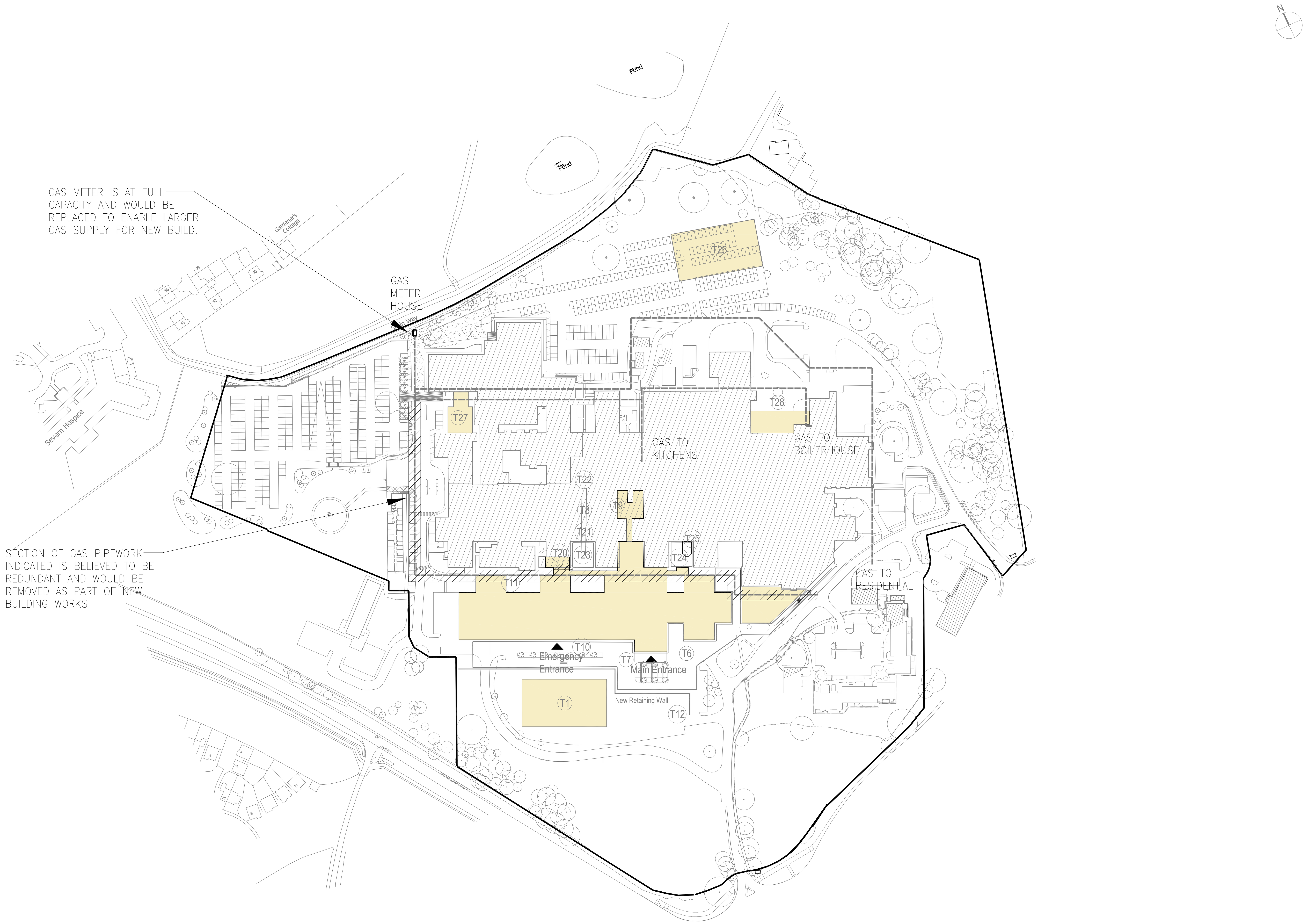

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

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THE EMERGENCY SITE LAYOUT

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

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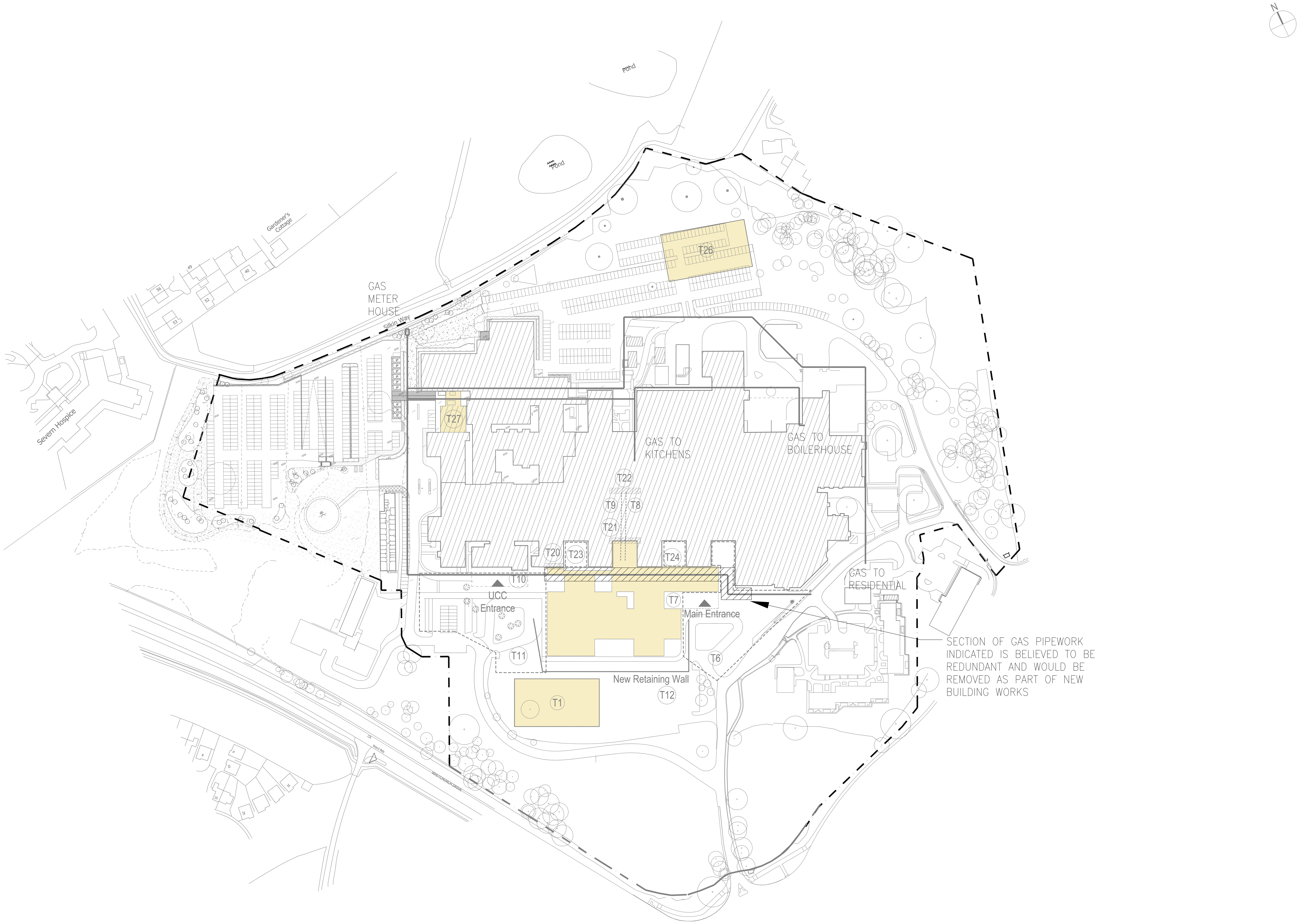

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

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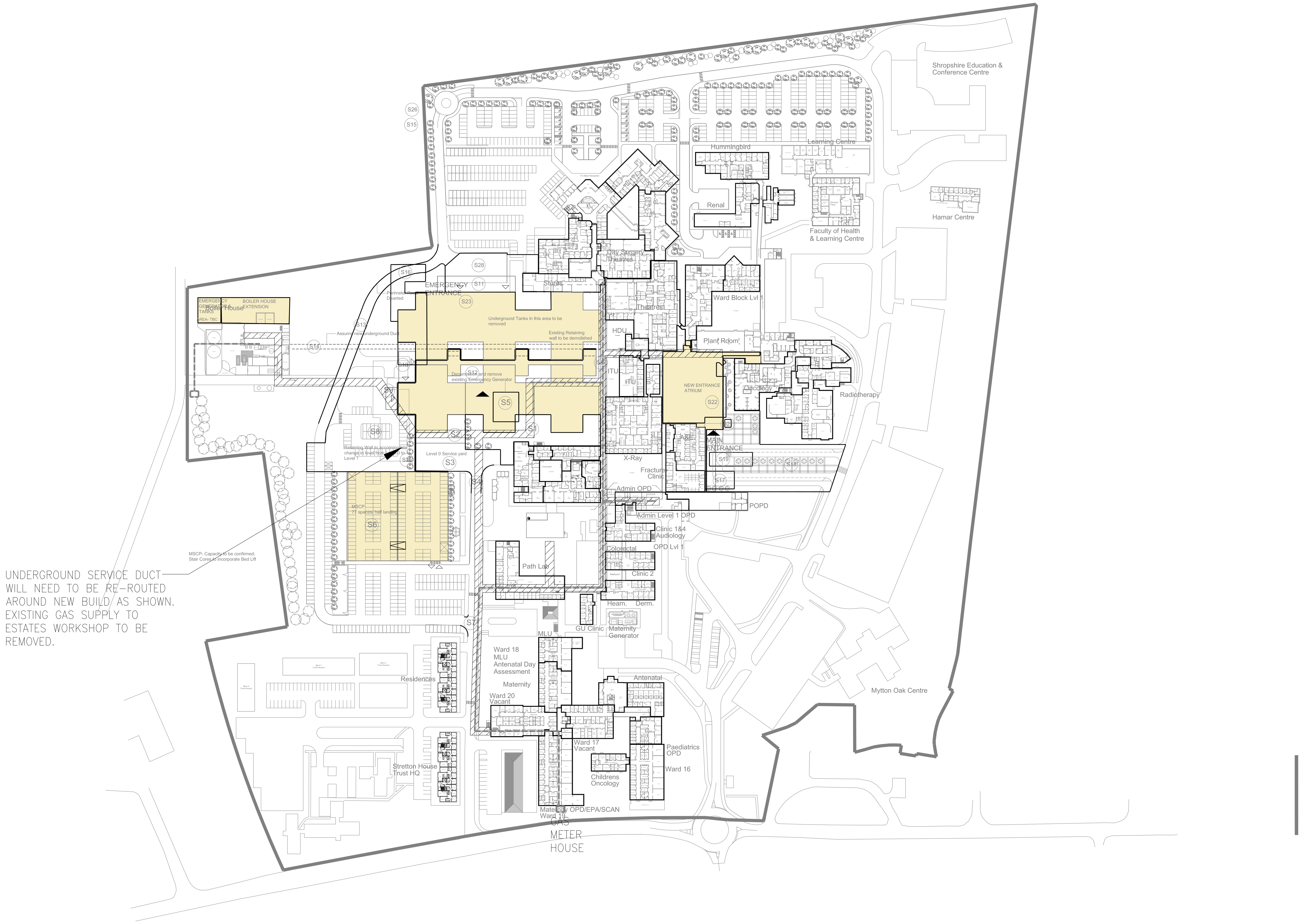

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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NO SIGNIFICANT HAZARDS ASSOCIATED WITH THIS DRAWING

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REV	DATE	BY	DESCRIPTION

DRAWING STATUS: ISSUED FOR OBC

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
NATURAL GAS - OPTION C1
THE EMERGENCY SITE LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
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TITLE:
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THE PLANNED CARE SITE LAYOUT

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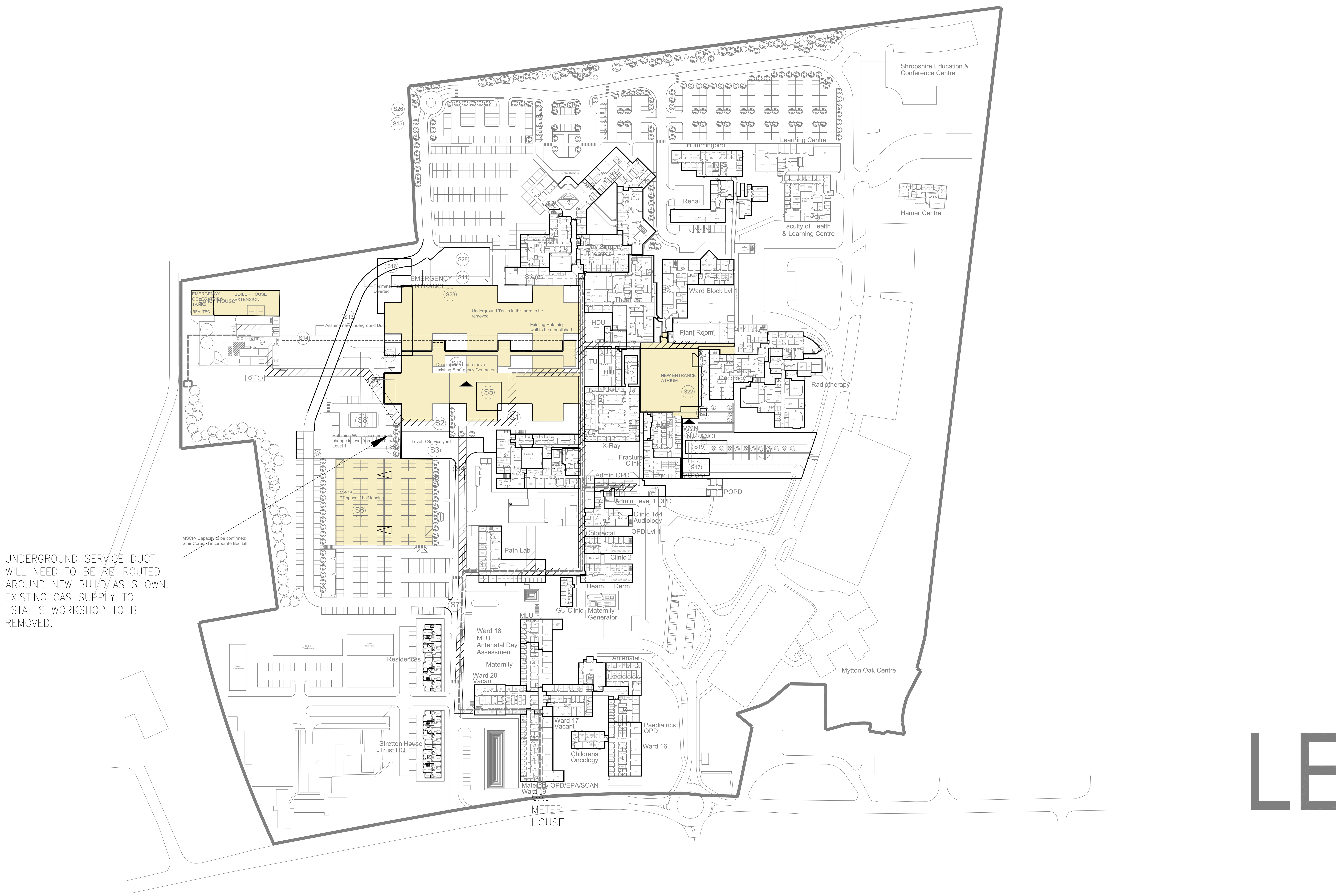

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TITLE:
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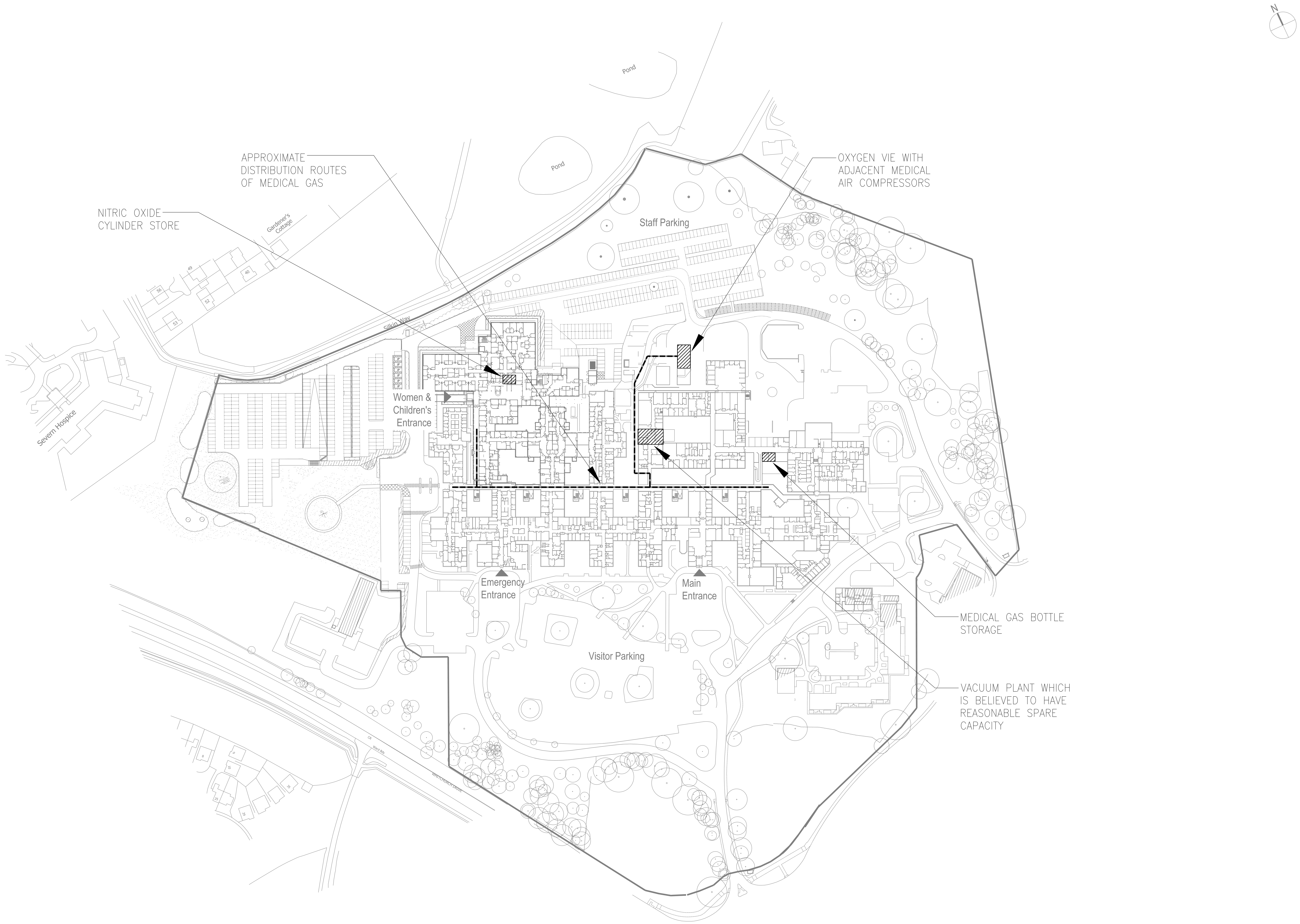

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PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
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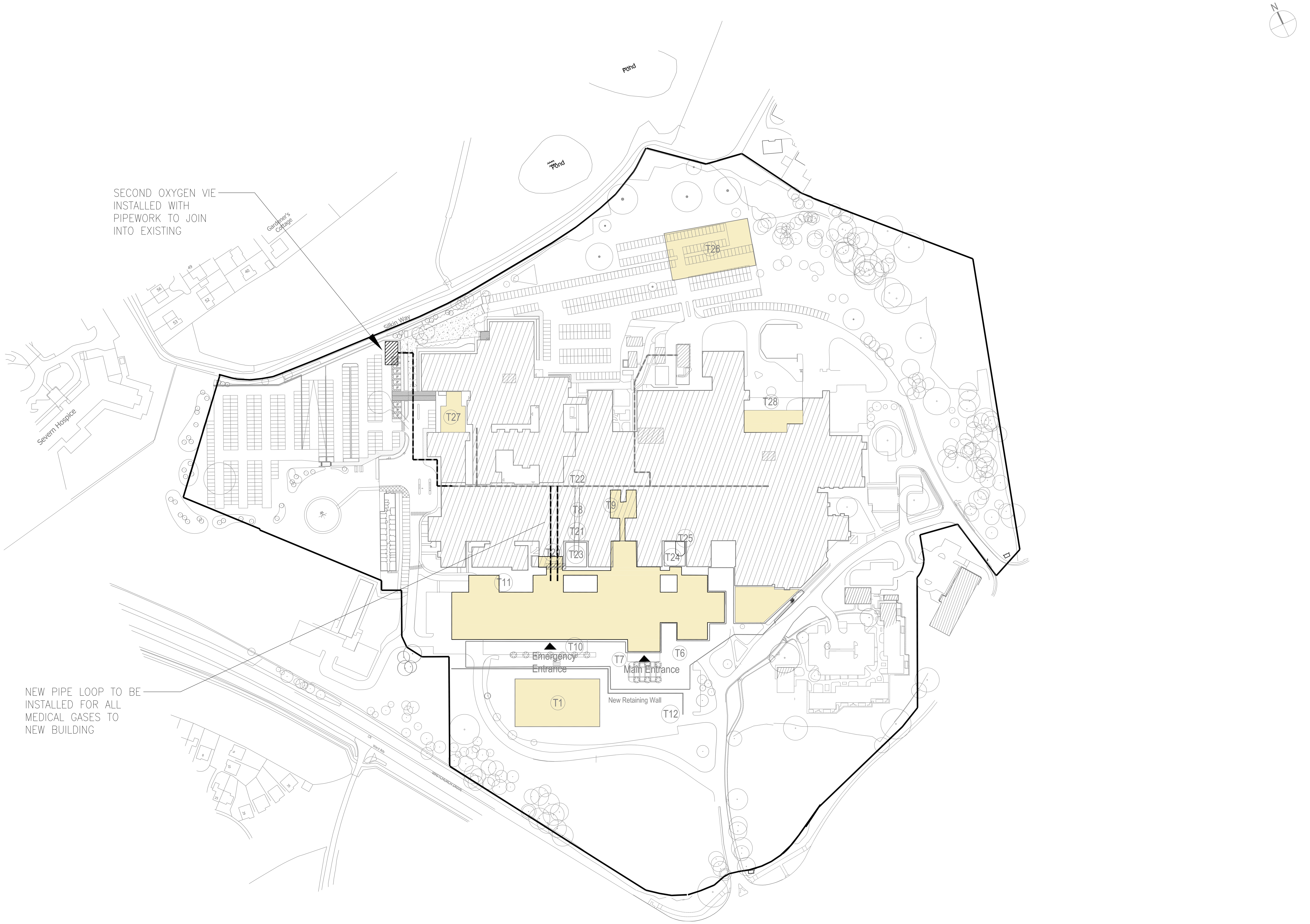

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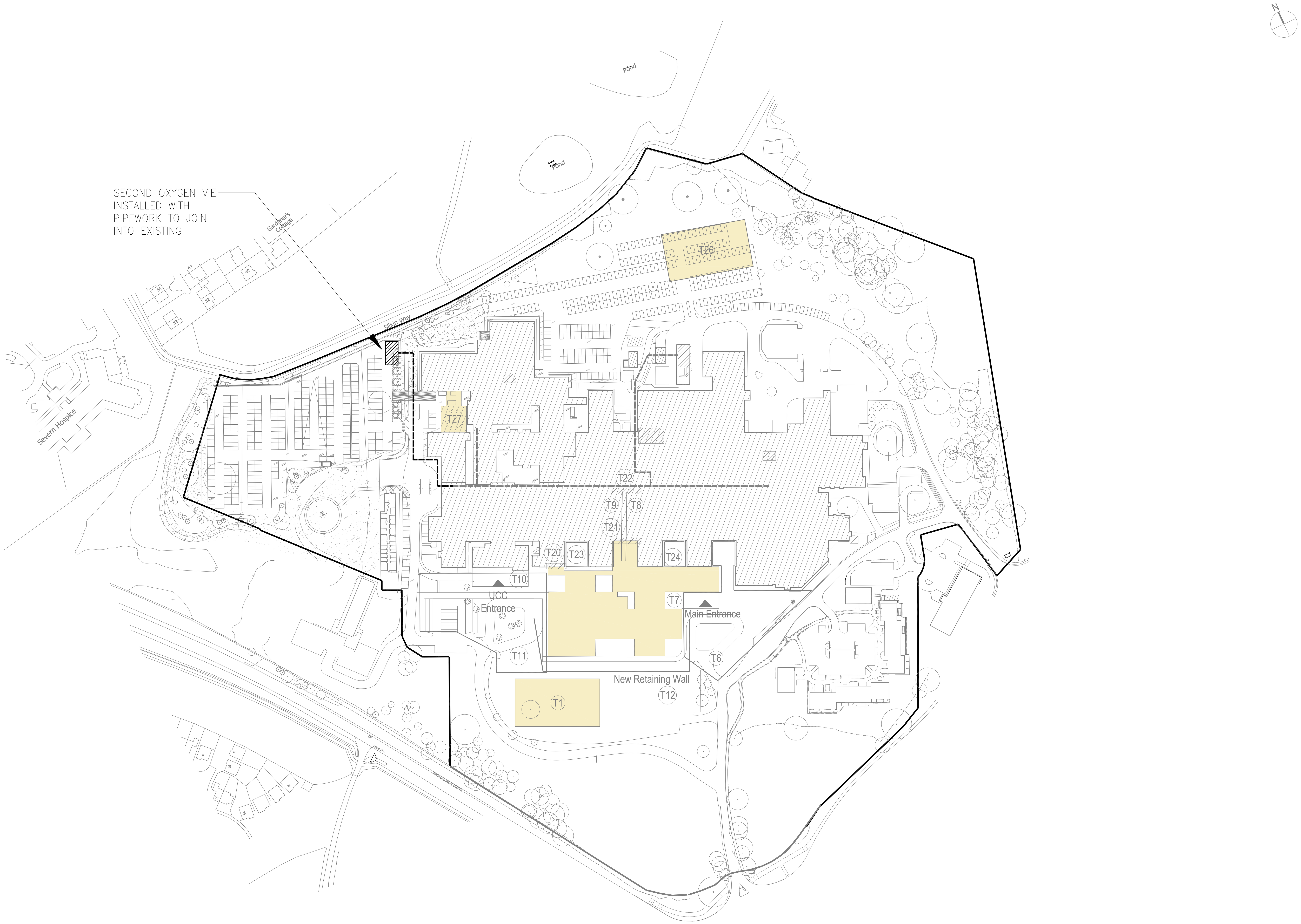

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Telford
TF1 6TF

TITLE:
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MEDICAL GAS - OPTION C2
THE PLANNED CARE SITE LAYOUT

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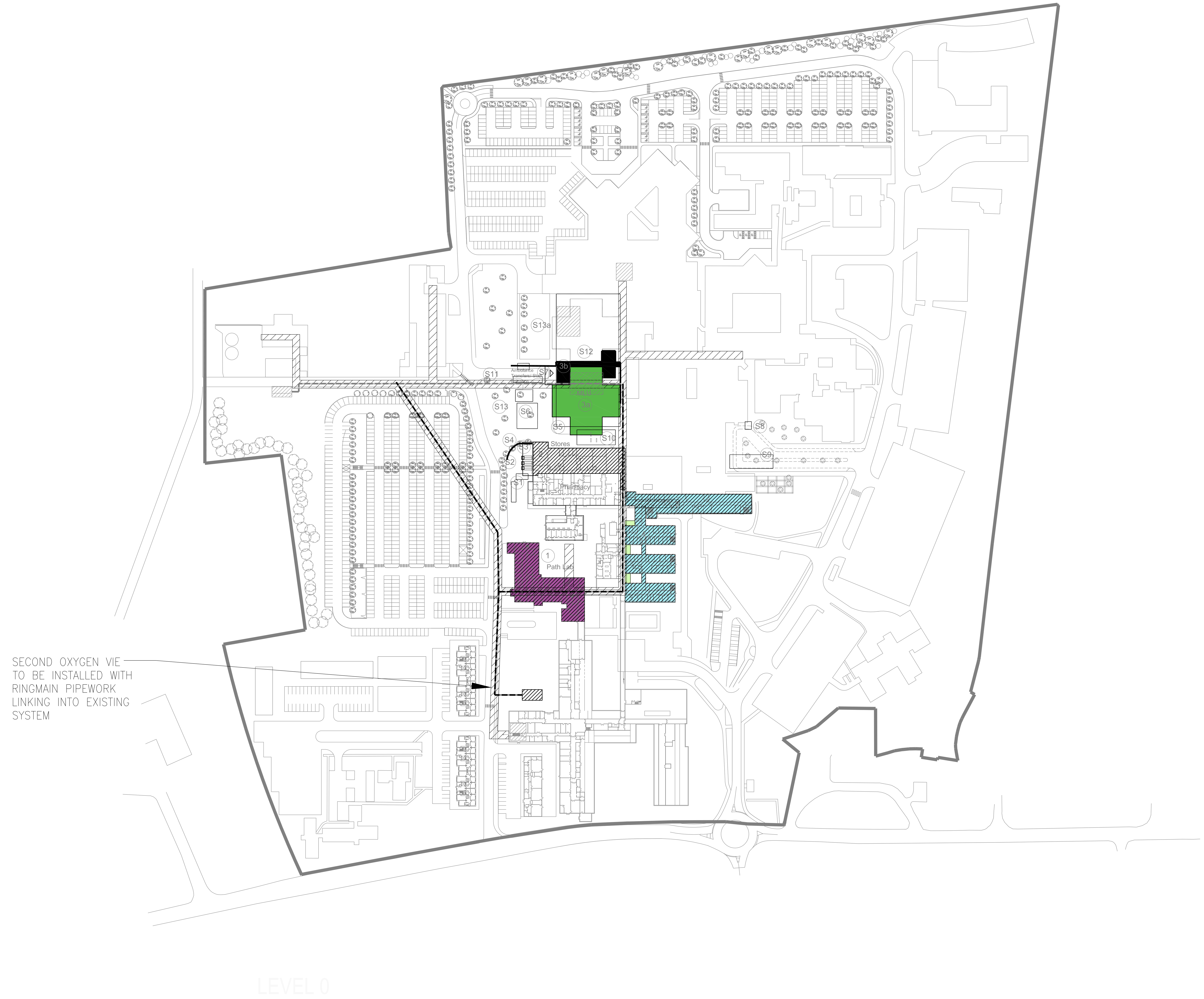

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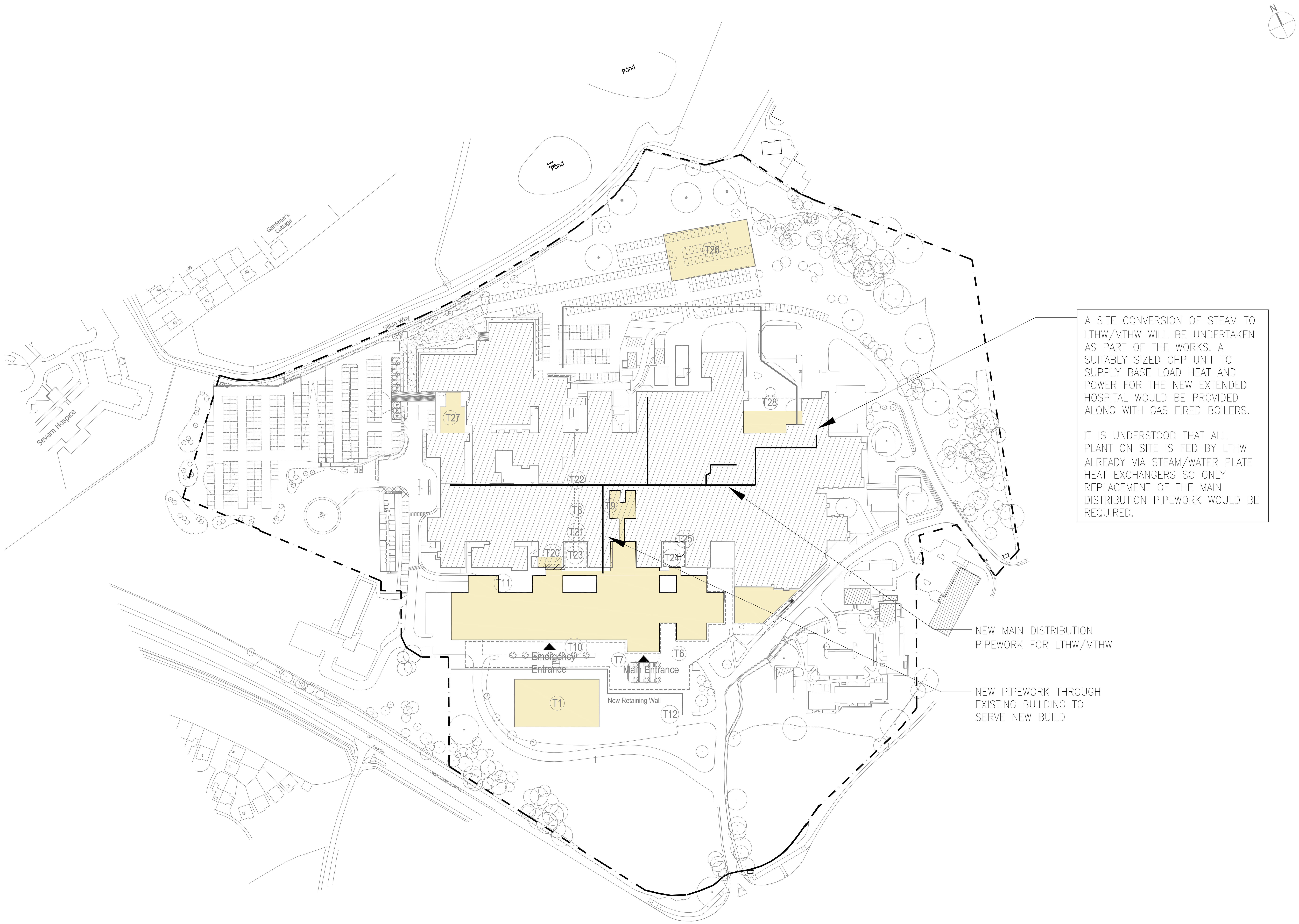
CAD File M4556-DSSR-RSH-X-DR-MEP-54204.dwg

DRAWING No: M4556-DSSR-RSH-X-DR-MEP-54204
REV: -



DO NOT SCALE

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5. EXISTING SERVICES SHOWN IN GREY NEW SERVICES IN COLOUR

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

READERS OF THIS DRAWING:
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NO SIGNIFICANT HAZARDS ASSOCIATED WITH THIS DRAWING

IT IS ASSUMED THAT A COMPETENT M&E CONTRACTOR OR USER WILL BE AWARE OF THE STANDARD FORESEEABLE RISKS ASSOCIATED WITH WORKING WITH THE TYPE OF SERVICES DETAILED WITHIN THIS DRAWING.

REV	DATE	BY	DESCRIPTION

DRAWING STATUS:
ISSUED FOR OBC

DSSR | CONSULTING ENGINEERS
Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
HEATING - OPTION B
THE EMERGENCY SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

CAD File M4556-DSSR-PRH-X-DR-MEP-56002.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-56002
REV: -

REFURBISHED AND NEW BUILD AREAS TO BE FED FROM EXISTING HEATING DISTRIBUTION

DO NOT SCALE

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
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www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

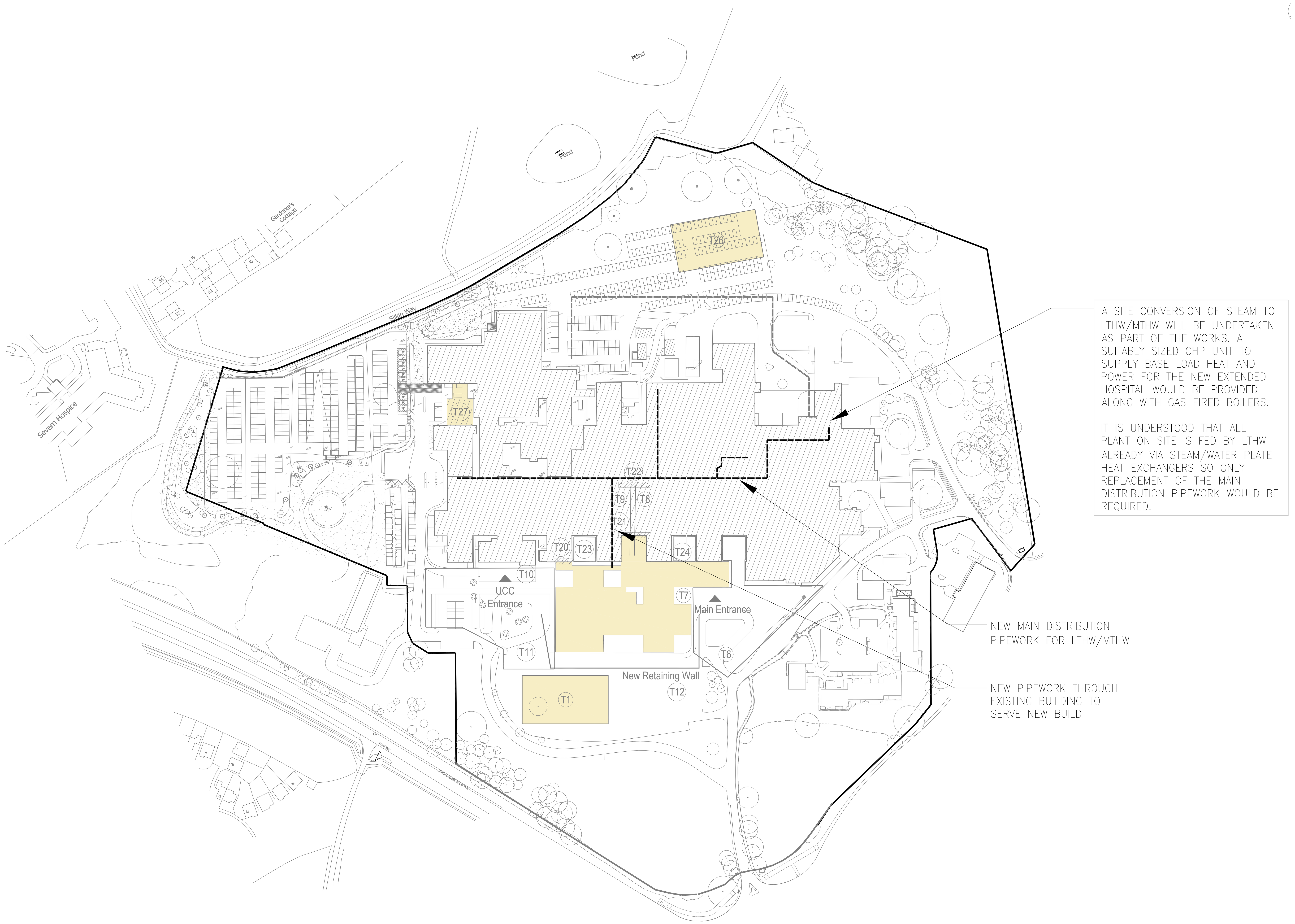
TITLE:
PROPOSED
HEATING - OPTION C1
THE PLANNED CARE SITE LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
DC	JUN 16	A0	1: 1000

CAD File M4556-DSSR-PRH-X-DR-MEP-56003.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-56003

REV: -



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Manchester
M16 0PT

Tel: +44 (0)161 872 4811
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www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
HEATING - OPTION C2
THE PLANNED CARE SITE LAYOUT

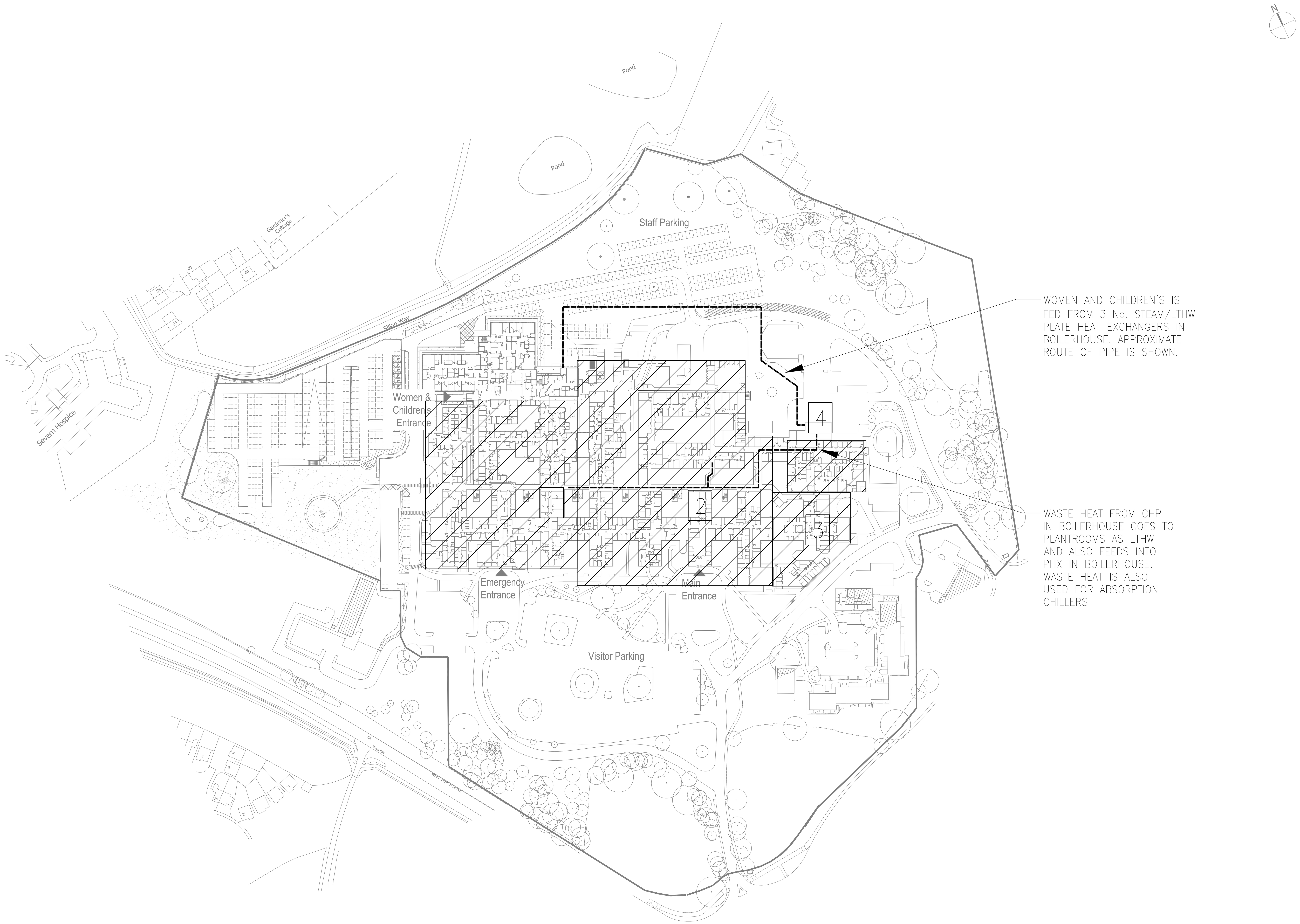
Designed	DC	Date	OCT 16	Checked	MS	Date	OCT 16
Drawn	DC	Date	OCT 16	Sheet Size	A0	Scale(s)	1: 1000

CAD File: M4556-DSSR-PRH-X-DR-MEP-56004.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-56004
REV: -

DO NOT SCALE

1. AREA SERVED FROM PHX IN PLANTROOM PG
2. AREA SERVED BY PHX IN PLANTROOM PD
3. AREA SERVED BY PHX IN PLANTROM ABOVE PAUL BROWN
4. ENDOSCOPY AREA SERVED BY PHX ABOVE BOILERHOUSE



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Glasgow Harrogate London Manchester

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M16 0PT

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www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
LTHW/MTHW HEATING SERVICES LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

CAD File M4556-DSSR-PRH-X-DR-MEP-56101.dwg

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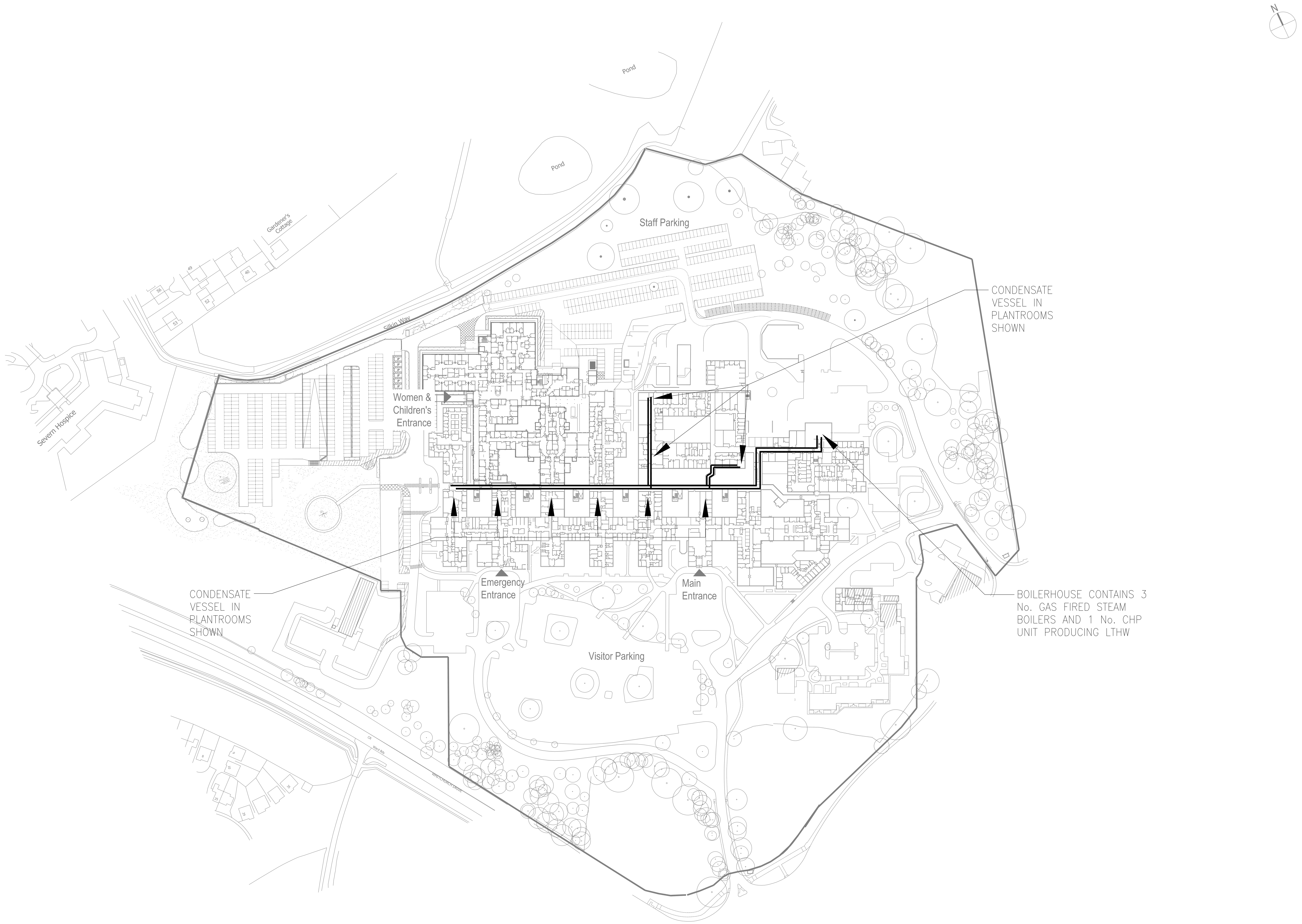

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
STEAM AND CONDENSATE SERVICES LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
DC	JUN 16	A0	1: 1000

CAD File: M4556-DSSR-PRH-X-DR-MEP-56301.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-56301 | REV: -

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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www.dssr.co.uk

CLIENT: The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
HEATING - OPTION C1
THE EMERGENCY SITE LAYOUT

Designed	DC	Date	JUN 16	Checked	MS	Date	JUN 16
Drawn	DC	Date	JUN 16	Sheet Size	A0	Scale(s)	1: 1000

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Manchester
M16 0PT

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
HEATING - OPTION B
THE PLANNED CARE SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
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CAD File M4556-DSSR-RSH-X-DR-MEP-56003.dwg

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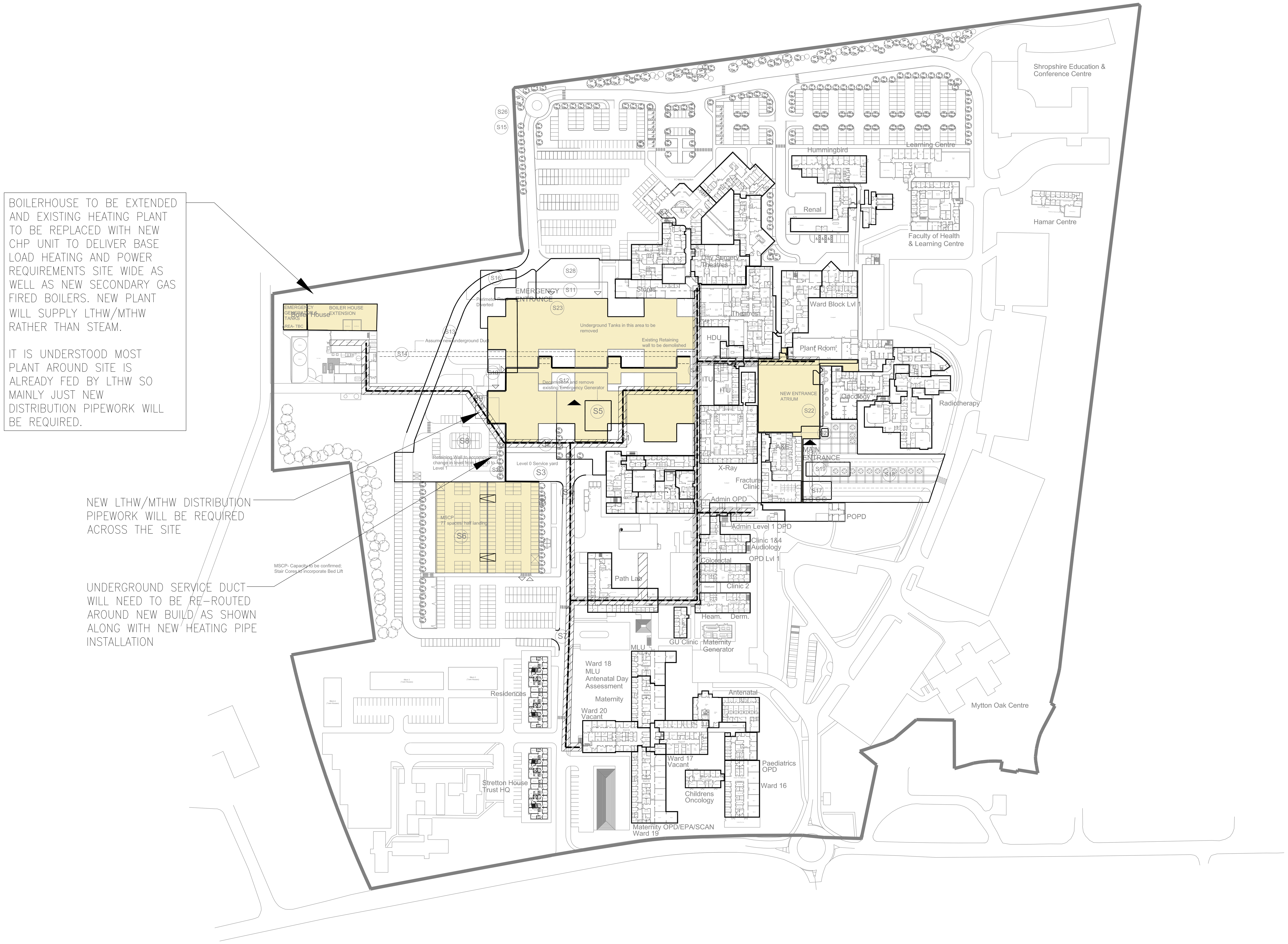

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CLIENT: The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
HEATING - OPTION C2
THE EMERGENCY SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

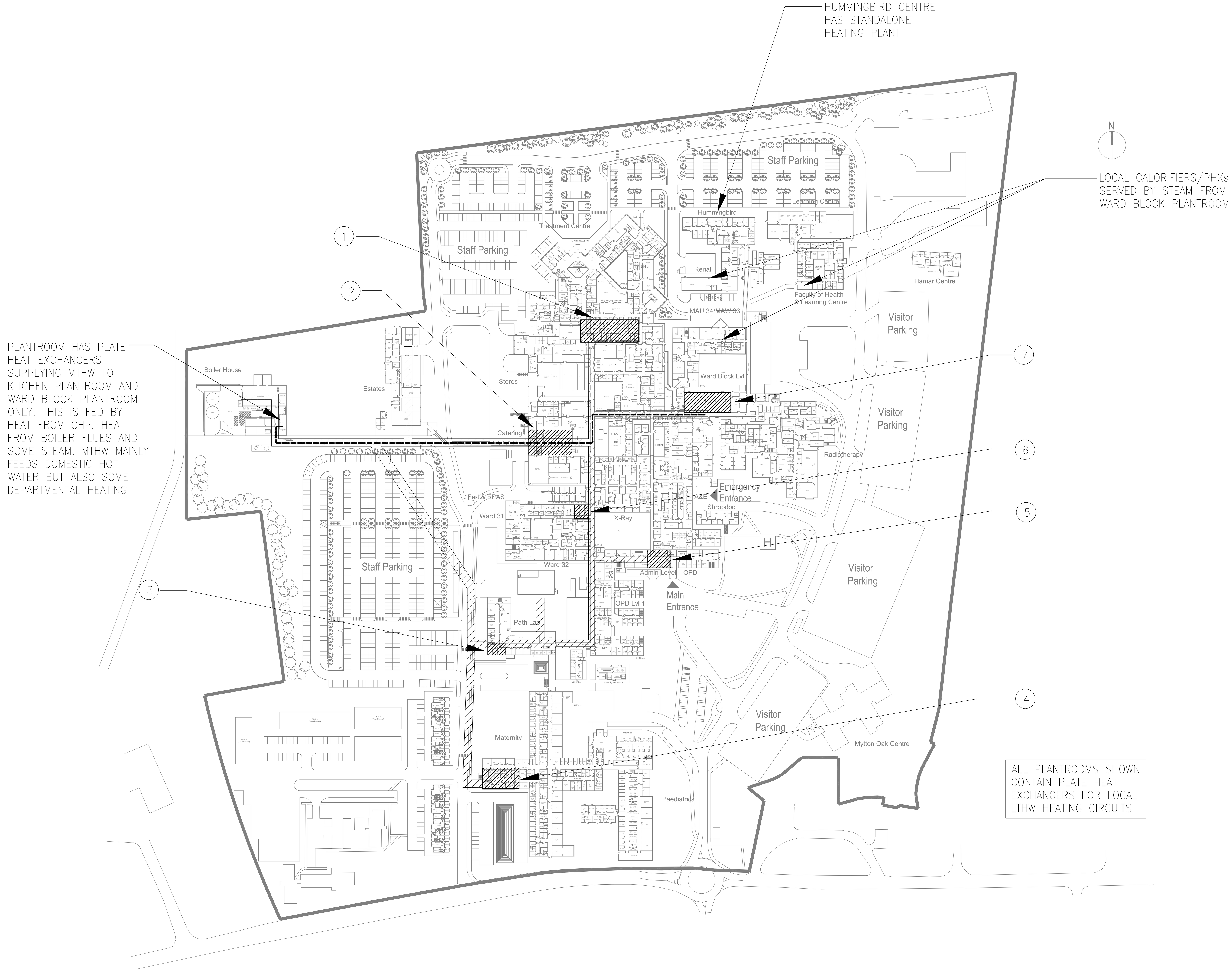
CAD File M4556-DSSR-RSH-X-DR-MEP-56004.dwg

DRAWING No: M4556-DSSR-RSH-X-DR-MEP-56004 REV: -

DO NOT SCALE

AREAS SERVED BY PLANTROOMS

1. TREATMENT CENTRE PLANTROOM
   TREATMENT CENTRE & NEW THEATRES. ALSO CONTAINS AN ABSORPTION CHILLER
2. KITCHEN PLANTROOM
   KITCHEN
3. PATH LAB PLANTROOM
   PATHOLOGY
4. MATERNITY PLANTROOM
   MATERNITY & PAEDIATRICS. ALSO CONTAINS AND ABSORPTION CHILLER
5. ADMIN PLANTROOM
   ADMIN & OUTPATIENTS
6. GYNAE PLANTROOM
   PHARMACY, GYNAE & STAFF CHANGING AREAS
7. WARD BLOCK PLANTROOM
   OLD THEATRES, A&E, X-RAY, FRACTURE CLINIC



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www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
EXISTING
LTHW/MTHW HEATING SERVICES LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
DC	JUN 16	A0	1: 1000

CAD File: M4556-DSSR-RSH-X-DR-MEP-56101.dwg

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

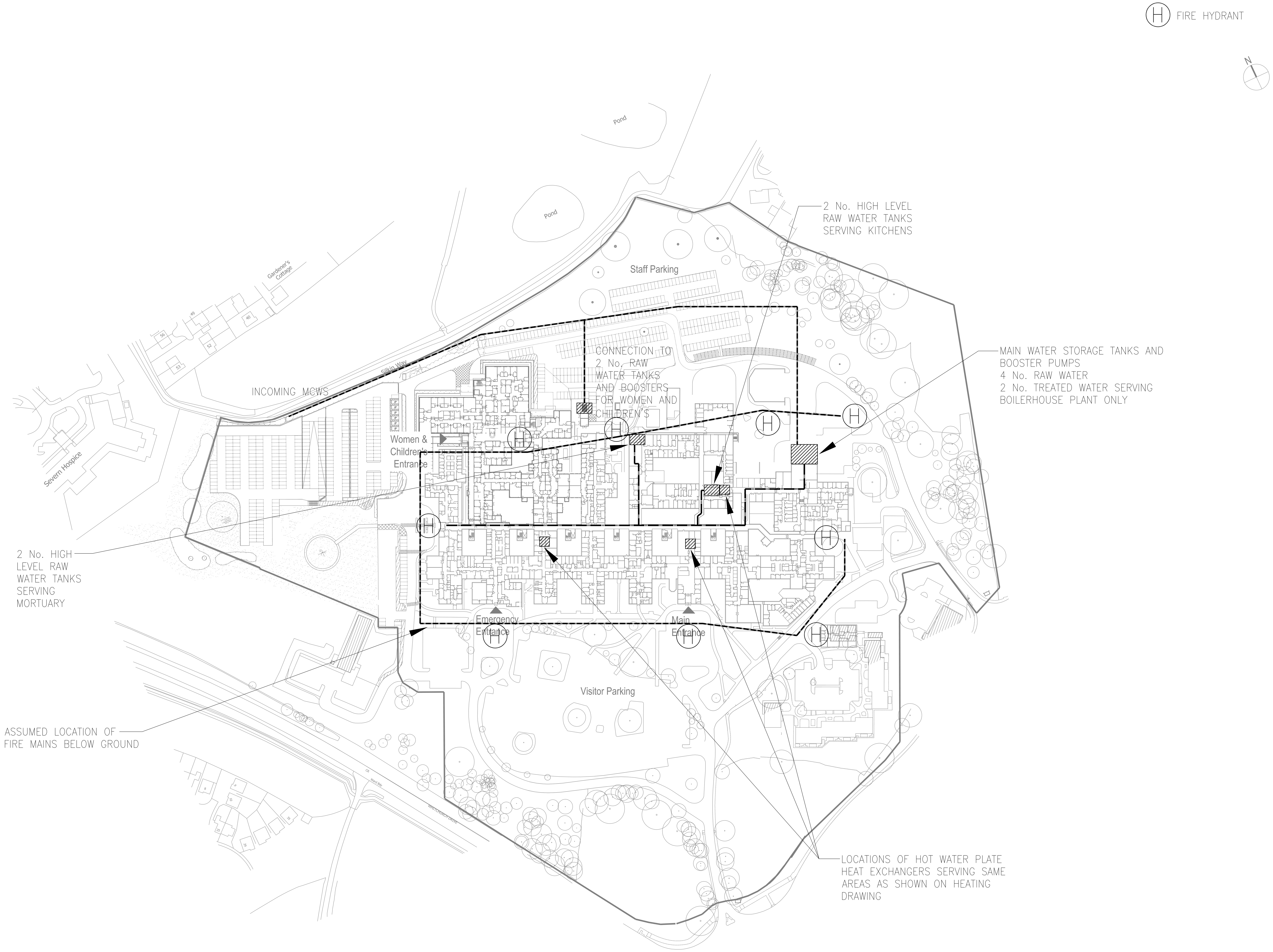
PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
EXISTING
STEAM AND CONDEMSATE SERVICES LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
DC	JUN 16	A0	1: 1000

CAD File M4556-DSSR-RSH-X-DR-MEP-56301.dwg

DRAWING No: M4556-DSSR-RSH-X-DR-MEP-56301
REV: -



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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

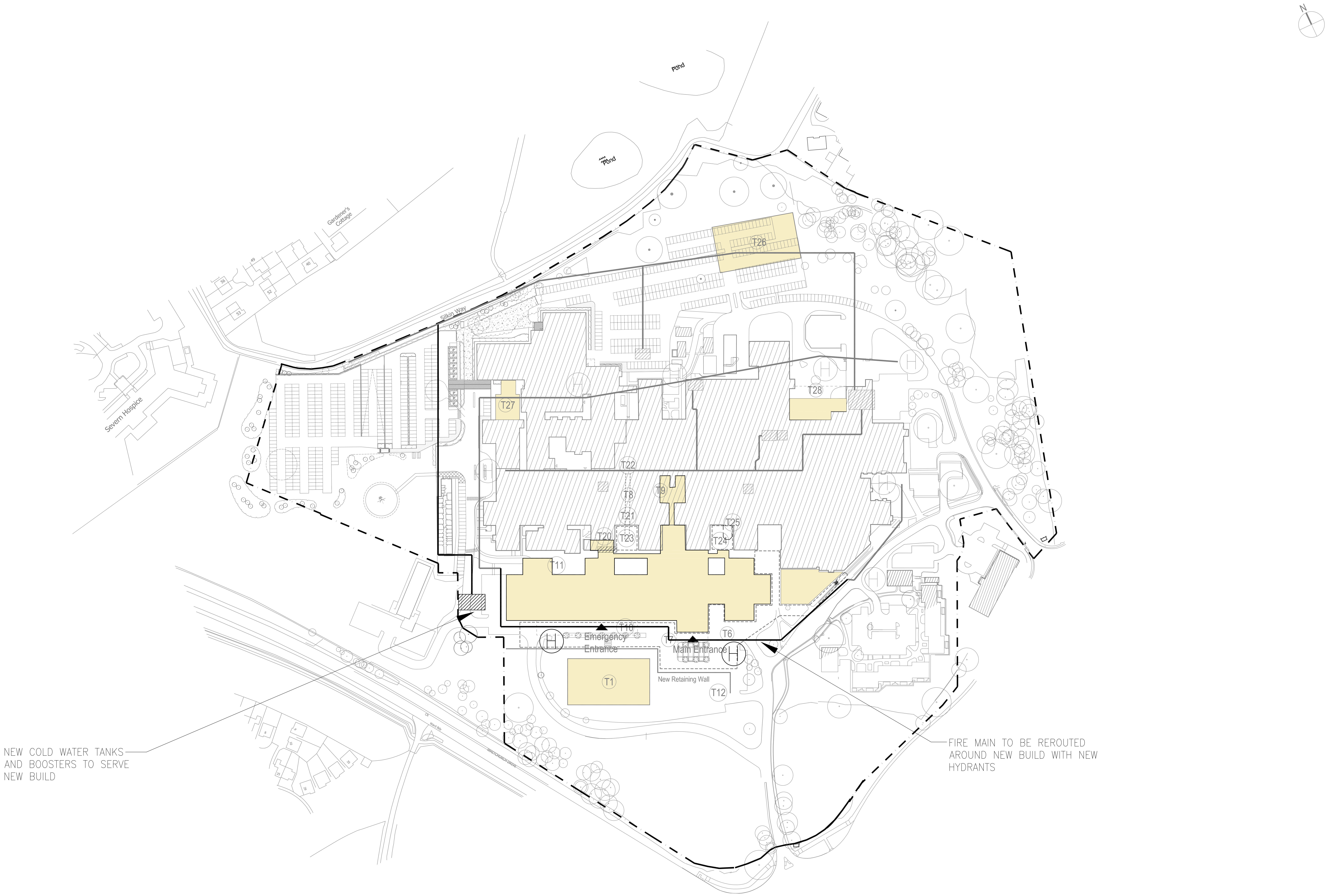
PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
DOMESTIC WATER SERVICES LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

CAD File M4556-DSSR-PRH-X-DR-MEP-53001.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-53001 REV: -



DO NOT SCALE

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5. EXISTING SERVICES SHOWN IN GREY AND NEW SERVICES IN COLOUR

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

READERS OF THIS DRAWING:
ALL EFFORTS HAVE BEEN TAKEN BY DSSR TO DESIGN OUT SIGNIFICANT HAZARDS WITHIN THE DESIGN RISK ASSESSMENT PROCESS. IT IS OUR OPINION THAT THE HAZARDS DETAILED BELOW CANNOT BE DESIGNED OUT BY US GIVEN THE CONSTRAINTS OF THE BRIEF AND ARE HIGHLIGHTED SO THAT OTHER MEANS CAN BE DEVELOPED TO MITIGATE THE RESIDUAL RISKS IDENTIFIED.

NO SIGNIFICANT HAZARDS ASSOCIATED WITH THIS DRAWING

IT IS ASSUMED THAT A COMPETENT M&E CONTRACTOR OR USER WILL BE AWARE OF THE STANDARD FORESEEABLE RISKS ASSOCIATED WITH WORKING WITH THE TYPE OF SERVICES DETAILED WITHIN THIS DRAWING.

REV	DATE	BY	DESCRIPTION

DRAWING STATUS:
ISSUED FOR OBC

DSSR | CONSULTING ENGINEERS
Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
DOMESTIC WATER - OPTION B
THE EMERGENCY SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

CAD File M4556-DSSR-PRH-X-DR-MEP-53002.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-53002
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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
DOMESTIC WATER - OPTION C1
THE PLANNED CARE SITE LAYOUT

Designed	DC	Date	JUN 16	Checked	MS	Date	JUN 16
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CAD File M4556-DSSR-PRH-X-DR-MEP-53003.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-53003
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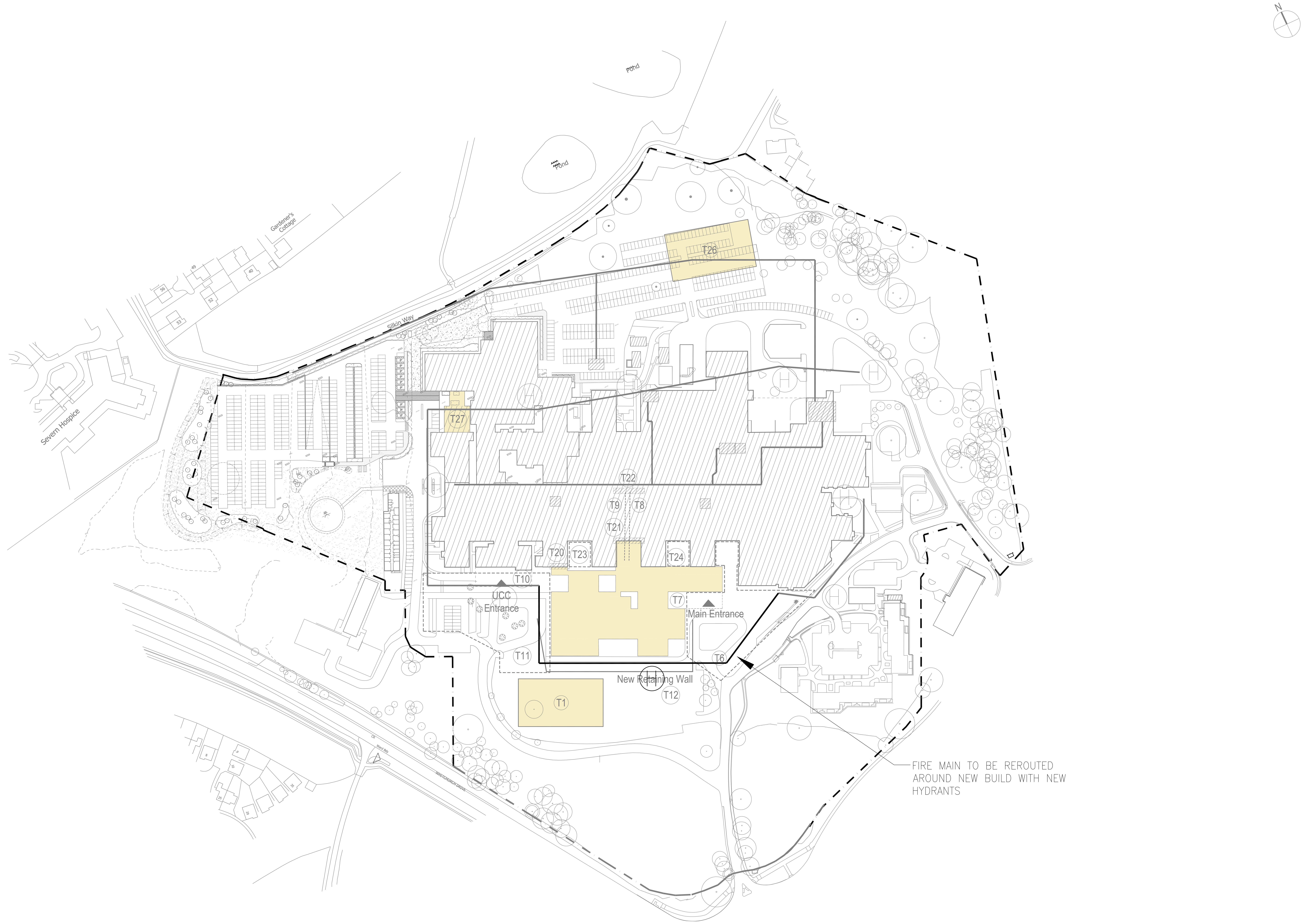

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Manchester Office
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Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
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www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
DOMESTIC WATER - OPTION C2
THE PLANNED CARE SITE

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
DC	JUN 16	A0	1: 1000

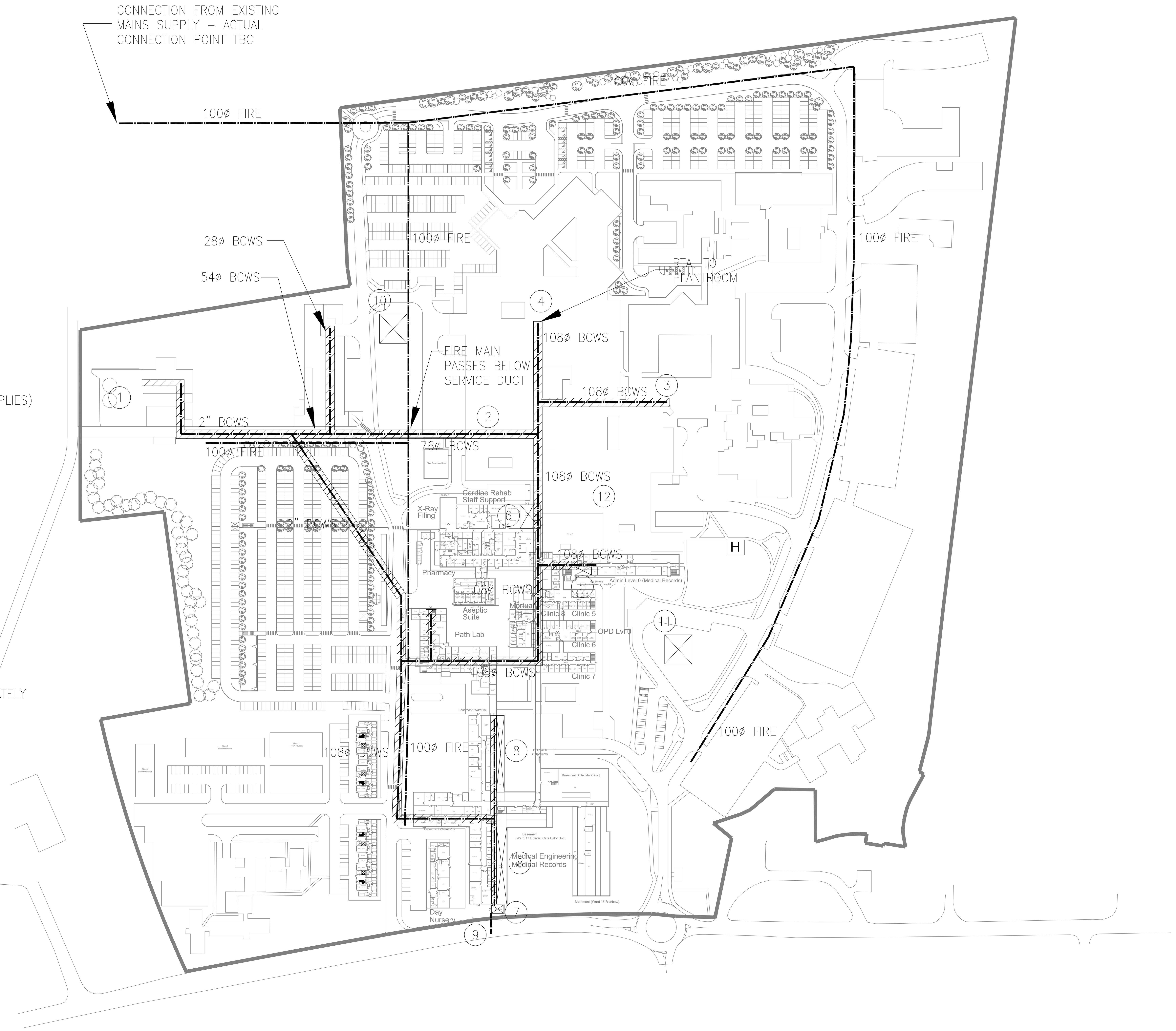
CAD File: M4556-DSSR-PRH-X-DR-MEP-53004.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-53004 | REV: -

DO NOT SCALE

LEGEND – EXISTING PLANTROOMS, ETC.

1) BOILER HOUSE
RO PLANT – WATER SOFTENER
HOLDING TANK
HOT WELLS AS REQ'D
2) KITCHEN PLANT ROOM [LEVEL 0]
CENTRAL STORES
KITCHEN
DINING ROOM
SUB-METER & BYPASS
HIGH LEVEL WATER STORAGE TANKS
3) THE WARD BLOCK PLANT ROOM [LEVEL 1]
WARDS
THEATRES
ITU
XRAY
FRACTURE CLINIC
A&E
HIGH LEVEL WATER STORAGE TANKS
4) TREATMENT CENTRE PLANT ROOM [LEVEL 2]
RO PLANT FOR ENDSCOPY WASH (SEPARATE SUPPLIES)
MAINS STORAGE TANKS
5) ADMIN PLANT ROOM [LEVEL 0]
ADMINISTRATION AREA
OUTPATIENTS
6) (GYNO) PHYS. MED. PLANT ROOM [LEVEL 0]
PHYS. MED.
7) INCOMING PLANT ROOM [LEVEL 0]
INCOMING MAINS WATER
WATER TREATMENT (COPPER SILVER)
BREAK TANK
PUMP BOOSTER SETS
8) COLD WATER STORAGE (LAGOONS)
9) INCOMING COLD WATER SUPPLY TO SITE
10) EMERGENCY WATER STORAGE 2
90,000 LITRES CAPACITY
11) EMERGENCY WATER STORAGE 1
90,000 LITRES CAPACITY
12) 2 SETS WATER STORAGE TANKS
SERVING ADMIN AND GYNAECOLOGY IN APPROXIMATELY
THIS AREA



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Manchester
M16 0PT

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
EXISTING
DOMESTIC WATER SERVICES LAYOUT

Designed	Date	Checked	Date
DC	JUN 16	MS	JUN 16
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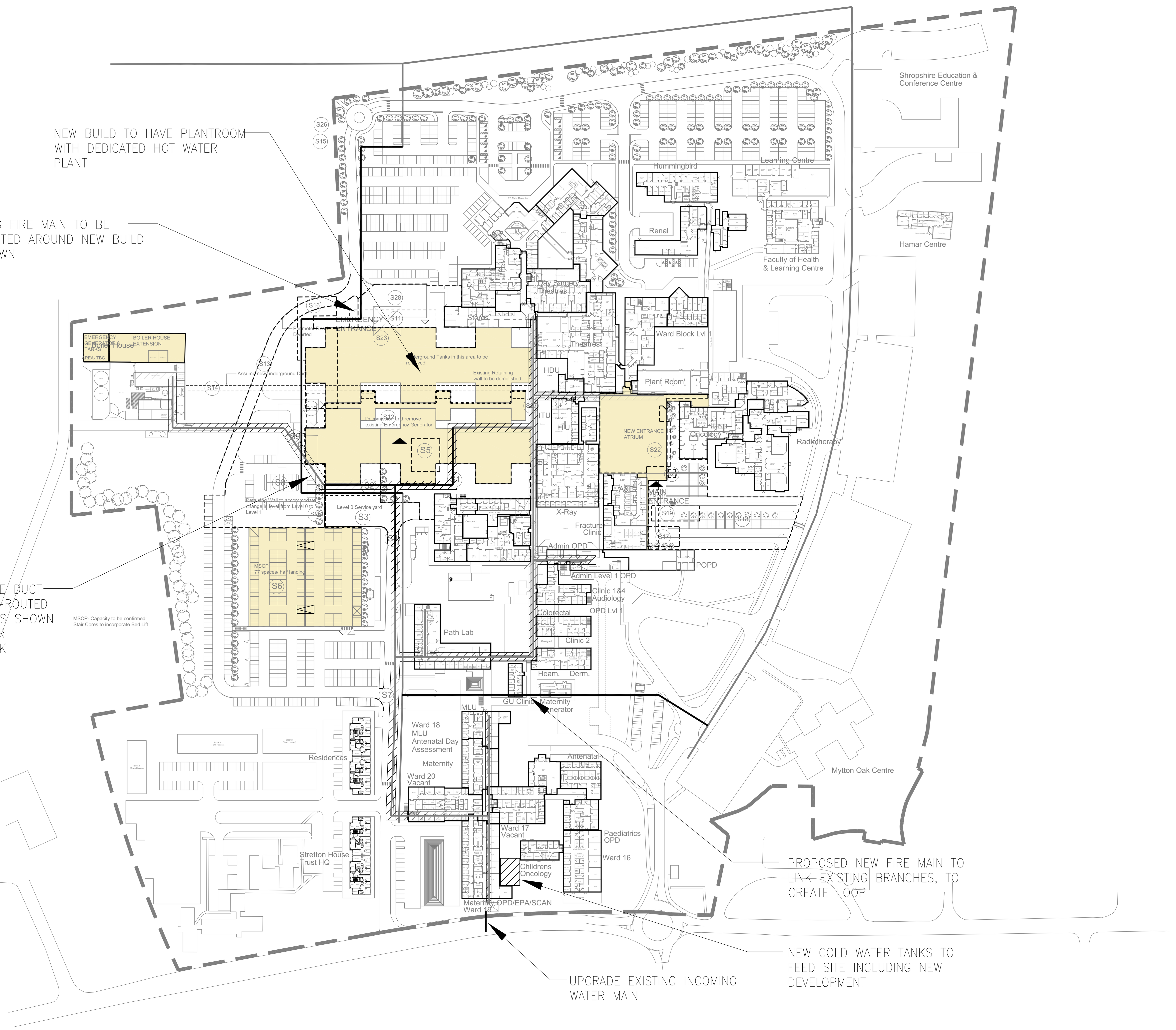

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
DOMESTIC WATER - OPTION C1
THE EMERGENCY SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

CAD File M4556-DSSR-RSH-X-DR-MEP-53002.dwg

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
DOMESTIC WATER - OPTION B
THE PLANNED CARE SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000
CAD File M4556-DSSR-RSH-X-DR-MEP-53003.dwg			

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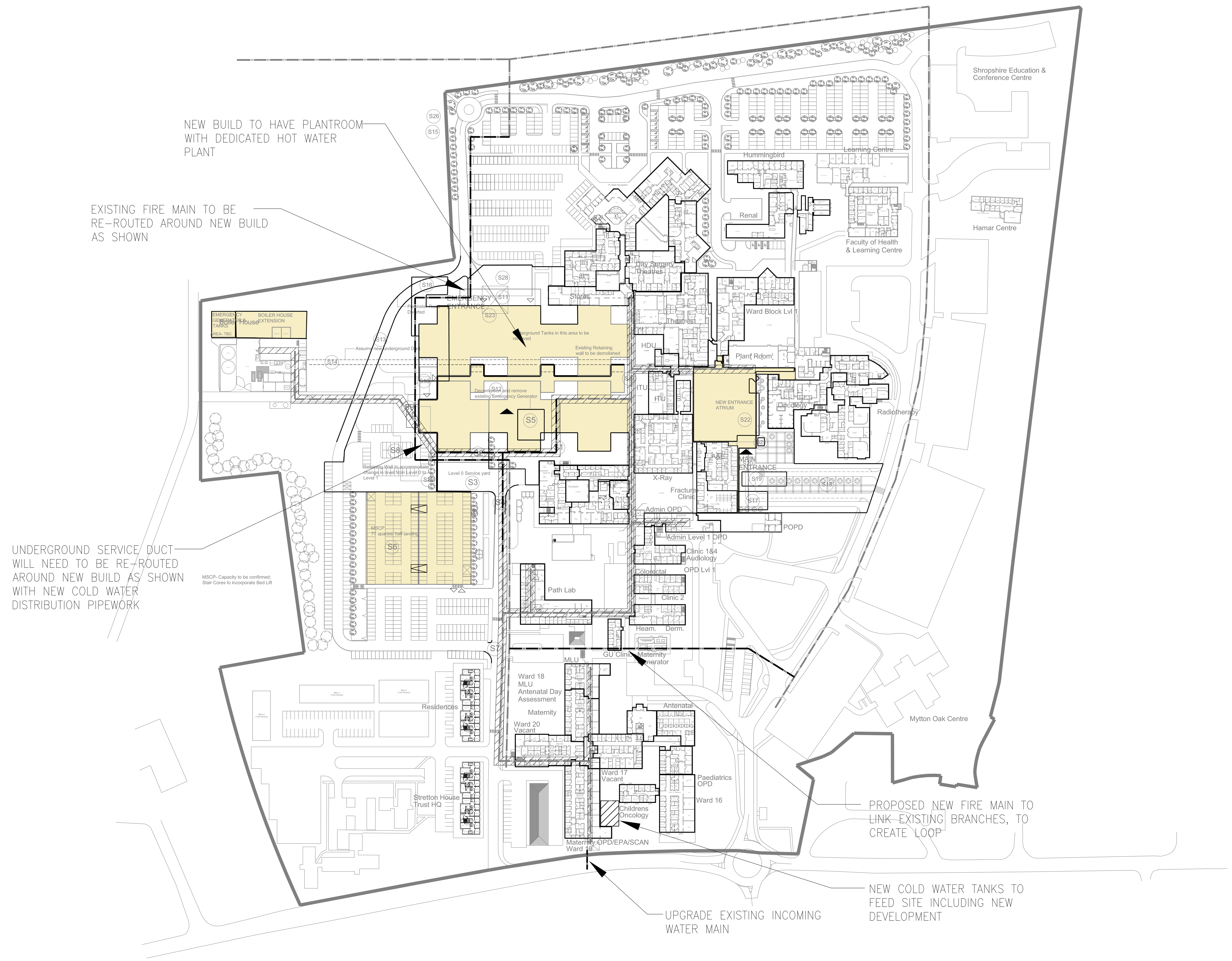

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Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
DOMESTIC WATER - OPTION C2
THE EMERGENCY SITE LAYOUT

Designed DC	Date JUN 16	Checked MS	Date JUN 16
Drawn DC	Date JUN 16	Sheet Size A0	Scale(s) 1: 1000

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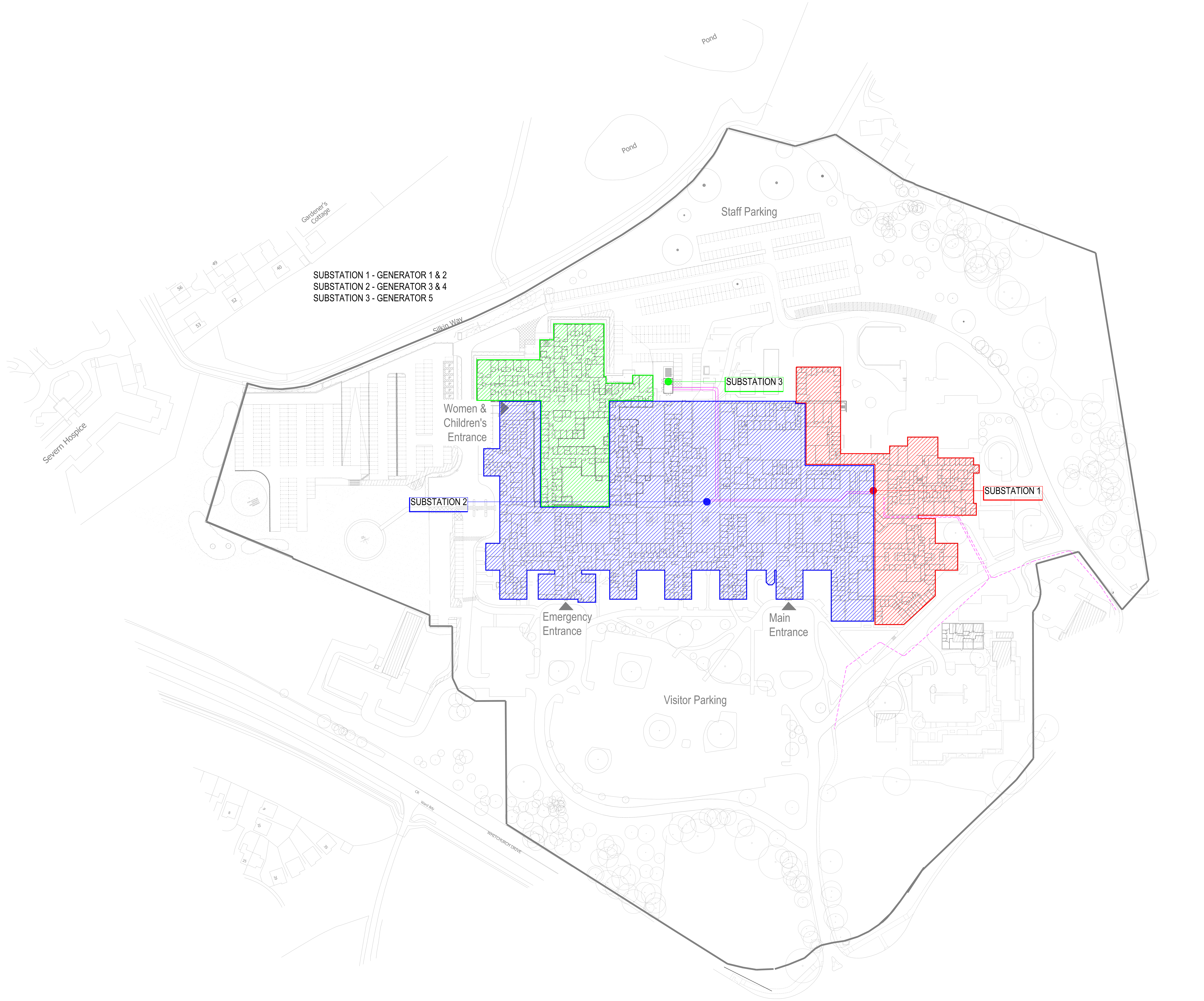

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
HV SUBSTATION & COVERAGE
LAYOUT

Designed	RM	Date	JUN 16	Checked	MS	Date	JUN 16
Drawn	RM	Date	JUN 16	Sheet Size	A0	Scale(s)	1: 750

CAD File: M4556-DSSR-PRH-X-DR-MEP-60001.dwg

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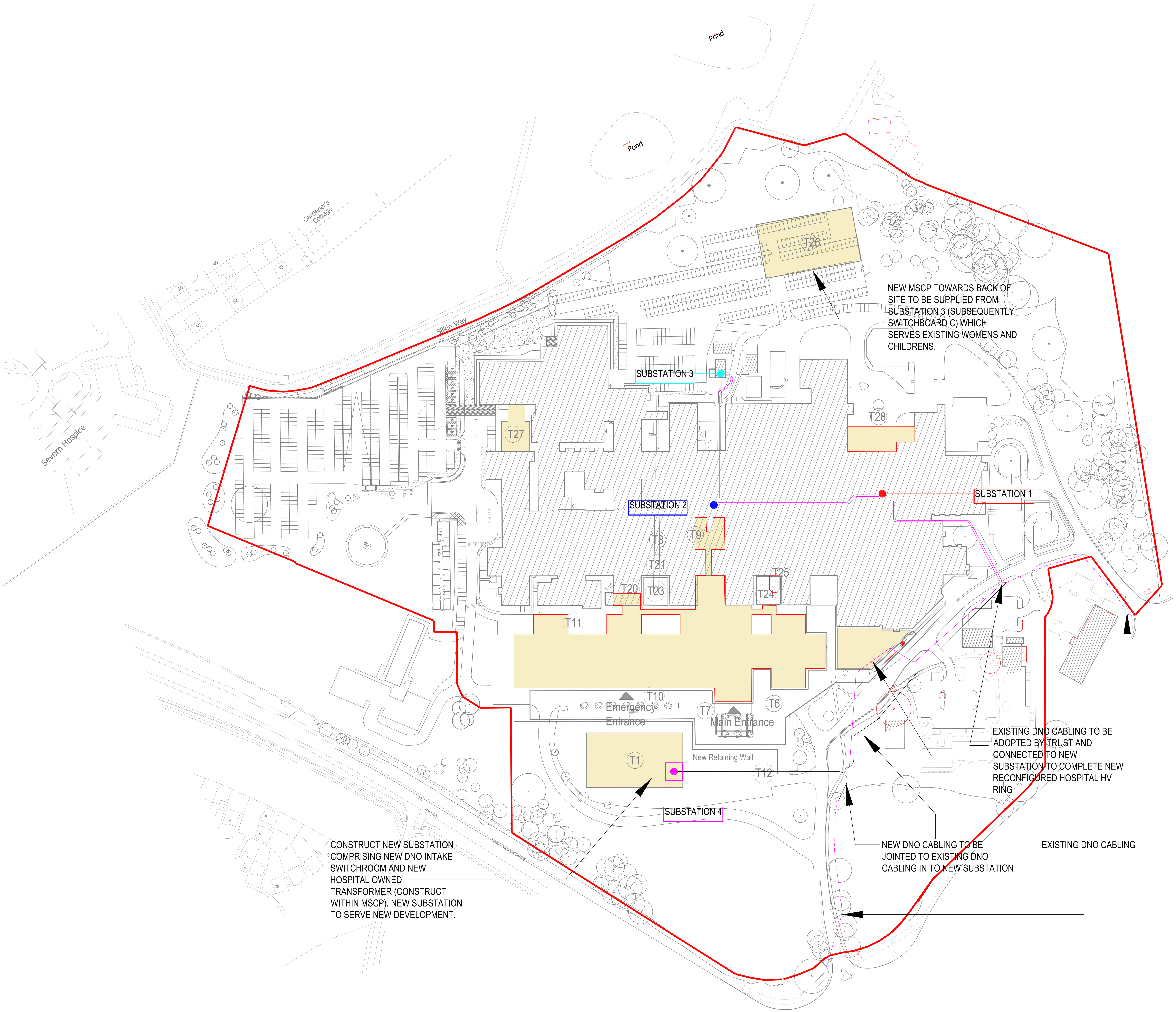

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CLIENT: The Shrewsbury and Telford Hospital NHS Trust

PROJECT: The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE: PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION B
THE EMERGENCY SITE LAYOUT

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
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RM	JUN 16	A0	1: 750

CAD File: M4556-DSSR-PRH-X-DR-MEP-60002.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-60002 REV: -

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PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION C1
THE PLANNED CARE SITE LAYOUT

Designed RM	Date JUN 16	Checked MS	Date JUN 16
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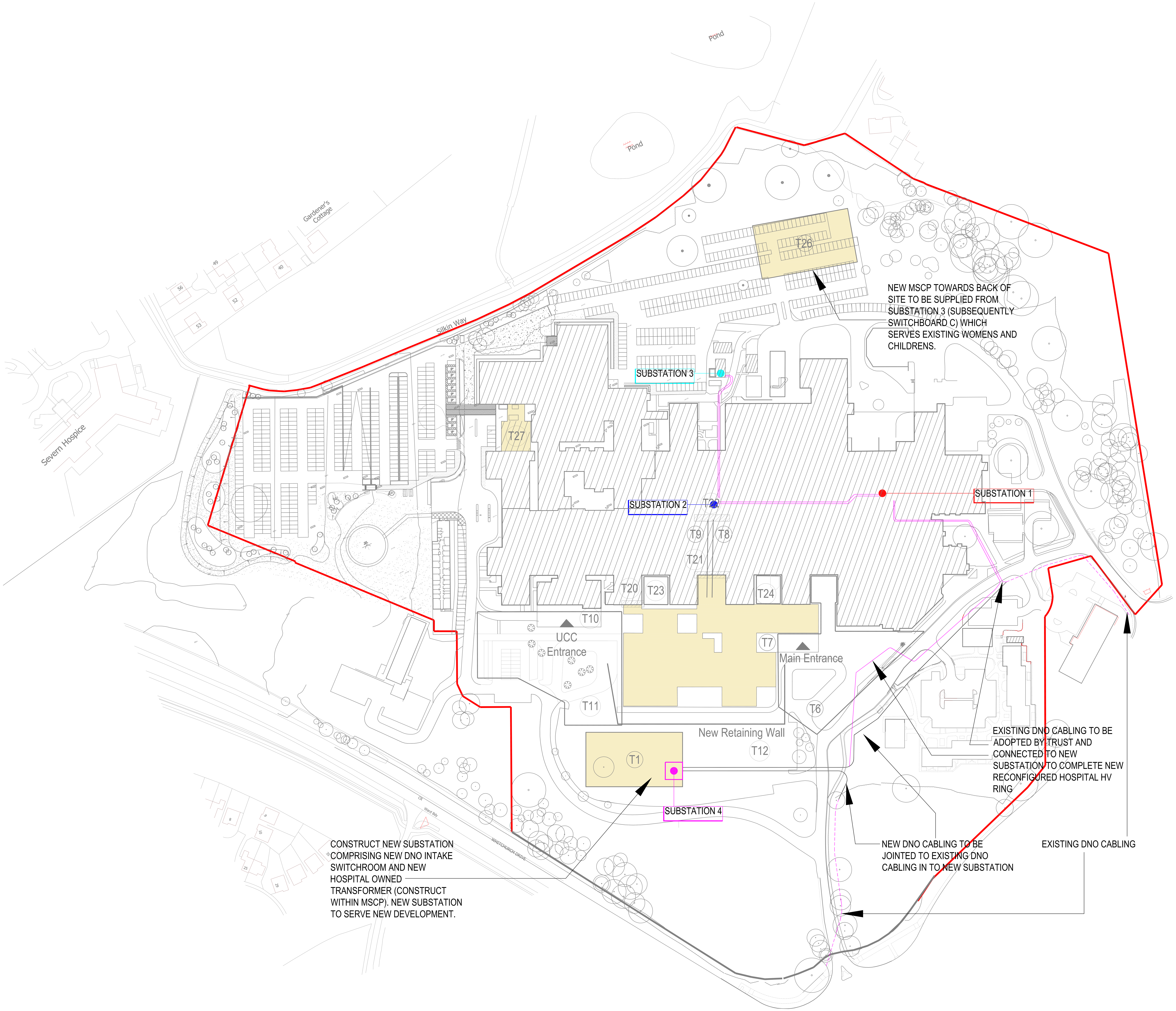

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NO SIGNIFICANT HAZARDS ASSOCIATED WITH THIS DRAWING

IT IS ASSUMED THAT A COMPETENT M&E CONTRACTOR OR USER WILL BE AWARE OF THE STANDARD FORESEEABLE RISKS ASSOCIATED WITH WORKING WITH THE TYPE OF SERVICES DETAILED WITHIN THIS DRAWING.

REV	DATE	BY	DESCRIPTION
–	–	–	–

DRAWING STATUS: ISSUED FOR OBC

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Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT: The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION C2
THE PLANNED CARE SITE LAYOUT

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
RM	JUN 16	A0	1: 750

CAD File: M4556-DSSR-PRH-X-DR-MEP-60004.dwg

DRAWING No: M4556-DSSR-PRH-X-DR-MEP-60004
REV: -

DO NOT SCALE

LEGEND

HV/LV TRANSFORMER

HV GENERATOR

CIRCUIT BREAKER

HV CABLING

3 CORE Cu/XLPE/SWA/PVC HV CABLING (# DENOTES CABLE REFERENCE)

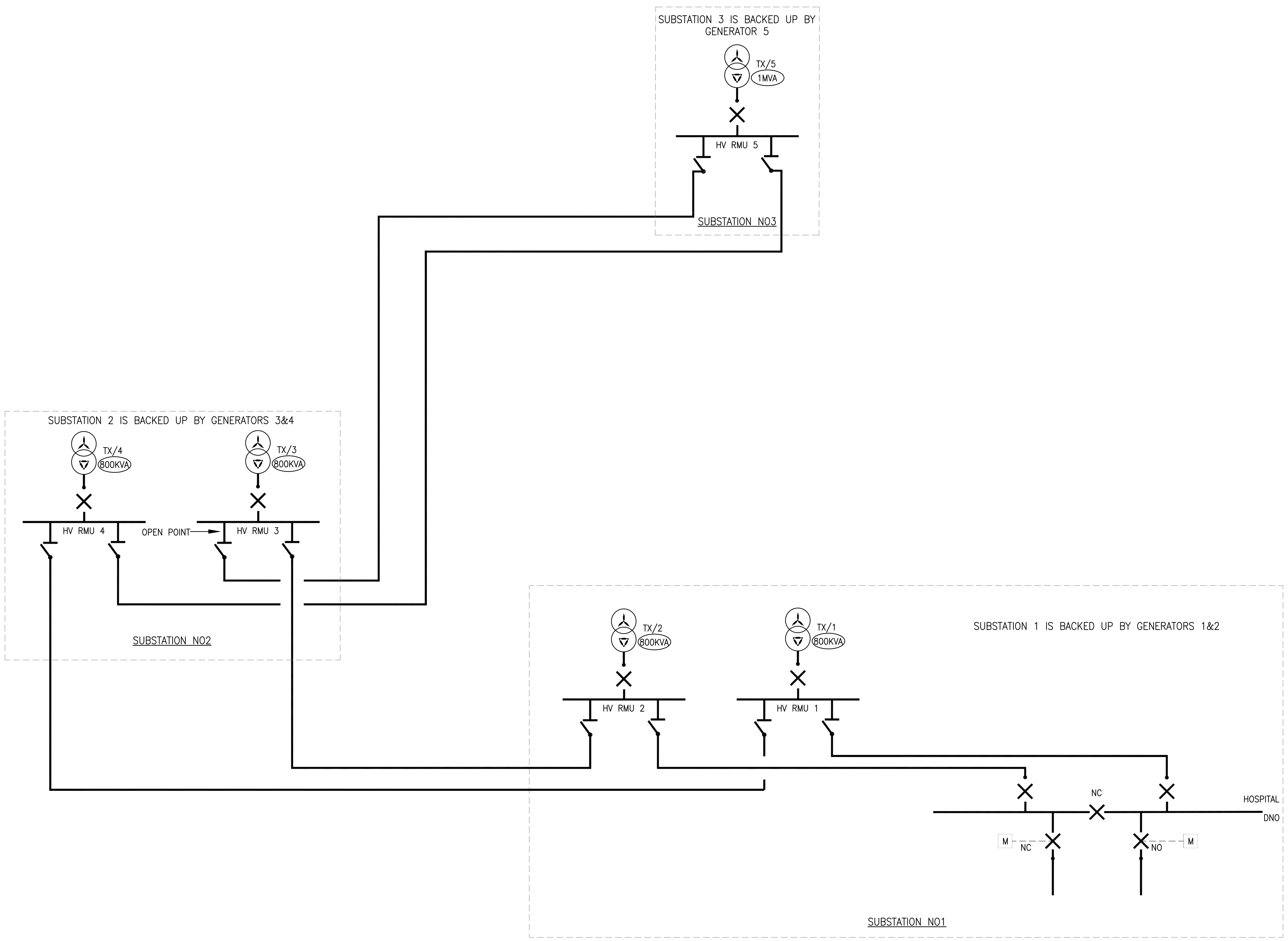
LOAD RATING

UNIT PROTECTION ZONE

VOLTAGE TRANSFORMER

NC = NORMALLY CLOSED

NO = NORMALLY OPEN



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CLIENT:
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PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
EXISTING
ELECTRICAL INFRASTRUCTURE
SCHEMATIC

Designed RM	Date JUN 16	Checked MS	Date JUN 16
Drawn RM	Date JUN 16	Sheet Size A0	Scale(s) 1: 750

CAD File M4556-DSSR-PRH-X-DX-MEP-60001.dwg

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REV: -

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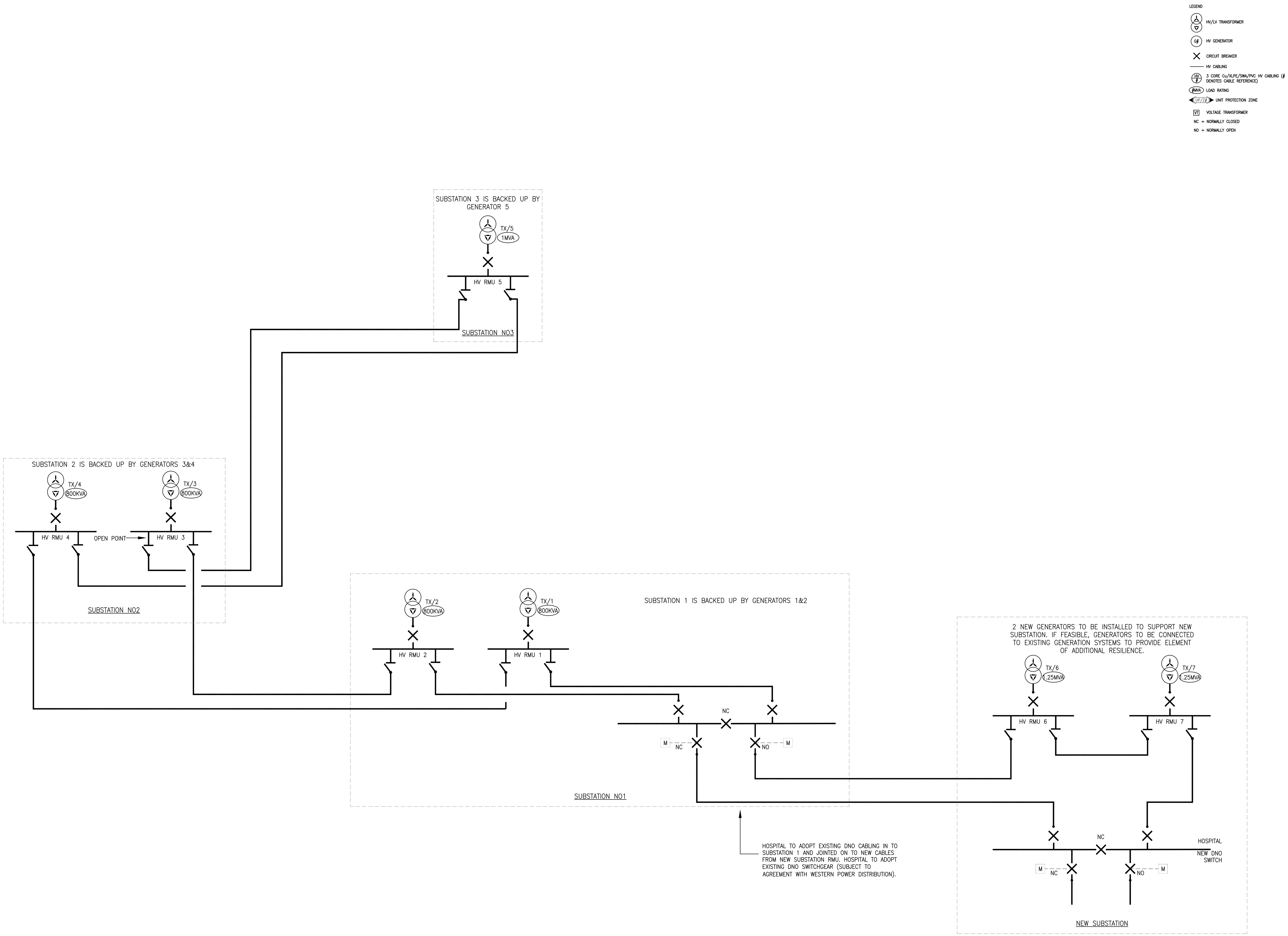

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CLIENT:
Shrewsbury and Telford Hospital NHS Trust

PROJECT:
Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION B
THE EMERGENCY SITE SCHEMATIC

Designed	RM	Date	JUN 16	Checked	MS	Date	JUN 16
Drawn	RM	Date	JUN 16	Sheet Size	A0	Scale(s)	1: 750

CAD File M4556-DSSR-PRH-X-DX-MEP-60002.dwg

DRAWING No: M4556-DSSR-PRH-X-DX-MEP-60002
REV: -

DO NOT SCALE

LEGEND

HV/LV TRANSFORMER

G# HV GENERATOR

CIRCUIT BREAKER

HV CABLING

HV # 3 CORE Cu/XLPE/SWA/PVC HV CABLING (# DENOTES CABLE REFERENCE)

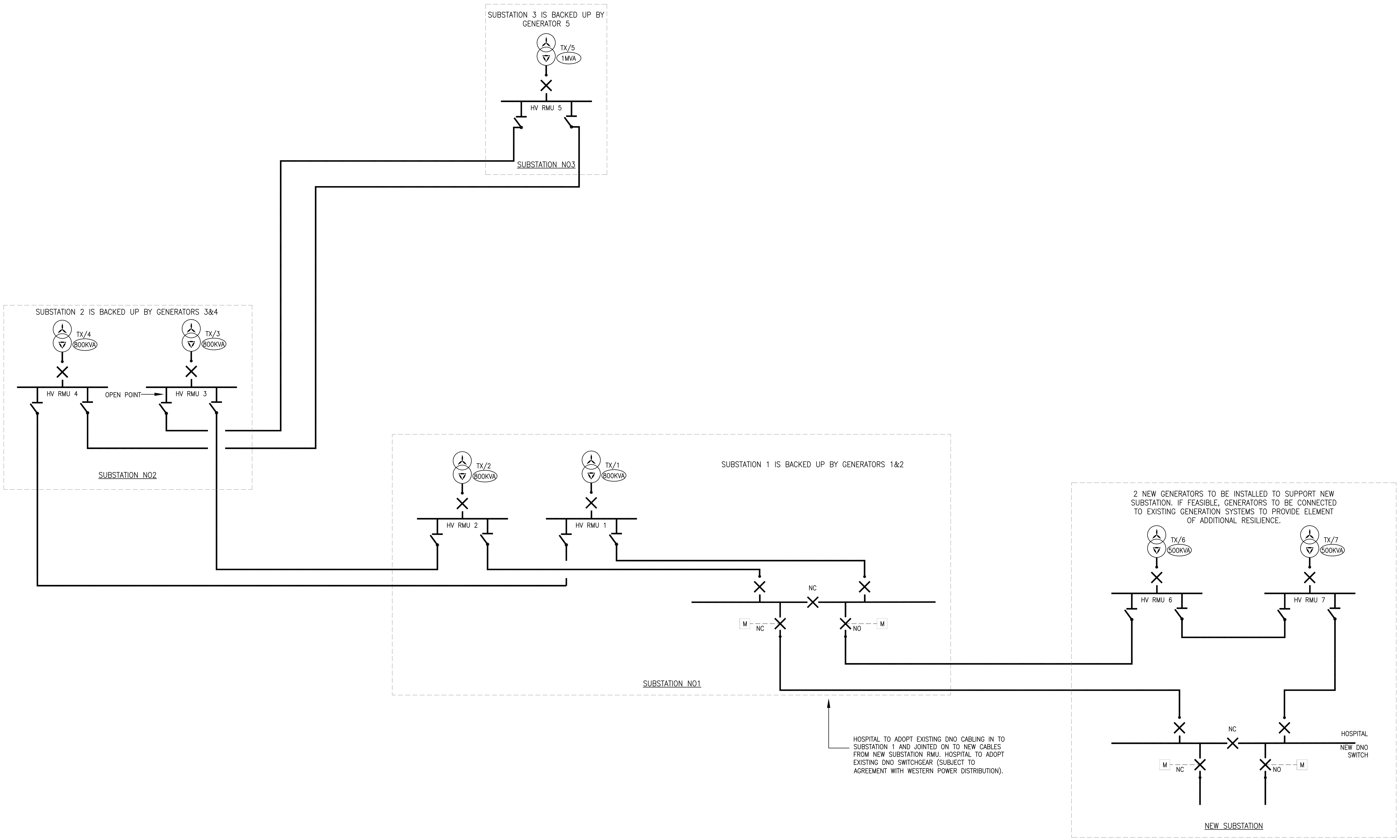
#MVA LOAD RATING

UP/Z# UNIT PROTECTION ZONE

VT VOLTAGE TRANSFORMER

NC = NORMALLY CLOSED

NO = NORMALLY OPEN



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CLIENT: The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION C1
THE PLANNED CARE SITE SCHEMATIC

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
RM	JUN 16	A0	1: 750

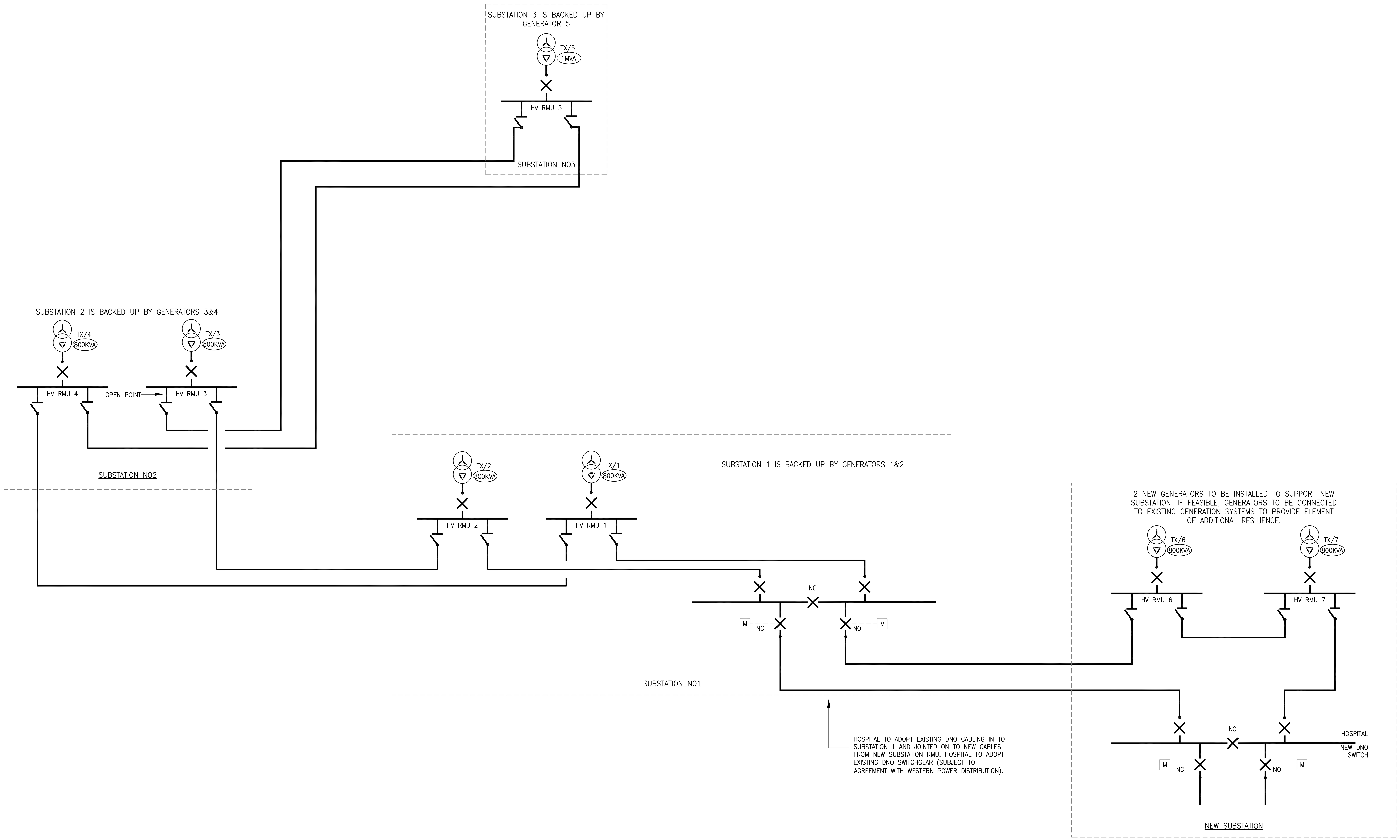
CAD File: M4556-DSSR-PRH-X-DX-MEP-60003.dwg

DRAWING No: M4556-DSSR-PRH-X-DX-MEP-60003 REV: -

DO NOT SCALE

LEGEND

HV/LV TRANSFORMER
HV GENERATOR
CIRCUIT BREAKER
HV CABLING
3 CORE Cu/XLPE/SWA/PVC HV CABLING (# DENOTES CABLE REFERENCE)
LOAD RATING
UNIT PROTECTION ZONE
VOLTAGE TRANSFORMER
NC = NORMALLY CLOSED
NO = NORMALLY OPEN



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Princess Royal Hospital
Apley Castle
Telford
TF1 6TF

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION C2
THE PLANNED CARE SITE SCHEMATIC

Designed RM	Date JUN 16	Checked MS	Date JUN 16
Drawn RM	Date JUN 16	Sheet Size A0	Scale(s) 1: 750

CAD File M4556-DSSR-PRH-X-DX-MEP-60004.dwg

DRAWING No: M4556-DSSR-PRH-X-DX-MEP-60004 REV: -

KNOWN OMISSIONS:
1. CHP SUBSTATION. LOCATION TBC

DO NOT SCALE

NOTES:
1. LOCATIONS SHOWN ARE INDICATIVE ONLY AND ARE BASED ON LIMITED EXISTING RECORD INFORMATION.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Manchester
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email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

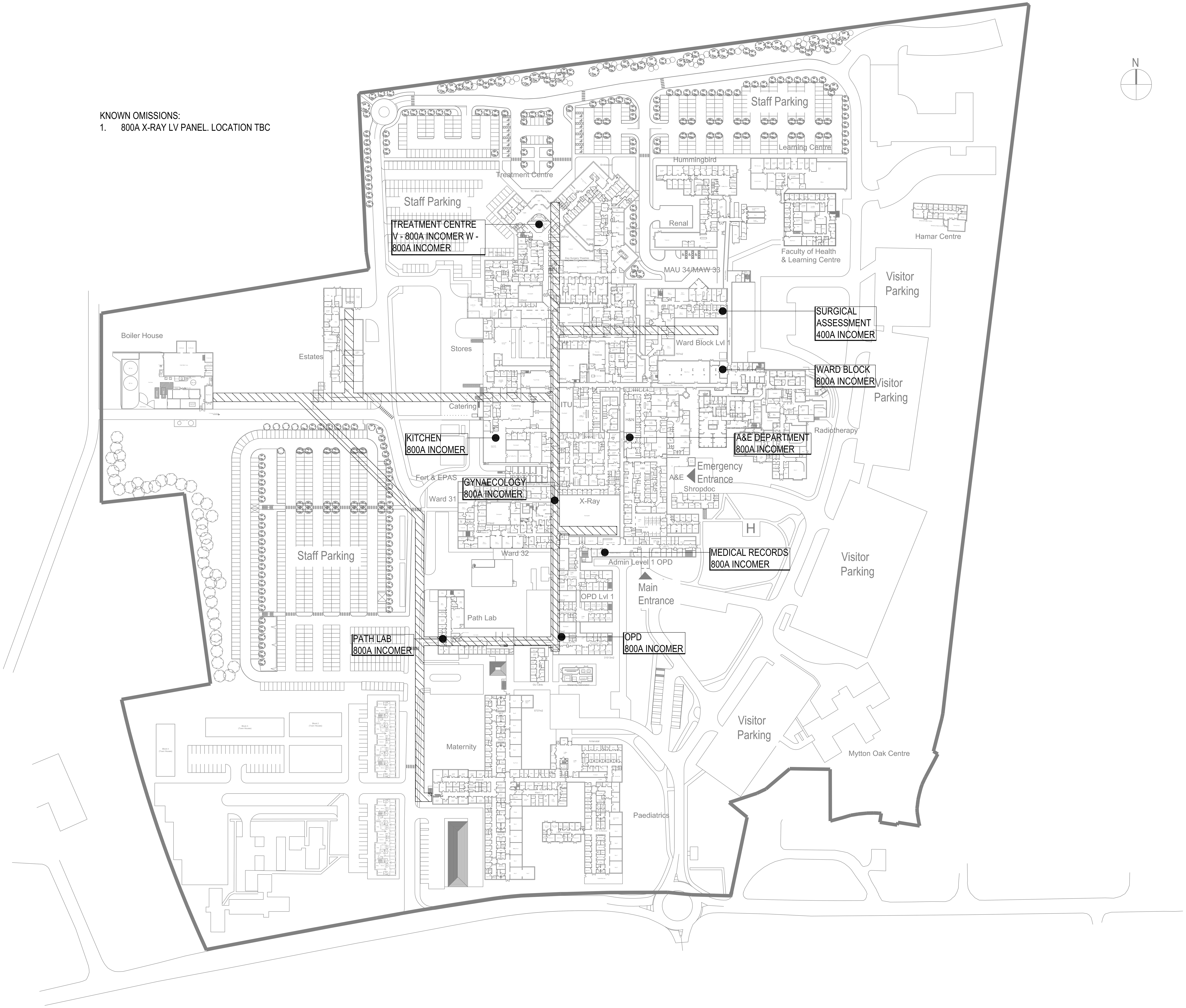
TITLE:
EXISTING
HV SUBSTATION & COVERAGE
LAYOUT

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
RM	JUN 16	A0	1: 750

CAD File: M4556-DSSR-RSH-X-DR-MEP-60001.dwg

DRAWING No: M4556-DSSR-RSH-X-DR-MEP-60001 REV: -

KNOWN OMISSIONS:
1. 800A X-RAY LV PANEL. LOCATION TBC



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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M16 0PT

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
EXISTING
MAIN LV PANELS
LAYOUT

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
Drawn	Date	Sheet Size	Scale(s)
RM	JUN 16	A0	1: 750

CAD File M4556-DSSR-RSH-X-DR-MEP-60002.dwg

DRAWING No: M4556-DSSR-RSH-X-DR-MEP-60002
REV: -

DO NOT SCALE

NOTES:
1. PROPOSALS ARE INDICATIVE ONLY.
2. PROPOSALS ARE HIGH LEVEL AND ARE SUBJECT TO VERIFICATION OF EXISTING INSTALLATIONS INCLUDING SPARE CAPACITY ANALYSIS.
3. EXTENT OF IMPLEMENTING PROPOSALS IS SUBJECT TO FURTHER REVIEW ONCE THE EXTENT OF EXISTING INSTALLATIONS ARE VERIFIED.
4. PROPOSALS CONSIDER ONLY WORKS REQUIRED TO ACCOMMODATE WORKS ASSOCIATED WITH SSP AND DO NOT GIVE CONSIDERATION AT THIS STAGE TO RECTIFYING BACK–LOG MAINTENANCE ISSUES (ALTHOUGH IT MAY TRANSPIRE THAT CARRYING OUT WORKS IN UNISON IS BENEFICIAL).

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE - OPTION B
THE PLANNED CARE SITE LAYOUT

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
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RM	JUN 16	A0	1: 750

CAD File: M4556-DSSR-RSH-X-DR-MEP-60003.dwg

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CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
ELECTRICAL LAYOUT - OPTION C1
THE EMERGENCY SITE LAYOUT

Designed RM	Date JUN 16	Checked MS	Date JUN 16
Drawn RM	Date JUN 16	Sheet Size A0	Scale(s) 1: 750

CAD File M4556-DSSR-RSH-X-DR-MEP-60004.dwg

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REV: -

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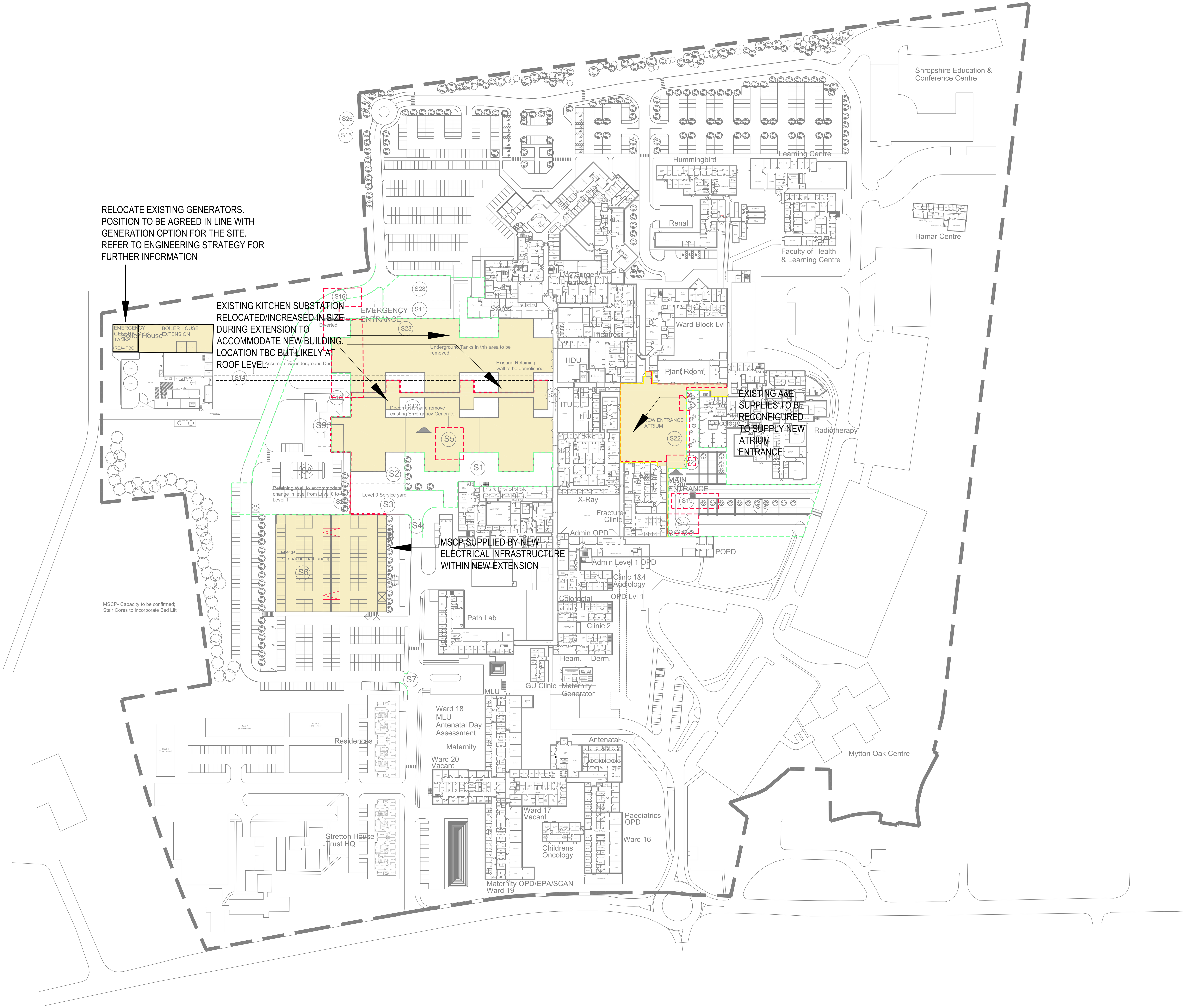

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TITLE:
PROPOSED
ELECTRICAL LAYOUT - OPTION C1
THE EMERGENCY SITE LAYOUT

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REV: -

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NOTES:
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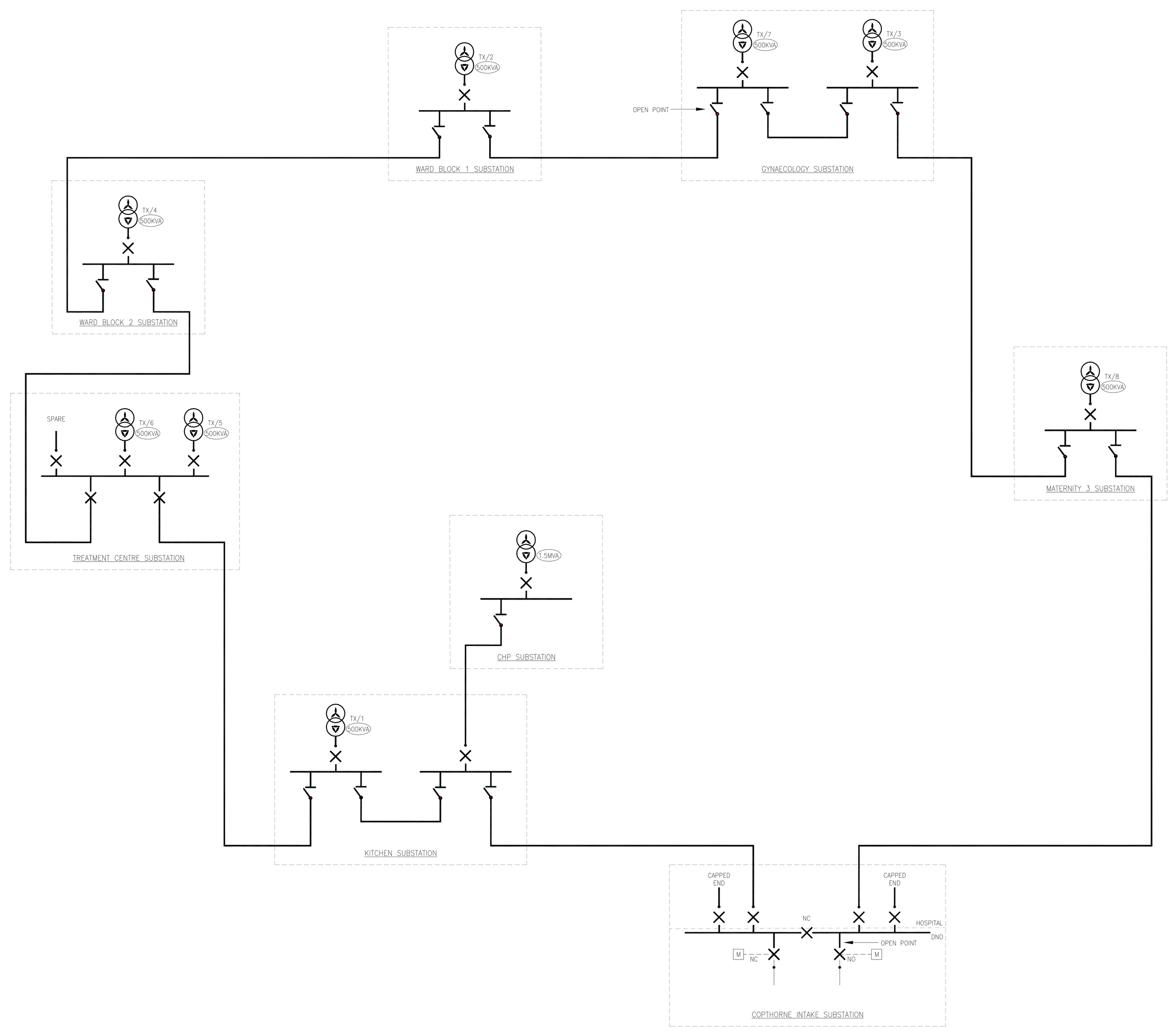
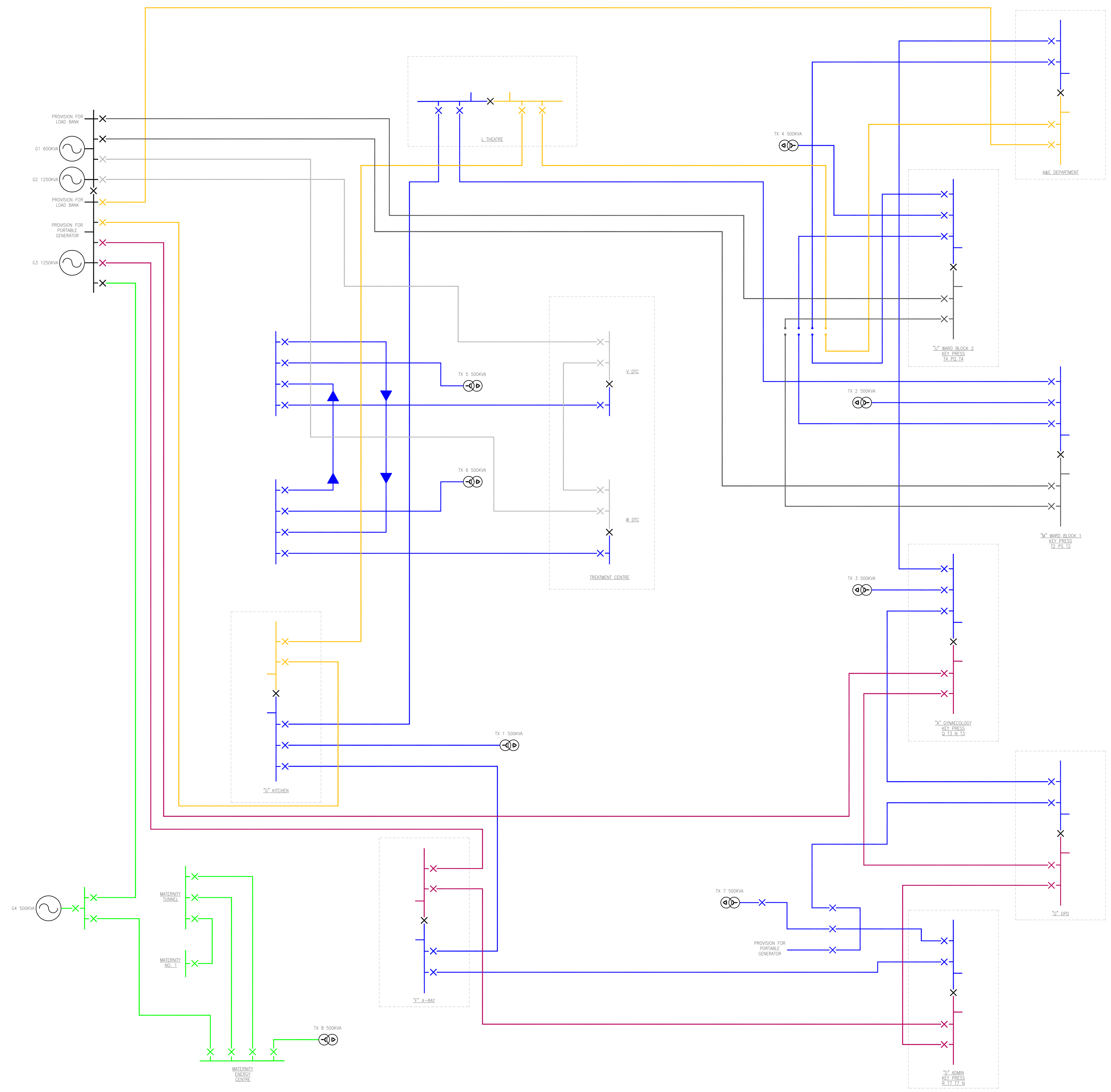
HV NETWORK



LV NETWORK (INCLUDING GENERATION)



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Shrewsbury
SY3 8XQ

TITLE:
EXISTING
ELECTRICAL INFRASTRUCTURE
SCHEMATIC

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
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DRAWING No: M4556-DSSR-RSH-X-DX-MEP-60001
REV: -

DO NOT SCALE

NOTES:
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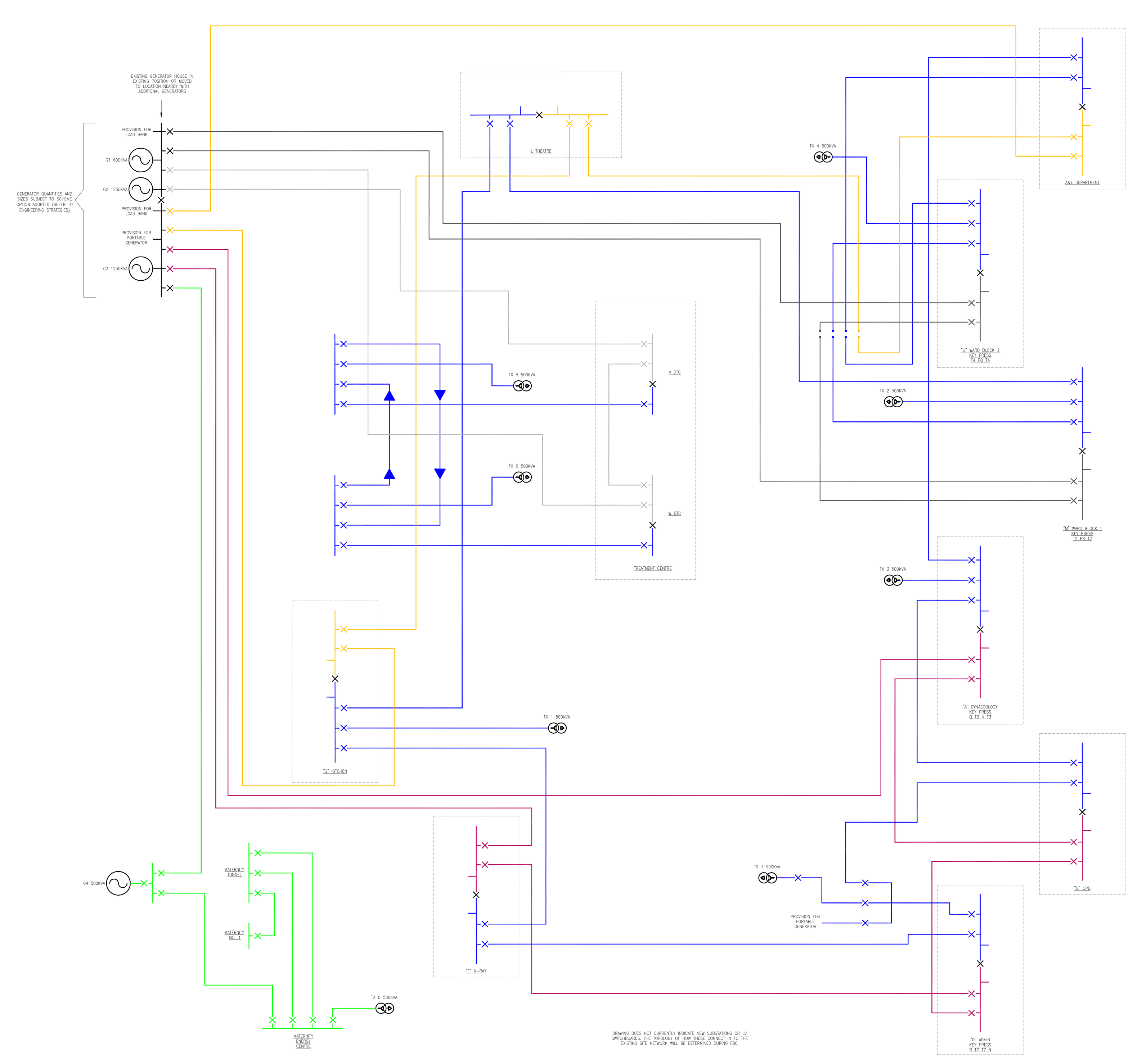
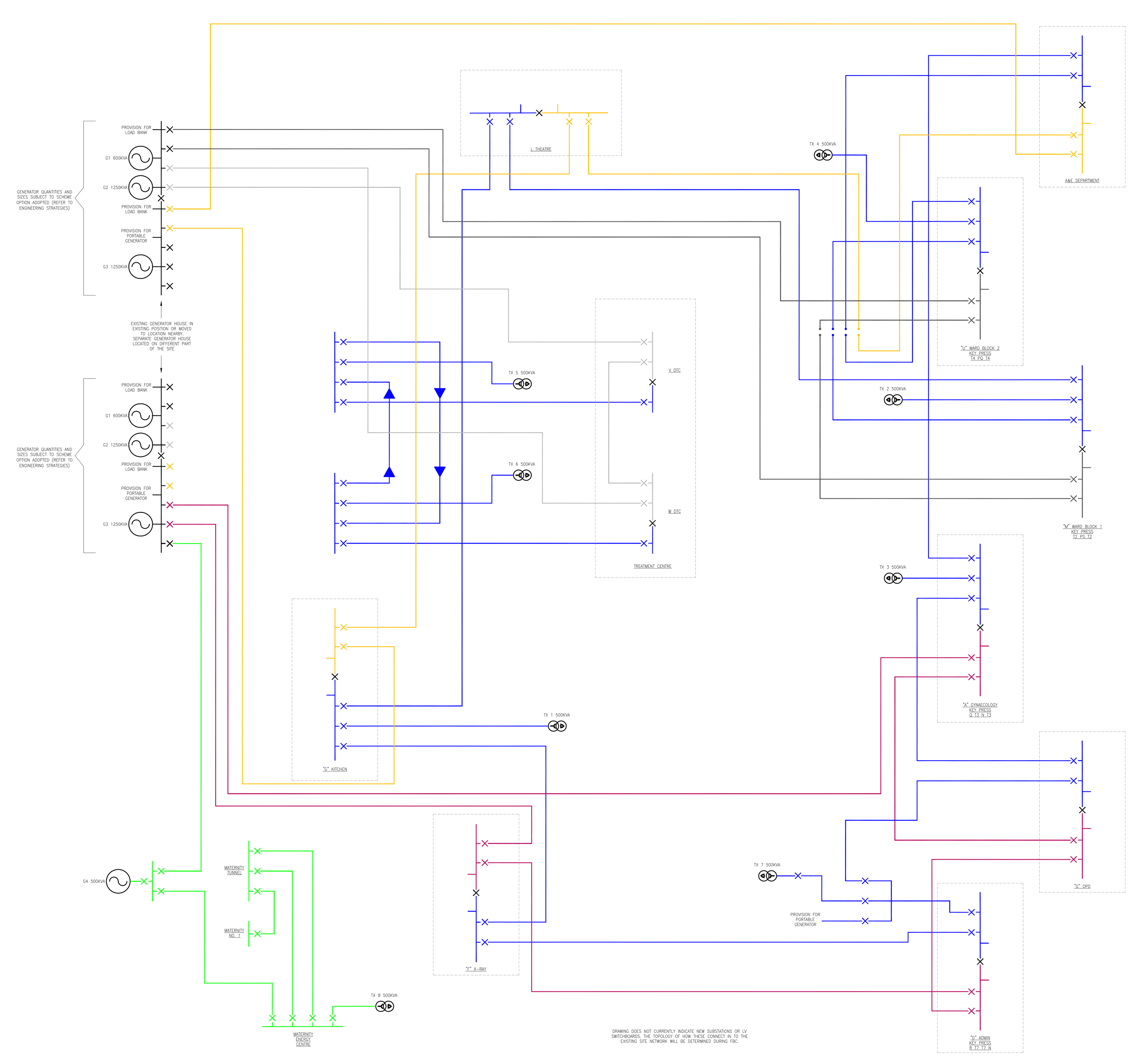
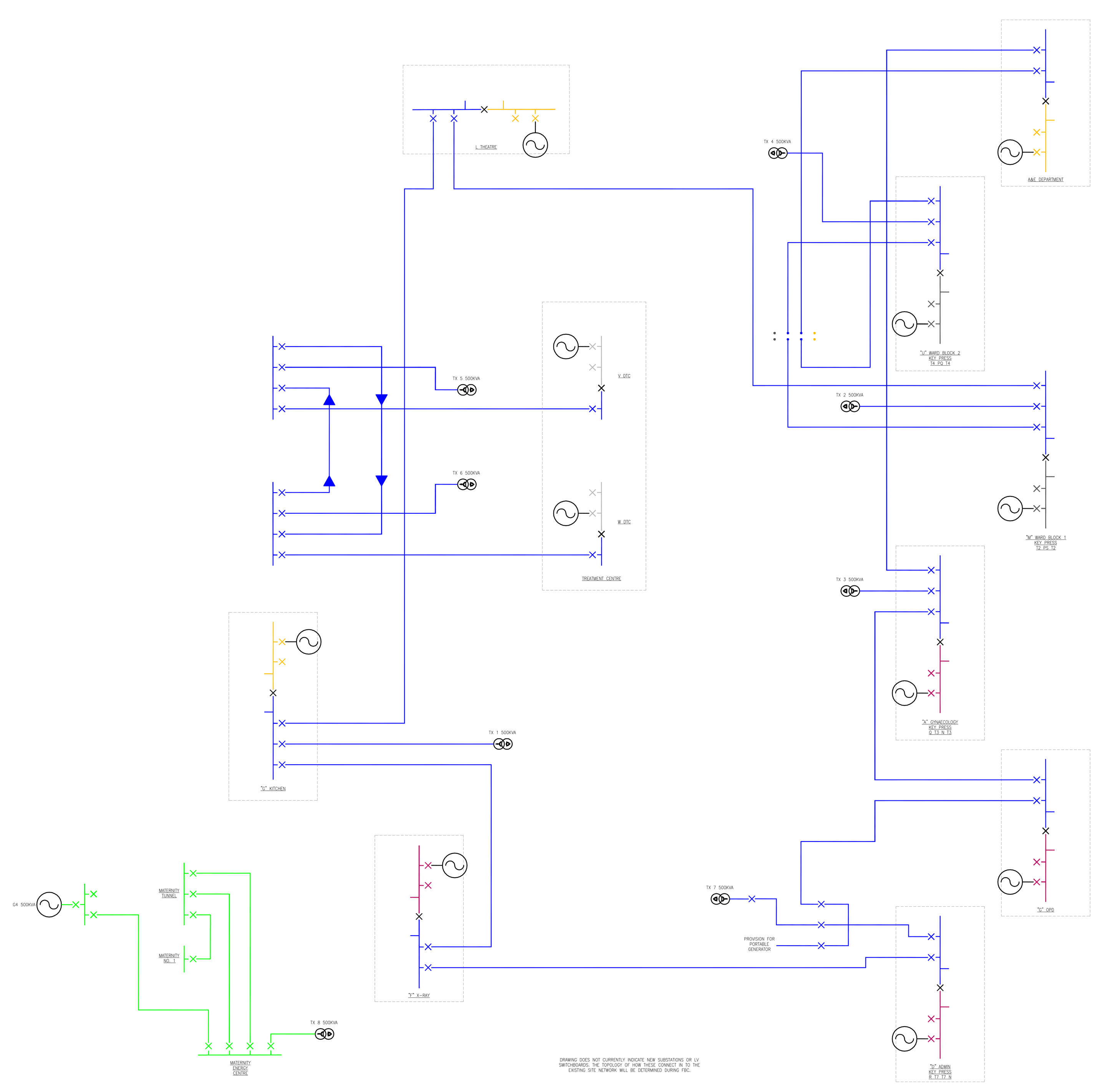
OPTIONS 1 & 2 – CENTRALISED LV GENERATION



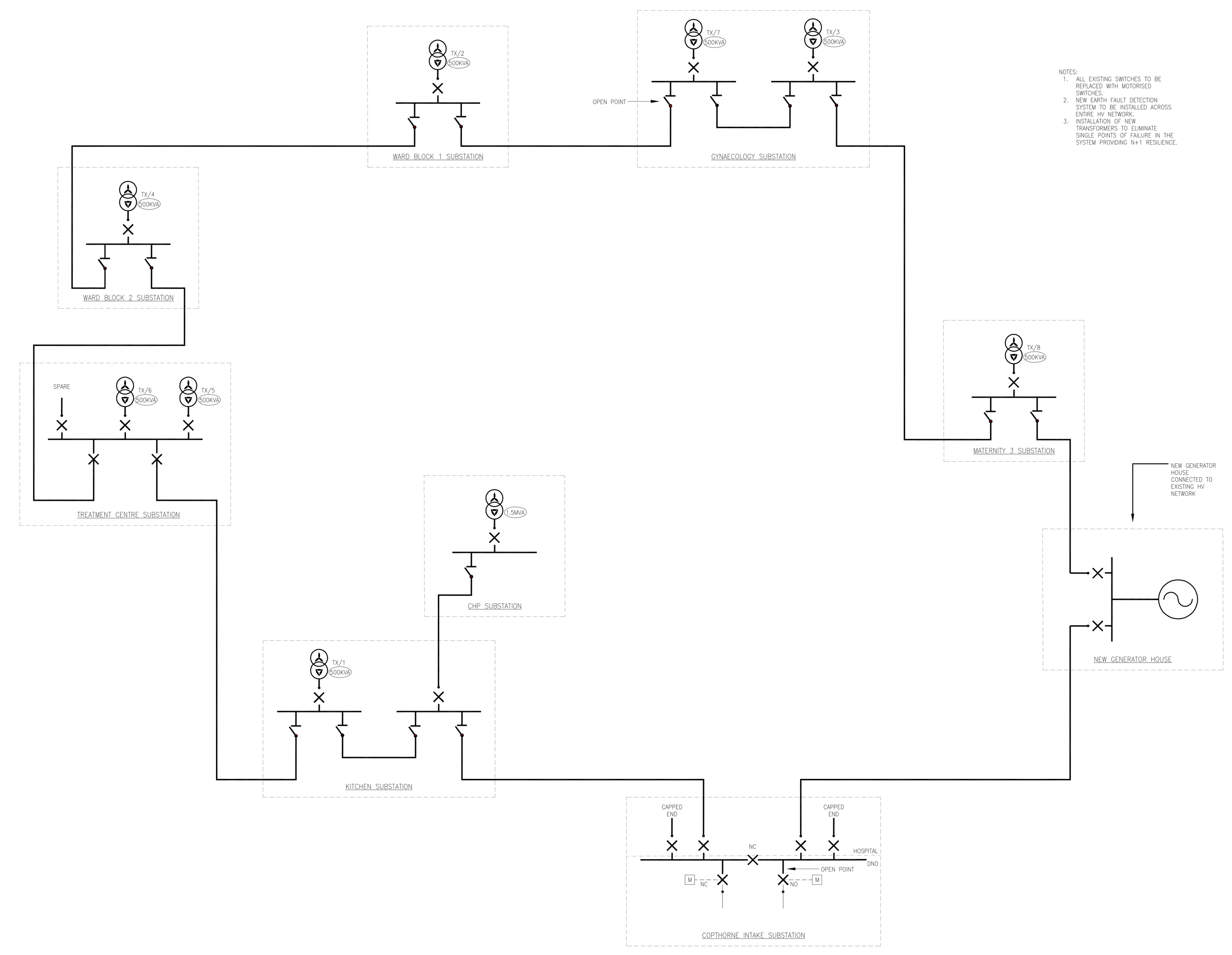
OPTION 3 – SEMI DISTRIBUTED LV GENERATION



OPTION 4 – DISTRIBUTED LV GENERATION



OPTION 5 – HV GENERATION



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ALL EFFORTS HAVE BEEN TAKEN BY DSSR TO DESIGN OUT SIGNIFICANT HAZARDS WITHIN THE DESIGN RISK ASSESSMENT PROCESS. IT IS OUR OPINION THAT THE HAZARDS DETAILED BELOW CANNOT BE DESIGNED OUT BY US GIVEN THE CONSTRAINTS OF THE BRIEF AND ARE HIGHLIGHTED SO THAT OTHER MEANS CAN BE DEVELOPED TO MITIGATE THE RESIDUAL RISKS IDENTIFIED.

NO SIGNIFICANT HAZARDS ASSOCIATED WITH THIS DRAWING

IT IS ASSUMED THAT A COMPETENT M&E CONTRACTOR OR USER WILL BE AWARE OF THE STANDARD FORESEEABLE RISKS ASSOCIATED WITH WORKING WITH THE TYPE OF SERVICES DETAILED WITHIN THIS DRAWING.

REV	DATE	BY	DESCRIPTION

DRAWING STATUS: ISSUED FOR OBC

DSSR | CONSULTING ENGINEERS
Glasgow Harrogate London Manchester

Manchester Office
Warwick House
17 Warwick Road
Manchester
M16 0PT

Tel: +44 (0)161 872 4811
Fax: +44 (0)161 872 7325
email: manchester@dssr.co.uk
www.dssr.co.uk

CLIENT:
The Shrewsbury and Telford Hospital NHS Trust

PROJECT:
The Royal Shrewsbury Hospital
Mytton Oak Road
Shrewsbury
SY3 8XQ

TITLE:
PROPOSED
ELECTRICAL INFRASTRUCTURE
ALL OPTIONS SCHEMATIC

Designed	Date	Checked	Date
RM	JUN 16	MS	JUN 16
Drawn	**Date**	**Sheet Size**	**Scale(s)**
RM	JUN 16	A0	1: 750

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DRAWING No: M4556-DSSR-RSH-X-DX-MEP-60002 REV: -

ELECTRICAL LOAD ASSESSMENT

Project Name:	SaTH SSP - Option B	Produced By:	RM
Project Ref:	M4556	Checked By:	
Revision:	- Issued for OBC	Date:	18/10/2016
Revision Comments:	OBC Stage high level load assessment. Areas in line with AHR-SCH-007_OBC Schedules for OBC Rev 07		

TOTAL NEW BUILD AREA m^2	14029	PRH Emergency Site - Option B

Service	Power Density (W/m^2)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	280580	0.8	224464
Building Services Pump	2	28058	0.8	22446.4
Lifts	6	84174	0.2	16834.8
Chiller	30	420870	0.9	378783
Small Power	15	210435	0.55	115739.25
IT	4	56116	0.8	44892.8
Medical Equipment	10	140290	0.45	63130.5
General Lighting	12	168348	0.55	92591.4
Task Lighting	1.5	21043.5	0.48	10100.88
Medical Lighting	0.5	7014.5	0.48	3366.96

Diversified W/m^2
69.31

TOTAL (W)	=	972350
TOTAL (kW)	=	972
TOTAL (kVA) @ 0.95	=	924
Growth Factor @ 25%	=	1155

ELECTRICAL LOAD ASSESSMENT

Project Name:	SaTH SSP - Option B	Produced By:	RM
Project Ref:	M4556	Checked By:	
Revision:	- Issued for OBC	Date:	18/10/2016
Revision Comments:	OBC Stage high level load assessment. Areas in line with AHR-SCH-007_OBC Schedules for OBC Rev 07		

TOTAL NEW BUILD AREA m^2	6130	RSH Planned Care Site - Option B

Service	Power Density (W/m^2)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	122600	0.8	98080
Building Services Pump	2	12260	0.8	9808
Lifts	6	36780	0.2	7356
Chiller	30	183900	0.9	165510
Small Power	15	91950	0.55	50572.5
IT	4	24520	0.8	19616
Medical Equipment	10	61300	0.45	27585
General Lighting	12	73560	0.55	40458
Task Lighting	1.5	9195	0.48	4413.6
Medical Lighting	0.5	3065	0.48	1471.2

Diversified W/m^2
69.31

TOTAL (W)	=	424870
TOTAL (kW)	=	425
TOTAL (kVA) @ 0.95	=	404
Growth Factor @ 25%	=	505

ELECTRICAL LOAD ASSESSMENT

Project Name:	SaTH SSP - Option C1	Produced By:	RM
Project Ref:	M4556	Checked By:	
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TOTAL NEW BUILD AREA m^2	4050	PRH Planned Care Site - Option C1

Service	Power Density (W/m^2)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	81000	0.8	64800
Building Services Pump	2	8100	0.8	6480
Lifts	6	24300	0.2	4860
Chiller	30	121500	0.9	109350
Small Power	15	60750	0.55	33412.5
IT	4	16200	0.8	12960
Medical Equipment	10	40500	0.45	18225
General Lighting	12	48600	0.55	26730
Task Lighting	1.5	6075	0.48	2916
Medical Lighting	0.5	2025	0.48	972

Diversified W/m^2
69.31

TOTAL (W)	=	280706
TOTAL (kW)	=	281
TOTAL (kVA) @ 0.95	=	267
Growth Factor @ 25%	=	333

ELECTRICAL LOAD ASSESSMENT

Project Name:	SaTH SSP - Option C1	Produced By:	RM
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TOTAL NEW BUILD AREA m^2	24283	RSH Emergency Site - Option C1

Service	Power Density (W/m^2)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	485660	0.8	388528
Building Services Pump	2	48566	0.8	38852.8
Lifts	6	145698	0.2	29139.6
Chiller	30	728490	0.9	655641
Small Power	15	364245	0.55	200334.75
IT	4	97132	0.8	77705.6
Medical Equipment	10	242830	0.45	109273.5
General Lighting	12	291396	0.55	160267.8
Task Lighting	1.5	36424.5	0.48	17483.76
Medical Lighting	0.5	12141.5	0.48	5827.92

Diversified W/m^2
69.31

TOTAL (W)	=	1683055
TOTAL (kW)	=	1683
TOTAL (kVA) @ 0.95	=	1599
Growth Factor @ 25%	=	1999

ELECTRICAL LOAD ASSESSMENT

Project Name: SaTH SSP - Option C2
Project Ref: M4556
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Produced By: RM
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TOTAL NEW BUILD AREA m^2	8090	PRH Planned Care Site - Option C2

Service	Power Density (W/m²)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	161800	0.8	129440
Building Services Pump	2	16180	0.8	12944
Lifts	6	48540	0.2	9708
Chiller	30	242700	0.9	218430
Small Power	15	121350	0.55	66742.5
IT	4	32360	0.8	25888
Medical Equipment	10	80900	0.45	36405
General Lighting	12	97080	0.55	53394
Task Lighting	1.5	12135	0.48	5824.8
Medical Lighting	0.5	4045	0.48	1941.6

Diversified W/m²
69.31

TOTAL (W)	=	560718
TOTAL (kW)	=	561
TOTAL (kVA) @ 0.95	=	533
Growth Factor @ 25%	=	666

ELECTRICAL LOAD ASSESSMENT

Project Name: SaTH SSP - Option C2
Project Ref: M4556
Revision: - Issued for OBC
Revision Comments: OBC Stage high level load assessment. Areas in line with AHR-SCH-007_OBC Schedules for OBC Rev 07

Produced By: RM
Checked By:
Date: 18/10/2016

TOTAL NEW BUILD AREA m^2	16259	RSH Emergency Site - Option C2

Service	Power Density (W/m^2)	Power (W)	Diversity	Total Power (W)
AHU Fans	20	325180	0.8	260144
Building Services Pump	2	32518	0.8	26014.4
Lifts	6	97554	0.2	19510.8
Chiller	30	487770	0.9	438993
Small Power	15	243885	0.55	134136.75
IT	4	65036	0.8	52028.8
Medical Equipment	10	162590	0.45	73165.5
General Lighting	12	195108	0.55	107309.4
Task Lighting	1.5	24388.5	0.48	11706.48
Medical Lighting	0.5	8129.5	0.48	3902.16

Diversified W/m^2
69.31

TOTAL (W)	=	1126911
TOTAL (kW)	=	1127
TOTAL (kVA) @ 0.95	=	1071
Growth Factor @ 25%	=	1338

DSSR | CONSULTING ENGINEERS

Project

THE SHREWSBURY AND TELFORD HOSPITAL NHS TRUST

SaTH SSP

ENGINEERING STRATEGY REPORT – OPTION B

OBC STAGE

DOC REF: M4556-DSSR-X-X-RP-MEP-90001

SEPTEMBER 2016

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Authored by:

name: Ross Monks/David Carpenter
role: Electrical Engineer/Mechanical Engineer
signed:

date: 25-10-16

Reviewed by:

name: Steve Greatrex
role: Executive Engineer
signed:

date: 25-10-16

Authorised for Issue by:

name: Mike Singleton/John Hatton
role: Partner/Regional Partner
signed:

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The signed original of this page is retained by the issuing team.

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-	25/10/16	Issued for OBC	

1. CONTENTS

2. INTRODUCTION

The SaTH NHS Trust are developing an Outline Business Case (OBC) for developments across both of their main sites (Royal Shrewsbury Hospital and Princess Royal Hospital). For the OBC several options are being considered and detailed descriptions of the options can be found within the other OBC reports produced by AHR. Generally the options relate to which site shall be the Emergency Site and which shall be the Planned Care Site.

DSSR have been commissioned to develop strategies to implement/accommodate the necessary changes to engineering services across both Royal Shrewsbury Hospital (RSH) and Princess Royal Hospital (PRH) for each of the proposed options (B, C1 & C2).

This report details the engineering services strategy for option B. The broadly involves PRH becoming the Emergency site and RSH the Planned Care site.

3. PRH EMERGENCY SITE

3.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas/oil fired steam boiler plant located within an integral boiler room adjacent to Receipt & Distribution. There is also a CHP plant where the waste heat is supplied to nearby areas of the hospital as LTHW. It must be noted that the existing boilers are on contract with MCL until Jan 2017. There is a desire within the Estates department to de-steam the site when contract expires. Conversion to LTHW/MTHW will be undertaken as part of this scheme.

Connecting new build to existing boilers would not achieve the required BREEAM rating and an additional renewable energy contribution will be required. This is likely to be additional CHP capacity but other options will be considered as a part of the sustainability review.

An additional boiler is required to satisfy the anticipated load of the new development, including reconfiguration of boiler house to accommodate the new plant. An additional CHP unit matched to base load of the new building is anticipated to satisfy the energy and carbon emissions targets. The capacity of the CHP and alternative energy sources will be assessed as part of the sustainability review.

The additional load will be offset by a combination of the boiler and CHP capacity. The provision of future boiler plant and CHP may be an extension of the existing contract, or a new energy supply contract. It is assumed that boiler plant upgrades as a result of aging plant is included in backlog maintenance budget but will be included in the overall SSP reconfiguration of the energy centre.

3.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the hospital street at plantroom level. As a part of the de steaming strategy distribution mains will be replaced by MTHW or LTHW mains. It is understood that the majority of plant on site is already fed by LTHW, so very little plant modifications would be needed.

3.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.

It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.

It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.

Consideration will be given to absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions.

It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog budget.

3.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main connected initially to bulk storage tanks located externally at ground level. Present storage includes 4 No. raw water tanks with an additional 2 No. treated water storage tanks.

Annual water consumption is 81,400 m^3/year which relates to a daily consumption of 223m^3/day. Assuming a typical 2/3 cold to 1/3 hot this equates to 148 m3/day cold and 74 m3/day hot water usage.

An additional 2 No. raw water tanks are installed adjacent to the Women's and Children's block, including dedicated booster pumps to serve that building. Assuming a requirement of ½ day storage this equates to a total stored volume of 111m^3

From the external central water storage tank cold water is pumped directly to departmental areas without further high level storage within the building.

New water tanks, complete with booster pumps, will be installed local to the new build with a separate supply from the incoming mains.

3.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within high level plantrooms. Existing calorifier installations do not have spare capacity included to serve extended development so it is proposed to provide new hot water generation within the new development.

A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation. Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity. All units will be live during normal operation.

A conventional hot water return circulation system will be included to maintain system temperatures. The return circulation will be dedicated to the new development only and not interconnected to existing systems. MTHW/LTHW will be used as the primary heat source for the domestic hot water generation.

3.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development.

3.7. NATURAL GAS

The existing gas meter house is adjacent to the new Women and Children's Facility. It is noted that the gas meter is currently at full capacity and the incoming supply will need upgrading to serve the new build. Further investigations are needed to establish the capacity of the distribution pipework.
There is an existing gas pipe running under the footprint of the proposed new build, across the front of the hospital, but this is understood to be redundant.

3.8. MEDICAL GASES

3.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the substation at the back of the hospital.
From the external VIE, oxygen is distributed to departmental areas via a single main along the hospital street.
The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

3.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

3.8.3. Nitrous oxide/Oxygen Mixture

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

3.8.4. Medical and surgical air

It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building). The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development

3.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

3.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

3.9. PNEUMATIC TUBE

The existing pneumatic tube system is a 160 diameter system which is considered unsuitable for extension to the new development however the system must be consistent across the site to be of benefit.

It is proposed therefore to replace existing 160 mm with 110 mm system (It must be noted that the replacement of the 160 tube with a 110 tube is not as a result of the new development or a backlog issue but must be included to ensure consistency across the site whilst avoiding installing an inappropriate system in the new development).

3.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 3300kVA to accommodate the new development.

The existing import supply agreement with the DNO (Western Power Distribution) for the site is 2080kVA and the site uses an average of 1435kVA (according to the DNO). The existing DNO 11kV network has very little spare capacity and the additional capacity is likely to result in a requirement to carry out upstream network reinforcement works.

Initial load assessments for PRH as the emergency site indicate additional load requirements as a result of the new development to be 1.155MVA including 25% growth factor, this is a substantial increase and as a result indicative costs are included for allowing the DNO to carry out this work.

Whilst the existing sub-stations have some spare capacity (albeit limited) it is proposed to install an additional sub-station dedicated to new development including duty/standby transformers, each rated at 1.25MVA to operate as N+1.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02. It also intended to locate the new HV intake switchgear within the new substation, providing the DNO with access to their switchgear without having to enter hospital premises (although some way-leave arrangements will still likely be required). These works will require diversion of DNO HV cabling, and the Trust will need to adopt the HV cabling currently owned by the DNO which supplies substation 1.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

3.11. EMERGENCY STANDBY GENERATION

Generators presently only support essential supplies and whilst it is considered desirable to upgrade to supply N+1 it is outside the scope of the SSP scheme.

It is proposed to install an additional 2 No. generators each rated at 1.25MVA to provide 100% support at N+1 to the new development. It is proposed to locate the generators alongside the existing generator plant and interconnect the distribution to provide enhanced resilience. Careful consideration will be given to cabling routes and configurations from this area as the current generators are located on the opposite side of the site to the proposed new development. It may transpire that new generators need to be located adjacent the new substation.

The existing oil storage capacity will be increased to include new generators.

It is assumed that any enhancements to existing generator provision will be covered by the backlog budget although no remedial works have at present been identified.

3.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

3.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.

It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

Cabling modifications and additions will be required to link the new developments fire alarm system to the site existing system.

3.14. SECURITY

It is proposed to include card access system within the new development.

It is proposed to include intruder alarms to ground floor day only areas.

It is proposed to include CCTV to internal circulation areas and external access, building perimeter and car park areas.

It is proposed to include a staff attack system to ED areas.

3.15. BMS & AUTOMATIC CONTROLS

The existing BMS is a Trend system, therefore the new BMS must be Trend and be integrated with existing.

A new BMS would be included in the new development and included in the plant costs. The installation will include an upgrade to the system front end & graphics. Plant rooms will each include BMS display panel.

3.16. IT/DATA SYSTEM

IT/Data networks within departmental areas will be covered by the departmental allowances.

New hub rooms with active equipment will be required in each of the departmental areas. Cabling and data outlets will be included in the scheme however all active equipment will be provided by the Trust IT specialist.

Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust’s existing IT strategy.

4. RSH PLANNED CARE SITE

4.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas fired steam boiler plant located within existing energy centre at the edge of the site behind the Estates department. The site is currently served by 2 N0. 5000 kW gas/oil fired boilers and 1No. 1030 kWe CHP/waste heat boiler. MTHW is taken from the CHP to heat DHWS calorifiers. This is backed up by steam and waste heat from the boiler flues. This MTHW feeds the Kitchen plantroom and the Ward Block plantroom, with the rest of the site being fed by steam. A third steam boiler is non-operational due to corrosion of tubes.

The CHP set is provided by an energy contract with EnerG. The boilers and CHP are on contract with EnerG for approximately another 6 further years The site winter load is met by 2 operational boilers but if 1 boiler or CHP is off line capacity is inadequate and without resilience. The site base heat load absorbs the entire output of the existing CHP unit.

Boiler plant is old inefficient and in poor condition, upgrade of boiler plant is included in the backlog maintenance schedule. The backlog schedule includes a replacement boiler to provide adequate resilience. The existing boiler capacity is inadequate to serve any additional load but will be sufficient to serve newly refurbished areas of the hospital.

4.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the subterranean duct to level 0 of the main building. The steam distribution system is in need of backlog maintenance, however this is assumed to be in the backlog budget. The mains will need upgrading to continue to safely feed the newly refurbished hospital.

The existing steam main is circa 40 years old and susceptible to periodic failures and will not provide the reliability required for future use.

4.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.
It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.
It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.
Consideration will be given absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions. It should be noted that adsorption

chillers are only effective when connected to a high temperature heat source such as steam or as at present MTHW.
It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog replacement schemes currently in progress.

4.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main which is pre-treated using a copper/silver treatment system. It is then initially connected to bulk storage tanks (referred locally as “lagoons”) located in the basement below the old Maternity (Copthorne building) Block. The future use of this building needs to be considered with respect to tank location and it would be preferable to relocate water storage externally if this building is to be demolished.

It is proposed to upgrade the incoming mains to provide increased capacity.

Annual water consumption is currently 105,000 m^3/year which relates to a daily consumption of 290 m^3/day. Assuming a typical split of 2/3 cold to 1/3 hot this equates to 193 m3/day cold and 97 m3/day hot water usage. Assuming requirement of ½ day storage this indicates a total storage requirement of 145 m^3.

From the central water storage tanks cold water is pumped to various high level storage tanks within the roof level plantrooms of the respective buildings via the subterranean service duct. The balance of water storage between low level bulk storage tanks and high level “break tanks” will be considered further in detailed design.

4.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within various individual plantrooms; due to the topography of the site, these are located at either Level 0, 1 or 2. A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation.

Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity to refurbished areas. All units will be live during normal operation.

4.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development.

The existing fire main will be extended into a “loop / ring” in order to safeguard the supply on site.

4.7. NATURAL GAS

There are two separate existing gas meters serving the site. One is adjacent to the energy centre, serving heating plant, and one at the bottom end of the maternity block, which distributes throughout the hospital. It is assumed that only new local supplies will be required to new hospital areas and the existing distribution mains are sufficient for the increased load. The same assumption has been made for the energy centre although further investigations of the gas meter and distribution pipework capacity will need to be made for both systems.

4.8. MEDICAL GASES

4.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the energy centre.
From the external VIE oxygen is distributed to departmental areas via a single main along the hospital street.
The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is anticipated that the existing VIE installation will require replacing as a part of the energy centre upgrade to coordinate with the new site arrangement.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

4.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

4.8.3. Nitrous oxide/Oxygen Mixtures

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

4.8.4. Medical and surgical air

Existing medical air compressors are located in the rooftop plantroom above the kitchens and in the new treatment centre plantroom.
It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building).

The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development.

4.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

4.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

4.9. PNEUMATIC TUBE

It is proposed extend the existing pneumatic tube system to serve departments within the new development including additional terminals as required by the departmental demands.
As the pneumatic tube system is a site wide system allowance will be included for refurbishment of the existing system as well as extension to new areas.

4.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 2500kVA to accommodate the new development.

The existing supply agreement with the DNO (Western Power Distribution) for the site is 1900kVA and the site uses an average of 1712kVA (according to the DNO). It is believed that the DNO are currently upgrading infrastructure in the area meaning available capacity is likely to increase however the DNO are unable to confirm the extent of this increase.

Initial load assessments for RSH as the planned site indicate additional load requirements as a result of the new development to be 505kVA including 25% growth factor, this is a substantial increase and as a result including costs for allowing the DNO to upgrade their network is reasonable although the extent of the upgrade will likely be limited to upgrading switchgear as opposed to renewing cables.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02.

The existing catering substation sits within the demolition section of the building and will subsequently be removed. Whilst the remaining existing sub-stations have some spare capacity it is proposed to install an additional sub-station dedicated to the new development including duty/standby transformers, each rated at 500kVA to operate as N+1. The new substation dedicated to the main area of the new development will also pick up any supplies outside of the demolition fed from the existing catering substation.

It is recommended load recordings taken on existing transformers in Catering, Gynae and Treatment Centre to determine current spare capacity across the site network.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

4.11. EMERGENCY STANDBY GENERATION

Careful consideration is required to the site's electrical generation strategy. At present the generation on site is provided via centralised standby generator plant located on the west side of the site adjacent the catering building. Essential electrical supplies to the existing buildings are provided by generators of capacity 2 x 1250kVA and 1 x 600kVA, giving a total of 3100kVA.

The maximum logged load recordings are 600amps/750kVA. The existing generators are also available to back up a Broad crown generator set in the old Maternity building if required.

The close proximity of the existing arrangement to the main building is ideal for LV Generation however as the existing generator building is on the site of the proposed development it is proposed to be relocated along with bulk oil storage tanks to clear the site prior to construction. It is currently proposed to relocate the generators to a site adjacent to the energy centre however this introduces significant challenges from an engineering perspective. The distances involved present issues with volt drop, meaning substantially oversized cables and subsequent increased duct sizes. It is unlikely that an LV solution will be workable with the generators in the current proposed location.

Generators currently support all LV supplies on site providing N+1 resilience.

It is proposed to install generation to cover the load of the new development maintaining N+1 resilience across the site.

The existing oil storage capacity will be increased to include new generators.

It is assumed that any enhancements to existing generator provision, other than the relocation will be covered by the backlog budget.

There are several options to be considered, all with their own advantages and disadvantages; these are discussed and summarised below. Regardless of the eventual adopted strategy, careful consideration will be given to the enabling works and sequencing of the generator relocation as to ensure the site network is provided with essential supplies at all times.

4.11.1. Option 1 - Leave Generator House in existing position

Overview:
From an engineering perspective this is the simplest and most cost effective solution. If the construction of the new development can be designed around the existing generator house the work required to upgrade the existing arrangement whilst keeping the Hospital live is relatively simple. The likelihood is that the existing 650kVA generator sets would be replaced for larger sets and additional cabling installed to pick up any new LV Switchboards installed as a result of the new development. From an engineering perspective this option only has advantages, however it is likely to cause issues architecturally as current proposals are to construct the new development on the existing generator house footprint.
Costs associated with option:
- New generator sets
- New cabling to new/relocated LV Switchboards
- Labour/coordination associated with replacement of existing sets for larger sets
- Possible extension of existing generator house if required
- Possible alterations to existing duct for cable route to new development

4.11.2. Option 2 - Move the generators to location as close as possible to main building

Overview:
This is the next favoured solution from an engineering perspective; it leaves the strategy for the site almost untouched with the main elements of works being in relation to modifying existing cabling to suit the new generator location. The actual distances between the generators and load need to be reviewed and confirmed. New larger generator sets would be installed and existing LV supplies moved over to them before the existing sets could be decommissioned and the generator house demolished. The existing 1250kVA set would be retained and moved to the new location with the 650kVA sets becoming surplus to requirements.
Costs associated with option:
- New generator sets
- New cabling to new/relocated LV Switchboards
- Cabling modifications to existing system including new cabling
- Labour/coordination associated with installation of new sets and relocation of existing set
- New generator house
- Demolition of existing generator house
- New underground duct from new generator house location

4.11.3. Option 3 - Semi-distributed LV Generation

Overview:
This solution will best be adopted if a scenario arises in which a suitably sized location cannot be sought for centralised LV generation plant. Two smaller generator houses will be located on either side of the site supplying their closest LV Switchboards. This solution is a slight variation on the

existing system although the philosophy remains the same; only in this adaptation there are two centralised plant locations.
Costs associated with option:
- New generator sets
- New cabling to new/relocated LV Switchboards
- Cabling modifications to existing system including new cabling
- Labour/coordination associated with installation of new sets and relocation of existing set
- New generator houses
- Demolition of existing generator house
- New underground ducts from new generator house locations

4.11.4. Option 4 - Distributed LV Generation

Overview:
This solution would see local generation plant installed adjacent each substation. Each substation would have its own set of generators providing N+1 resilience. The likelihood of this option being possible is remote as it requires substantial dedicated space for generators next to each substation which would be difficult to accommodate in an existing building.
Costs associated with option:
- At least 12no. new generator sets
- New cabling to new/relocated LV Switchboards
- Cabling modifications to existing system
- Labour/coordination associated with installation of new sets and relocation of existing set
- New generator houses
- Demolition of existing generator house
- New underground ducts/cable ways from each new generator house locations

4.11.5. Option 5 - HV Generation

Overview:
This is the only feasible option if the generator house has to go in the current proposed location. The proposed location is too far from the main building for LV generation to be considered; the distances involved would present issues in relation to volt drop making an LV solution unworkable. The design to accommodate HV Generation would be complex with a requirement for new automatic earth fault detection systems, upgraded HV switchgear (motorised switches), likely upgrade of existing substations including dual transformer arrangements or substantial embellishment of existing LV ring to eliminate single point of failure locations within the system (this would be extremely difficult to accommodate due to spatial constraints in existing rooms). Note this solution completely changes the existing philosophy on site and requires work in all areas of the hospital whether or not they are intended to be included within the SSP scheme.
Costs associated with option:
- New generator sets (no provision for reusing any of the existing)
- Replacement HV Switchgear in every substation
- New Earth Fault Detection system

- New cabling to connect in to site HV Ring
- Cabling modifications to existing LV system
- Labour/coordination associated with installation of new sets and relocation of existing set
- New generator house
- Demolition of existing generator house
- New underground duct from new generator house location

4.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

4.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.
It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

4.14. SECURITY

It is proposed to include card access system within the new development.

It is proposed to include intruder alarms to ground floor day only areas.

It is proposed to include CCTV to internal circulation areas and external access, building perimeter and car park areas.

It is proposed to include a staff attack system to OPD areas.

4.15. BMS & AUTOMATIC CONTROLS

The existing BMS is a Seachange system under the EnerG contract with a further 6 years to run. The new BMS will therefore be an extension of the existing system to maintain consistent functionality.

A new BMS would be included in the new development and included in the plant costs. The installation will include an upgrade to the system front end & graphics. Plant rooms will each include BMS display panel.

4.16. IT/DATA SYSTEM

IT/Data networks within departmental areas will be covered by the departmental allowances.

New hub rooms with active equipment will be required in each of the departmental areas. Cabling and data outlets will be included in the scheme however all active equipment will be provided by the Trust IT specialist.

Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust's existing IT strategy.

DSSR | CONSULTING ENGINEERS

Project

THE SHREWSBURY AND TELFORD HOSPITAL NHS TRUST

SaTH SSP

ENGINEERING STRATEGY REPORT – OPTION C1

OBC STAGE

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Authored by:

name:	Ross Monks/David Carpenter
role:	Electrical Engineer/Mechanical Engineer
signed:	
date:	25-10-16

Reviewed by:

name:	Steve Greatrex
role:	Executive Engineer
signed:	
date:	25-10-16

Authorised for Issue by:

name:	Mike Singleton/John Hatton
role:	Partner/Regional Partner
signed:	
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1. CONTENTS

2. INTRODUCTION

The SaTH NHS Trust are developing an Outline Business Case (OBC) for developments across both of their main sites (Royal Shrewsbury Hospital and Princess Royal Hospital). For the OBC several options are being considered and detailed descriptions of the options can be found within the other OBC reports produced by AHR. Generally the options relate to which site shall be the Emergency Site and which shall be the Planned Care Site.

DSSR have been commissioned to develop strategies to implement/accommodate the necessary changes to engineering services across both Royal Shrewsbury Hospital (RSH) and Princess Royal Hospital (PRH) for each of the proposed options (B, C1 & C2).

This report details the engineering services strategy for option C1. The broadly involves RSH becoming the Emergency site and PRH the Planned Care site.

3. RSH EMERGENCY SITE

3.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas fired steam boiler plant located within existing energy centre at the edge of the site behind the Estates department. The site is currently served by 2 N0. 5000 kW gas/oil fired boilers and 1No. 1030 kWe CHP/waste heat boiler. MTHW is taken from the CHP to heat DHWS calorifiers. This is backed up by steam and waste heat from the boiler flues. This MTHW feeds the Kitchen plantroom and the Ward Block plantroom, with the rest of the site being fed by steam. A third steam boiler is non-operational due to corrosion of tubes.

The CHP set is provided by an energy contract with EnerG. The boilers and CHP are on contract with EnerG for approximately another 6 further years The site winter load is met by 2 operational boilers but if 1 boiler or CHP is off line capacity is inadequate and without resilience. The site base heat load absorbs the entire output of the existing CHP unit.

Boiler plant is old inefficient and in poor condition, upgrade of boiler plant is included in the backlog maintenance schedule. The backlog schedule includes a replacement boiler to provide adequate resilience. The existing boiler capacity is inadequate to serve any additional load.

There is a desire within the Estates department to de-steam the site when contract expires. Conversion to MTHW/LTHW will be undertaken as part of this scheme.

Connecting new build to existing boilers would not achieve the required BREEAM rating and an additional renewable energy contribution will be required. This is likely to be additional CHP capacity but other options will be considered as a part of the sustainability review. An additional boiler is required to satisfy the anticipated load of the new development, including reconfiguration of boiler house to accommodate new plant.

An additional CHP unit, matched to base load of the new building, or combined base load of new and existing buildings, is anticipated to satisfy the energy and carbon emissions targets. The capacity of the CHP and alternative energy sources will be assessed as part of the sustainability review. The provision of future boiler plant and CHP may be an extension of the existing contract or a new energy supply contract.

It is assumed at present that boiler plant upgrades as a result of aging plant is included in backlog maintenance budget but will be addressed as part of the SSP.

3.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the subterranean duct to level 0 of the main building. As a part of the preferred de-steaming strategy distribution mains will be replaced by MTHW or LTHW mains.
The existing steam main is circa 40 years old and susceptible to periodic failures and will not provide the reliability required for future use.

Due to the condition of the existing service duct and its location under the footprint of the proposed development it will be necessary to replace the duct. The construction and location of the new duct will need to be coordinated with the construction of the new building to allow safe and reliable heat supply to the retained buildings during construction.

It is proposed to create a ring main configuration in order to improve resilience to both existing and new areas.

As the existing calorifier installation is due for replacement as part of the backlog maintenance schedule it may be possible to combine the existing and proposed loads onto a common plant. It is likely that existing calorifers will require replacement before the SSP scheme is approved. The scope of the future development will therefore need to respond to the interim site developments.

3.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.
It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.
It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.
Consideration will be given absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions. It should be noted that adsorption

chillers are only effective when connected to a high temperature heat source such as steam or as at present MTHW.
It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog replacement schemes currently in progress.

3.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main which is pre-treated using a copper/silver treatment system. It is then initially connected to bulk storage tanks (referred locally as "lagoons") located in the basement below the old Maternity (Copthorne building) Block. The future use of this building needs to be considered with respect to tank location and it would be preferable to relocate water storage externally if this building is to be demolished.

It is proposed to upgrade the incoming mains to provide increased capacity.

Annual water consumption is currently 105,000 m^3/year which relates to a daily consumption of 290 m^3/day. Assuming a typical split of 2/3 cold to 1/3 hot this equates to 193 m3/day cold and 97 m3/day hot water usage. Assuming requirement of ½ day storage this indicates a total storage requirement of 145 m^3. The increased capacity to satisfy the extended site is anticipated to result in a total stored volume of 163 m^3.

Existing tanks will be replaced with duplicate above ground GRP external tanks to meet Water Regulations requirements; 2no. tanks each 82m^3 stored capacity.

From the central water storage tanks cold water is pumped to various high level storage tanks within the roof level plantrooms of the respective buildings via the subterranean service duct. The balance of water storage between low level bulk storage tanks and high level "break tanks" will be considered further in detailed design.

Due to the footprint of the new development, there will be a requirement to alter / re-route the existing subterranean service duct which houses the pumped cold water supply around the new buildings. New cold water distribution pipework will be needed where ducts have been altered.

3.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within various individual plantrooms; due to the topography of the site, these are located at either Level 0, 1 or 2. Existing calorifier installations do not have spare capacity included to serve extended development so it is proposed to provide new hot water generation within the new development. A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation.

Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity. All units will be live during normal operation.

A conventional hot water return circulation system will be included to maintain system temperatures. The return circulation will be dedicated to the new development only and not interconnected to existing systems.

MTHW/LTHW will be used as the primary heat source for the domestic hot water generation.

It is preferred to replace the present water treatment system as current guidance suggests this should not be adopted on new schemes.

3.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development. Due to the location of the existing fire main, there will be a requirement to alter the routing of the fire main to “avoid” the footprint of the new development.

The existing fire main will be extended into a “loop / ring” in order to safeguard the supply on site.

Consultation will be required with the Fire Officer to establish the need to retain the fire-fighting tanks currently installed on the site.

3.7. NATURAL GAS

There are two separate existing gas meters serving the site. One is adjacent to the energy centre, serving heating plant, and one at the bottom end of the maternity block, which distributes throughout the hospital. It is assumed that only new local supplies will be required to new hospital areas and the existing distribution mains are sufficient for the increased load. The same assumption has been made for the energy centre although further investigations of the gas meter and distribution pipework capacity will need to be made for both systems.

3.8. MEDICAL GASES

3.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the energy centre.
From the external VIE oxygen is distributed to departmental areas via a single main along the hospital street.
The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is anticipated that the existing VIE installation will require replacing as a part of the energy centre upgrade to coordinate with the new site arrangement.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

3.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

3.8.3. Nitrous oxide/Oxygen Mixtures

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

3.8.4. Medical and surgical air

Existing medical air compressors are located in the rooftop plantroom above the kitchens and in the new treatment centre plantroom.
It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building).

The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development.

3.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

3.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

3.9. PNEUMATIC TUBE

It is proposed extend the existing pneumatic tube system to serve departments within the new development including additional terminals as required by the departmental demands.
As the pneumatic tube system is a site wide system allowance will be included for refurbishment of the existing system as well as extension to new areas.

3.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 3900kVA to accommodate the new development.

The existing supply agreement with the DNO (Western Power Distribution) for the site is 1900kVA and the site uses an average of 1712kVA (according to the DNO). It is believed that the DNO are currently upgrading infrastructure in the area meaning available capacity is likely to increase however the DNO are unable to confirm the extent of this increase.

Initial load assessments for RSH as the emergency site indicate additional load requirements as a result of the new development to be 1.999MVA including 25% growth factor, this is a substantial increase and as a result including costs for allowing the DNO to upgrade their network is reasonable.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02.

The existing catering substation sits within the demolition section of the building and will subsequently be removed. Whilst the remaining existing sub-stations have some spare capacity it is proposed to install an additional sub-station dedicated to the new development (including MSCP) including duty/standby transformers, each rated at 2MVA to operate as N+1.

The new substation dedicated to the main area of the new development will also pick up any supplies outside of the demolition fed from the existing catering substation.
It is recommended load recordings taken on existing transformers in Catering, Gynae and Treatment Centre to determine current spare capacity across the site network.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

3.11. EMERGENCY STANDBY GENERATION

The strategy for emergency standby generation remains the same for RSH as the emergency site as it does with the planned care site. Logistically all of the same challenges remain; the only difference with the emergency site is that the rating of the generators will increase to provide N+1 resilience to the new site demand in its entirety. Refer to M4556-X-X-RP-90001 for further information.

3.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

3.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.
It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

3.14. SECURITY

It is proposed to include card access system within the new development.

It is proposed to include intruder alarms to ground floor day only areas.

It is proposed to include CCTV to internal circulation areas and external access, building perimeter and car park areas.

It is proposed to include a staff attack system to ED & OPD areas.

3.15. BMS & AUTOMATIC CONTROLS

The existing BMS is a Seachange system under the EnerG contract with a further 6 years to run. The new BMS will therefore be an extension of the existing system to maintain consistent functionality.

A new BMS would be included in the new development and included in the plant costs. The installation will include an upgrade to the system front end & graphics. Plant rooms will each include BMS display panel.

3.16. IT/DATA SYSTEM

IT/Data networks within departmental areas will be covered by the departmental allowances.

New hub rooms with active equipment will be required in each of the departmental areas. Cabling and data outlets will be included in the scheme however all active equipment will be provided by the Trust IT specialist.

Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust's existing IT strategy.

4. PRH PLANNED CARE SITE

4.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas/oil fired steam boiler plant located within an integral boiler room adjacent to Receipt & Distribution. There is also a CHP plant where the waste heat is supplied to nearby areas of the hospital as LTHW. It must be noted that the existing boilers are on contract with MCL until Jan 2017.

It is anticipated that the existing boilers will be sufficient to serve the newly refurbished and new build areas of the hospital.

4.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the hospital street at plantroom level. The steam distribution system is in need of remedial works, however this is assumed to be included in the backlog budget.

4.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.

It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.

It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.

Consideration will be given to absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions.

It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog budget.

4.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main connected initially to bulk storage tanks located externally at ground level. Present storage includes 4 No. raw water tanks with an additional 2 No. treated water storage tanks.

Annual water consumption is 81,400 m^3/year which relates to a daily consumption of 223m^3/day. Assuming a typical 2/3 cold to 1/3 hot this equates to 148 m3/day cold and 74 m3/day hot water usage.

An additional 2 No. raw water tanks are installed adjacent to the Women's and Children's block, including dedicated booster pumps to serve that building. Assuming a requirement of ½ day storage this equates to a total stored volume of 111m^3

From the external central water storage tank cold water is pumped directly to departmental areas without further high level storage within the building.

It is anticipated that the existing cold water distribution system will be sufficient to serve the newly refurbished and new build areas of the hospital.

4.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within high level plantrooms. Existing calorifier installations do not have spare capacity included to serve extended development so it is proposed to provide new hot water generation within the new development.

A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation. Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity. All units will be live during normal operation.

4.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development.

4.7. NATURAL GAS

The existing gas meter house is adjacent to the new Women and Children's Facility. It is noted that the gas meter is currently at full capacity and the incoming supply will need upgrading to serve the new build. Further investigations are needed to establish the capacity of the distribution pipework.
There is an existing gas pipe running under the footprint of the proposed new build, across the front of the hospital, but this is understood to be redundant.

4.8. MEDICAL GASES

4.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the substation at the back of the hospital.
From the external VIE, oxygen is distributed to departmental areas via a single main along the hospital street.

The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

4.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

4.8.3. Nitrous oxide/Oxygen Mixture

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

4.8.4. Medical and surgical air

It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building). The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development

4.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

4.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

4.9. PNEUMATIC TUBE

The existing pneumatic tube system is a 160 diameter system and will not be upgraded as part of this scheme.

4.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 2500kVA to accommodate the new development.

The existing import supply agreement with the DNO (Western Power Distribution) for the site is 2080kVA and the site uses an average of 1435kVA (according to the DNO). The existing DNO 11kV network has very little spare capacity and the additional capacity is likely to result in a requirement to carry out upstream network reinforcement works.

Initial load assessments for PRH as the planned care site indicate additional load requirements as a result of the new development to be 333kVA including 25% growth factor, this is a relatively low increase and the capacity to accommodate it is already on site.

Whilst the existing sub-stations have some spare capacity it is proposed to install an additional sub-station dedicated to new development including duty/standby transformers, each rated at 500kVA to operate as N+1.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02. It also intended to locate the new HV intake switchgear within the new substation, providing the DNO with access to their switchgear without having to enter hospital premises (although some way-leave arrangements will still likely be required). These works will require diversion of DNO HV cabling, and the Trust will need to adopt the HV cabling currently owned by the DNO which supplies substation 1.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

4.11. EMERGENCY STANDBY GENERATION

Generators presently only support essential supplies and whilst it is considered desirable to upgrade to supply N+1 it is outside the scope of the SSP scheme.

It is proposed to install an additional 2 No. generators each rated at 500kVA to provide 100% support at N+1 to the new development. It is proposed to locate the generators alongside the existing generator plant and interconnect the distribution to provide enhanced resilience. Careful consideration will be given to cabling routes and configurations from this area as the current generators are located on the opposite side of the site to the proposed new development. It may transpire that new generators need to be located adjacent the new substation.

The existing oil storage capacity will be increased to include new generators.

It is assumed that any enhancements to existing generator provision will be covered by the backlog budget although no remedial works have at present been identified.

4.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

4.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.

It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

Cabling modifications and additions will be required to link the new developments fire alarm system to the site existing system.

4.14. SECURITY

It is proposed to include card access system within the new development.

It is proposed to include intruder alarms to ground floor day only areas.

It is proposed to include CCTV to internal circulation areas and external access, building perimeter and car park areas.

4.15. BMS & AUTOMATIC CONTROLS

The existing BMS is a Trend system, therefore the new BMS must be Trend and be integrated with existing.

A new BMS would be included in the new development and included in the plant costs. The installation will include an upgrade to the system front end & graphics. Plant rooms will each include BMS display panel.

4.16. IT/DATA SYSTEM

IT/Data networks within departmental areas will be covered by the departmental allowances.

New hub rooms with active equipment will be required in each of the departmental areas. Cabling and data outlets will be included in the scheme however all active equipment will be provided by the Trust IT specialist.

Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust's existing IT strategy.

E manchester@dssr.co.uk T 0161 872 4811 F 0161 872 7325
Warwick House 17 Warwick Road Manchester

Glasgow | Harrogate | London | Manchester

DSSR | CONSULTING ENGINEERS

Project

THE SHREWSBURY AND TELFORD HOSPITAL NHS TRUST

SaTH SSP

ENGINEERING STRATEGY REPORT – OPTION C2

OBC STAGE

DOC REF: M4556-DSSR-X-X-RP-MEP-90003

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Authored by:

name: Ross Monks/David Carpenter
role: Electrical Engineer/Mechanical Engineer
signed:

date: 25-10-16

Reviewed by:

name: Steve Greatrex
role: Executive Engineer
signed:

date: 25-10-16

Authorised for Issue by:

name: Mike Singleton/John Hatton
role: Partner/Regional Partner
signed:

date: 25-10-16

The signed original of this page is retained by the issuing team.

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-	25-10-16	Issued for OBC	

1. CONTENTS

2. INTRODUCTION

The SaTH NHS Trust are developing an Outline Business Case (OBC) for developments across both of their main sites (Royal Shrewsbury Hospital and Princess Royal Hospital). For the OBC several options are being considered and detailed descriptions of the options can be found within the other OBC reports produced by AHR. Generally the options relate to which site shall be the Emergency Site and which shall be the Planned Care Site.

DSSR have been commissioned to develop strategies to implement/accommodate the necessary changes to engineering services across both Royal Shrewsbury Hospital (RSH) and Princess Royal Hospital (PRH) for each of the proposed options (B, C1 & C2).

This report details the engineering services strategy for option C2. The broadly involves RSH becoming the Emergency site and PRH the Planned care site, with the Women's and Children's department remaining at PRH.

3. RSH EMERGENCY SITE

3.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas fired steam boiler plant located within existing energy centre at the edge of the site behind the Estates department. The site is currently served by 2 N0. 5000 kW gas/oil fired boilers and 1No. 1030 kWe CHP/waste heat boiler. MTHW is taken from the CHP to heat DHWS calorifiers. This is backed up by steam and waste heat from the boiler flues. This MTHW feeds the Kitchen plantroom and the Ward Block plantroom, with the rest of the site being fed by steam. A third steam boiler is non-operational due to corrosion of tubes.

The CHP set is provided by an energy contract with EnerG. The boilers and CHP are on contract with EnerG for approximately another 6 further years The site winter load is met by 2 operational boilers but if 1 boiler or CHP is off line capacity is inadequate and without resilience. The site base heat load absorbs the entire output of the existing CHP unit.

Boiler plant is old inefficient and in poor condition, upgrade of boiler plant is included in the backlog maintenance schedule. The backlog schedule includes a replacement boiler to provide adequate resilience. The existing boiler capacity is inadequate to serve any additional load.

There is a desire within the Estates department to de-steam the site when contract expires. Conversion to MTHW/LTHW will be undertaken as part of this scheme.

Connecting new build to existing boilers would not achieve the required BREEAM rating and an additional renewable energy contribution will be required. This is likely to be additional CHP capacity but other options will be considered as a part of the sustainability review. An additional boiler is

required to satisfy the anticipated load of the new development, including reconfiguration of boiler house to accommodate new plant.
An additional CHP unit, matched to base load of the new building, or combined base load of new and existing buildings, is anticipated to satisfy the energy and carbon emissions targets. The capacity of the CHP and alternative energy sources will be assessed as part of the sustainability review. The provision of future boiler plant and CHP may be an extension of the existing contract or a new energy supply contract.

It is assumed at present that boiler plant upgrades as a result of aging plant is included in backlog maintenance budget but will be addressed as part of the SSP.

3.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the subterranean duct to level 0 of the main building. As a part of the preferred de-steaming strategy distribution mains will be replaced by MTHW or LTHW mains.
The existing steam main is circa 40 years old and susceptible to periodic failures and will not provide the reliability required for future use.

Due to the condition of the existing service duct and its location under the footprint of the proposed development it will be necessary to replace the duct. The construction and location of the new duct will need to be coordinated with the construction of the new building to allow safe and reliable heat supply to the retained buildings during construction.

It is proposed to create a ring main configuration in order to improve resilience to both existing and new areas.

As the existing calorifier installation is due for replacement as part of the backlog maintenance schedule it may be possible to combine the existing and proposed loads onto a common plant. It is likely that existing calorifers will require replacement before the SSP scheme is approved. The scope of the future development will therefore need to respond to the interim site developments.

3.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.
It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.
It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.

Consideration will be given absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions. It should be noted that adsorption chillers are only effective when connected to a high temperature heat source such as steam or as at present MTHW.
It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog replacement schemes currently in progress.

3.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main which is pre-treated using a copper/silver treatment system. It is then initially connected to bulk storage tanks (referred locally as "lagoons") located in the basement below the old Maternity (Copthorne building) Block. The future use of this building needs to be considered with respect to tank location and it would be preferable to relocate water storage externally if this building is to be demolished.

It is proposed to upgrade the incoming mains to provide increased capacity.

Annual water consumption is currently 105,000 m^3/year which relates to a daily consumption of 290 m^3/day. Assuming a typical split of 2/3 cold to 1/3 hot this equates to 193 m3/day cold and 97 m3/day hot water usage. Assuming requirement of ½ day storage this indicates a total storage requirement of 145 m^3. The increased capacity to satisfy the extended site is anticipated to result in a total stored volume of 163 m^3.

Existing tanks will be replaced with duplicate above ground GRP external tanks to meet Water Regulations requirements; 2no. tanks each 82m^3 stored capacity.

From the central water storage tanks cold water is pumped to various high level storage tanks within the roof level plantrooms of the respective buildings via the subterranean service duct. The balance of water storage between low level bulk storage tanks and high level "break tanks" will be considered further in detailed design.

Due to the footprint of the new development, there will be a requirement to alter / re-route the existing subterranean service duct which houses the pumped cold water supply around the new buildings. New cold water distribution pipework will be needed where ducts have been altered.

3.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within various individual plantrooms; due to the topography of the site, these are located at either Level 0, 1 or 2. Existing calorifier installations do not have spare capacity included to serve extended development so it is proposed to provide new hot water generation within the new development. A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation.

Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity. All units will be live during normal operation.

A conventional hot water return circulation system will be included to maintain system temperatures. The return circulation will be dedicated to the new development only and not interconnected to existing systems.

MTHW/LTHW will be used as the primary heat source for the domestic hot water generation.

It is preferred to replace the present water treatment system as current guidance suggests this should not be adopted on new schemes.

3.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development. Due to the location of the existing fire main, there will be a requirement to alter the routing of the fire main to "avoid" the footprint of the new development.

The existing fire main will be extended into a "loop / ring" in order to safeguard the supply on site.

Consultation will be required with the Fire Officer to establish the need to retain the fire-fighting tanks currently installed on the site.

3.7. NATURAL GAS

There are two separate existing gas meters serving the site. One is adjacent to the energy centre, serving heating plant, and one at the bottom end of the maternity block, which distributes throughout the hospital. It is assumed that only new local supplies will be required to new hospital areas and the existing distribution mains are sufficient for the increased load. The same assumption has been made for the energy centre although further investigations of the gas meter and distribution pipework capacity will need to be made for both systems.

3.8. MEDICAL GASES

3.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the energy centre.
From the external VIE oxygen is distributed to departmental areas via a single main along the hospital street.
The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is anticipated that the existing VIE installation will require replacing as a part of the energy centre upgrade to coordinate with the new site arrangement.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

3.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

3.8.3. Nitrous oxide/Oxygen Mixtures

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

3.8.4. Medical and surgical air

Existing medical air compressors are located in the rooftop plantroom above the kitchens and in the new treatment centre plantroom.
It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building).

The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development.

3.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

3.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

3.9. PNEUMATIC TUBE

It is proposed extend the existing pneumatic tube system to serve departments within the new development including additional terminals as required by the departmental demands.
As the pneumatic tube system is a site wide system allowance will be included for refurbishment of the existing system as well as extension to new areas.

3.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 3300kVA to accommodate the new development.

The existing supply agreement with the DNO (Western Power Distribution) for the site is 1900kVA and the site uses an average of 1712kVA (according to the DNO). It is believed that the DNO are currently upgrading infrastructure in the area meaning available capacity is likely to increase however the DNO are unable to confirm the extent of this increase.

Initial load assessments for RSH as the emergency site indicate additional load requirements as a result of the new development to be 1.338MVA including 25% growth factor, this is a substantial increase and as a result including costs for allowing the DNO to upgrade their network is reasonable.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02.

The existing catering substation sits within the demolition section of the building and will subsequently be removed. Whilst the remaining existing sub-stations have some spare capacity it is proposed to install additional sub-stations dedicated to the new development including duty/standby transformers, each rated at 1.5MVA to operate as N+1.

The new substation dedicated to the main area of the new development will also pick up any supplies outside of the demolition fed from the existing catering substation.
It is recommended load recordings taken on existing transformers in Catering, Gynae and Treatment Centre to determine current spare capacity across the site network.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

3.11. EMERGENCY STANDBY GENERATION

The strategy for emergency standby generation remains the same for RSH as the emergency site as it does with the planned care site. Logistically all of the same challenges remain; the only difference with the emergency site is that the rating of the generators will increase to provide N+1 resilience to the new site demand in its entirety.

3.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

3.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.
It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

3.14. SECURITY

It is proposed to include card access system within the new development.

It is proposed to include intruder alarms to ground floor day only areas.

It is proposed to include CCTV to internal circulation areas and external access, building perimeter and car park areas.

It is proposed to include a staff attack system to ED & OPD areas.

3.15. BMS & AUTOMATIC CONTROLS

The existing BMS is a Seachange system under the EnerG contract with a further 6 years to run. The new BMS will therefore be an extension of the existing system to maintain consistent functionality.

A new BMS would be included in the new development and included in the plant costs. The installation will include an upgrade to the system front end & graphics. Plant rooms will each include BMS display panel.

3.16. IT/DATA SYSTEM

IT/Data networks within departmental areas will be covered by the departmental allowances.

New hub rooms with active equipment will be required in each of the departmental areas. Cabling and data outlets will be included in the scheme however all active equipment will be provided by the Trust IT specialist.

Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust's existing IT strategy.

4. PRH PLANNED CARE SITE

4.1. PRIMARY HEAT ENERGY

The existing heat energy provided to the site is derived from gas/oil fired steam boiler plant located within an integral boiler room adjacent to Receipt & Distribution. There is also a CHP plant where the waste heat is supplied to nearby areas of the hospital as LTHW. It must be noted that the existing boilers are on contract with MCL until Jan 2017. There is a desire within the Estates department to de-steam the site when contract expires. Conversion to LTHW/MTHW will be undertaken as part of this scheme.

Connecting new build to existing boilers would not achieve the required BREEAM rating and an additional renewable energy contribution will be required. This is likely to be additional CHP capacity but other options will be considered as a part of the sustainability review.

An additional boiler is required to satisfy the anticipated load of the new development, including reconfiguration of boiler house to accommodate the new plant. An additional CHP unit matched to base load of the new building is anticipated to satisfy the energy and carbon emissions targets. The capacity of the CHP and alternative energy sources will be assessed as part of the sustainability review.

The additional load will be offset by a combination of the boiler and CHP capacity. The provision of future boiler plant and CHP may be an extension of the existing contract, or a new energy supply contract. It is assumed that boiler plant upgrades as a result of aging plant is included in backlog maintenance budget but will be included in the overall SSP reconfiguration of the energy centre.

4.2. HEAT DISTRIBUTION

Heat distribution from the energy centre to the hospital is presently via steam mains which are routed through the hospital street at plantroom level. As a part of the de steaming strategy distribution mains will be replaced by MTHW or LTHW mains. It is understood that the majority of plant on site is already fed by LTHW, so very little plant modifications would be needed.

4.3. COOLING AND VENTILATION

Additional ventilation and cooling will be required to the proposed development in accordance with HTM/HBN guidance. Costs of ventilation and cooling plant are included within the standard departmental cost allowances.

It is proposed to provide dedicated cooling plant within the scope of the extended areas of building as existing chilled water distribution is not site wide and there is little benefit in extending existing systems to connect to the new installation as unnecessary costs will be incurred. Some benefit to resilience would be achieved by such cross connection but as this is not a life support system this is not considered essential.

It is proposed to include multiple chillers to achieve 100% of design duty. It is not considered necessary to provide additional spare capacity as for the majority of the operational period the chillers will operate at less than 50% duty.

Consideration will be given to absorption cooling as lead system, linked to CHP in order to provide an increased summer load and reduce overall carbon emissions.

It is assumed remedial works to existing ventilation and cooling systems are covered by the backlog budget.

4.4. DOMESTIC COLD WATER SERVICES

Cold water supplies are currently provided via an 80mm incoming main connected initially to bulk storage tanks located externally at ground level. Present storage includes 4 No. raw water tanks with an additional 2 No. treated water storage tanks.

Annual water consumption is 81,400 m^3/year which relates to a daily consumption of 223m^3/day. Assuming a typical 2/3 cold to 1/3 hot this equates to 148 m3/day cold and 74 m3/day hot water usage.

An additional 2 No. raw water tanks are installed adjacent to the Women's and Children's block, including dedicated booster pumps to serve that building. Assuming a requirement of ½ day storage this equates to a total stored volume of 111m^3

From the external central water storage tank cold water is pumped directly to departmental areas without further high level storage within the building.

It is anticipated that the existing cold water distribution system will be sufficient to serve the newly refurbished and new build areas of the hospital.

4.5. DOMESTIC HOT WATER SERVICES

Domestic hot water is produced by steam to domestic hot water calorifiers located within high level plantrooms. Existing calorifier installations do not have spare capacity included to serve extended development so it is proposed to provide new hot water generation within the new development.

A zonal approach to hot water generation and distribution provides a more manageable system than an extended site wide installation. Plate heat exchangers combined with semi storage type storage cylinders are proposed to provide N+1 or duty, support & standby capacity. All units will be live during normal operation.

4.6. EXTERNAL FIRE MAINS

The existing external hydrant main will be extended including additional hydrants to cover the new development.

4.7. NATURAL GAS

The existing gas meter house is adjacent to the new Women and Children's Facility. It is noted that the gas meter is currently at full capacity and the incoming supply will need upgrading to serve the new build. Further investigations are needed to establish the capacity of the distribution pipework.
There is an existing gas pipe running under the footprint of the proposed new build, across the front of the hospital, but this is understood to be redundant.

4.8. MEDICAL GASES

4.8.1. Oxygen

Oxygen is currently derived from a VIE installation located externally adjacent to the substation at the back of the hospital.
From the external VIE, oxygen is distributed to departmental areas via a single main along the hospital street.
The existing distribution arrangement is compliant with standards applicable at installation however is not suitable for extension to serve the new development. It is proposed therefore to include a second liquid oxygen VIE installation to provide a second independent source of supply in a separate location to the present installation.
It is assumed the VIE installation is leased as is normal practice.
It is then proposed to extend oxygen distribution to serve new development and create a ring distribution to comply with current guidance as defined in HTM 02.

4.8.2. Nitrous oxide

It is anticipated that a nitrous oxide manifold will be required to serve specific areas of the new development in addition to existing areas. It is proposed therefore to include a new central manifold to serve the whole site in order to minimise duplication and management costs.

4.8.3. Nitrous oxide/Oxygen Mixture

It is anticipated that nitrous oxide/oxygen mixture (Entonox) will be sufficient to serve new build areas.

4.8.4. Medical and surgical air

It is proposed to include additional medical compressed air plant comprising multiple compressors (this plant could be co-located with existing plant or located within and dedicated to the new building). The medical air distribution will be extended to new development and interconnect with the existing network to provide added resilience.

It is not anticipated that surgical air plant will be required to serve the new development

4.8.5. Medical vacuum

It is proposed to include additional medical vacuum plant dedicated to the new development (this plant could be co-located with existing plant or located within and dedicated to the new building)
The medical vacuum distribution will be extended to new development and interconnect with the existing network to provide added resilience.

4.8.6. Medical Gas Manifolds

It is proposed to include medical gas manifold room including oxygen & medical air manifolds to HTM 02 to provide emergency standby supplies.

4.9. PNEUMATIC TUBE

The existing pneumatic tube system is a 160 diameter system which is considered unsuitable for extension to the new development however the system must be consistent across the site to be of benefit.

It is proposed therefore to replace existing 160 mm with 110 mm system (It must be noted that the replacement of the 160 tube with a 110 tube is not as a result of the new development or a backlog issue but must be included to ensure consistency across the site whilst avoiding installing an inappropriate system in the new development).

4.10. ELECTRICAL DISTRIBUTION

It is proposed to increase the capacity of incoming electrical supply including new main intake switchgear to serve the existing site including the additional load of the new development. It is proposed to provide an intake capacity of 2800kVA to accommodate the new development.

The existing import supply agreement with the DNO (Western Power Distribution) for the site is 2080kVA and the site uses an average of 1435kVA (according to the DNO). The existing DNO 11kV network has very little spare capacity and the additional capacity is likely to result in a requirement to carry out upstream network reinforcement works.

Initial load assessments for PRH as the planned care site indicate additional load requirements as a result of the new development to be 666kVA including 25% growth factor, this is a relatively low increase and the capacity to accommodate it is already on site.

Whilst the existing sub-stations have some spare capacity it is proposed to install an additional sub-station dedicated to new development including duty/standby transformers, each rated at 500kVA to operate as N+1.

It is proposed to replace the existing main intake HV/LV switchgear to meet new load demand and meet HTM 06-02. It also intended to locate the new HV intake switchgear within the new substation, providing the DNO with access to their switchgear without having to enter hospital premises (although some way-leave arrangements will still likely be required). These works will require diversion of DNO HV cabling, and the Trust will need to adopt the HV cabling currently owned by the DNO which supplies substation 1.

The existing electrical supply is supported by a 600kWe CHP unit. The entire output of this unit is absorbed by the site's electrical base load. It is proposed therefore to consider a further CHP unit to support the overall site load including the new development. The size and provision of CHP will be considered against alternative renewable strategies in the sustainability assessment.

4.11. EMERGENCY STANDBY GENERATION

Generators presently only support essential supplies and whilst it is considered desirable to upgrade to supply N+1 it is outside the scope of the SSP scheme.

It is proposed to install an additional 2 No. generators each rated at 500kVA to provide 100% support at N+1 to the new development. It is proposed to locate the generators alongside the existing generator plant and interconnect the distribution to provide enhanced resilience. Careful consideration will be given to cabling routes and configurations from this area as the currently generators are located on the opposite side of the site to the proposed new development. It may transpire that new generators need to be located adjacent the new substation.

The existing oil storage capacity will be increased to include new generators.

It is assumed that any enhancements to existing generator provision will be covered by the backlog budget although no remedial works have at present been identified.

4.12. IPS/UPS

Isolated power supplies including UPS support will be included in accordance with BS7671 to all group 2 medical locations.

4.13. FIRE ALARM & DETECTION SYSTEM

Fire alarm and detection will be included in the departmental allowances.

It is proposed to upgrade to the central alarm panel & network to accommodate the additional zones.

Cabling modifications and additions will be required to link the new developments fire alarm system to the site existing system.

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Cooling to all hub rooms will be included within the scheme.

It is assumed a new enhanced data centre will be required to support the existing facility including expansion of the existing unit. This element is being provided as a part of the Trust's existing IT strategy.

DSSR | CONSULTING ENGINEERS

PROJECT | THE SHREWSBURY AND TELFORD HOSPITAL NHS TRUST SUSTAINABLE SERVICES PROGRAMME

LOW AND ZERO CARBON TECHNOLOGY

FEASIBILITY STUDY

DSSR REF: M4556-DSSR-RSH-X-RP-MEP-50001

This Version

Authored by:

name:	S. Greatrex
role:	Executive Mechanical Engineer
signed:	
date:	13th July 2016

Reviewed by:

name:	M.Singleton
role:	Partner
signed:	
date:	13th July 2016

Authorised for Issue by:

name:	**M.Singleton**
role:	**Partner**
signed:	
date:	**13th July 2016**

The signed original of this page is retained by the issuing team.

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Contents

TABLE OF FIGURES

1 EXECUTIVE SUMMARY

This report provides Shrewsbury and Telford Hospital NHS Trust and Design Team Members with an overview of the most appropriate Low and Zero Carbon (LZC) Technologies that could be considered for the proposed Sustainable Services Programme (SSP) at the Royal Shrewsbury Hospital, Shrewsbury. It is intended to eliminate those technologies that are not likely to be suitable whilst identifying potential pros and cons for the identified technologies that would potentially be feasible for this site and within the acceptable commercial limitations of a government organisation. The recommendations within this report have taken into consideration the environmental and economic impact of the various low and LZC energy technologies, with the aim to establish the most appropriate technology in moving forward.

The report reviews the environmental and economic feasibility of various low energy, low impact renewable energy technologies and design methodologies using in house simplified energy modelling software that considers:

a) Energy generated from LZC energy source per year

b) The assessed carbon emission when compared to the base option with no LZC technologies applied

c) Any available grants

d) All technologies appropriate to the site and energy demand of the site incorporating the Option 4 area allowance.

The study has been compiled using the following process:

- A review of the expected applicable energy costs and offsetting tariff subsides available and are summarised in Appendix 1.
- This study uses in house energy profiling software the outputs of which are provided in Appendix 2. The assessed energy profile will require refining against the actual gas and electrical daily/monthly profile information that the Trust can make available.
- A detailed overview of low and zero carbon technologies that *may* be applicable are summarised in the study summarised in Appendix 3

Specific performance requirements for both energy and carbon emissions need to be agreed with the Trust against their Sustainable Development Management Plan, with consideration given to:

- The reduction of the building's regulated CO_2 emissions in line with the NHS Carbon Reduction Strategy for England, "Saving Carbon, Improving Health" January 2009; with a target set to cut carbon emissions with a minimum reduction of 26% by 2010, together with the government measures to provide 20% of the total predicted energy requirements by renewable energy sources by 2020.
- Whilst no specific energy targets have been set for the development, Health Technical Memorandum 07-02:EnCO$_2$de requires an energy performance benchmark for a General

Acute Hospital should be less than 62 / 52 GJ/100 m^3 for an existing hospital / New build (refurbishment), with a corresponding carbon emission benchmark of ∢125 / 105 kg/m^2 CO_2 – Gas, ∢145 / 120 kg/m ^{2} CO_2 – Oil).

The initial high level results are based on many assumptions in developing the initial energy profile summarised in Appendix 2, such as the assumed average heated volume height of 3.8m, that can have a significant impact on GJ / 100m^3 figures.

The initial results of the study show that the varying site options favour various renewable technologies, the table below summarises these options.

	Favourable Technology to Reduce CO_2	Favourable Technology to Reduce Energy
Option B – PRH (Emergency)	1600kWth Bio-mass Boiler	1600kWth Bio-mass Boiler
Option C1 – RSH (Emergency)	1600kWth Bio-mass Boiler	2no 850kWth Gas CHP
Option C2 – RSH (emergency	1no 492kWth Bio-diesel CHP	1no 492kWth Bio-diesel CHP

In comparing the biomass options of wood pellet against wood chip, whilst there is a premium to pay for pellet, this offers the greatest potential for carbon reduction; the amount of on-site fuel storage required is a significant factor when considering biomass fuel deliveries to the site, and this factor alone will establish if biomass is the most appropriate technology for the site.

Supporting the biomass solution with supplementary Solar PV could further improve the on-site renewables, and option 6 assesses the amount of Solar PV required to achieve a 1% reduction to the sites carbon footprint.

An option to reduce the biomass boiler output below 1MW is also included to maximise the renewable Heat Incentive Tariff (identified as option 7), this will result in a reduced energy and carbon performance level.

Consideration has been given to a small scale red diesel plant (492 kW thermal considered in the analysis), providing a comparable carbon performance to that of the biomass wood pellet boiler plant option. In considering this and bio-diesel options there are also known issues with being able to responsibly source the fuel, and the Bio-Diesel option would be recommended to be discounted on basis of experience other Trusts have encountered with reliability and fuel sourcing issues for this particular technology.

Ground Source Heat Pumps could be considered, however their performance will be dictated by the geology of the site. Considering this factor together with the disposition of the existing and proposed building stock will determine the finite location for the well field (that will come at considerable cost). These factors are likely to rule out this option in favour of the biomass and CHP alternatives.

There are potential plant/maintenance savings to be made when comparing the Gas CHP to biomass boiler option, albeit the Gas CHP would deliver a reduced level of carbon reduction.

Fuel deliveries to the site will be a major logistical issue in considering the biomass option, and if this can be accommodated, biomass is likely to be the favoured technology for minimising the carbon footprint on the site.

Should the logistical fuel deliveries prove to be an issue that cannot be accommodated by the site, gas CHP would be the preferred solution, at the expense of achieving a reduced carbon footprint.

2 FINANCIAL INCENTIVES

It is not justifiable to rule out a specific technology due to unfavourable financial cost. In an attempt to encourage the installation of renewable technologies, a number of grant schemes, such as that offered by Salix Finance Ltd (an independent, not for profit company), funded by The Department for Energy and Climate Change, The Welsh Assembly Government and The Scottish Government via the Carbon Trust; together with Low Carbon Building Programme (LCBP) managed by the Building Research Establishment (BRE) for public sector and charitable organisations was introduced.

It has been realised that these grants can relieve some of the financial burden and in turn increase the viability of some renewable technologies.

Unfortunately the LCBP is now closed and more recently the capital expenditure based grant funding has been replaced by two revenue based incentives which are open to everyone known as the Feed in Tariff and Renewable Heat Incentive Schemes.

Feed-In Tariffs offer an income on on-site LZC electrical generation. This forms the base tariff. The amount of income is dependent on the technology and scale of installation. In addition to the generation tariff there is additional revenue based on excess electrical generation being fed back into the grid. This is available from April 2010.

The Renewable Heat Incentive (RHI) will offer similar revenue based upon the LZC generated heat. This incentive is based upon the size of installation rather than the metered output to avoid wasting heat.

Projects that attract either Feed In Tariff (FIT) or Renewable Heat Incentive (RHI) payments are not eligible for Salix funding. Refer to Appendix 1 for details of the tariff rates applied in this analysis.

2.1 Feed in Tariff

Renewable generation systems up to a capacity of 5MW are eligible under the new Government Funded Feed-In Tariffs (FIT) scheme, which was introduced in April 2010. A large number of electricity-producing renewable energy systems are eligible for FITs.

The systems below 50kW need to be Micro-generation Certification Scheme (MCS) (www.microgenerationcertification.org) certified and are to be installed by a MCS accredited company.

For larger systems there is an accreditation process called 'ROO-FIT' through the Renewables and CHP Register (www.renewablesandchp.ofgem.gov.uk).

The simplest way to benefit from feed-in tariffs is to utilise a registered FIT licensed supplier, who will handle all the paperwork for you. The link gives a list of current registered suppliers: www.ofgem.gov.uk/SUSTAINABILITY/ENVIRONMENT/FITS/RFITLS/Pages/rfitls.aspx

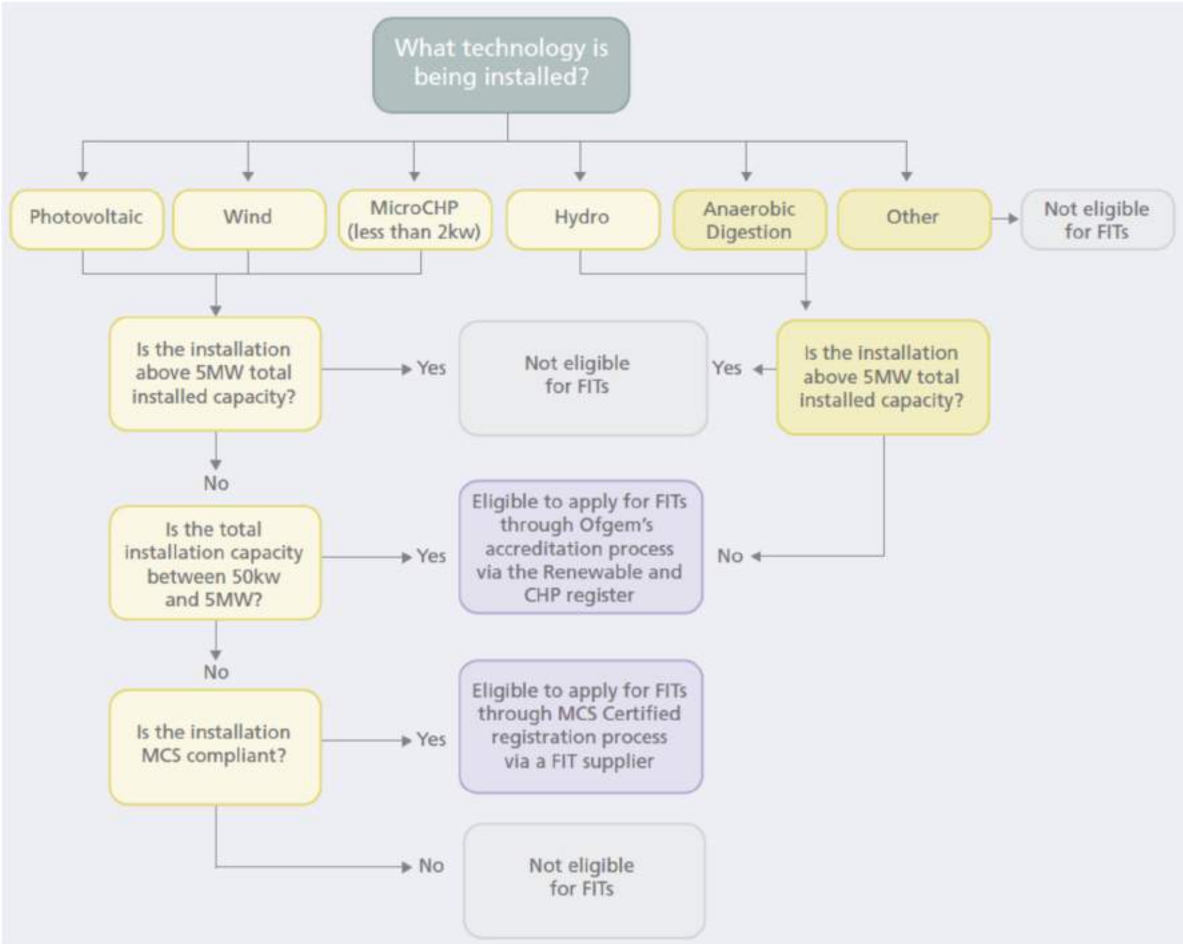

Figure 1 - FIT Flow Chart (Source: DECC)

The potential income from FIT will depend on the size and type of technology installed.

The table below highlights the tariff bands for Photovoltaics and Wind Turbines which would be the technologies most likely to be suitable for this development.

FITs are also applicable to the following technologies: anaerobic digestion, hydro and micro CHP (<2kW).

2.2 Renewable Heat Incentive

This incentive is aimed at renewable heat installations of all sizes, covering the following technologies:

- Biomass
- Solar Thermal Hot Water
- Ground Source Heat Pumps
- Biomass CHP
- Biomethane injected into the gas grid.

Announcements from DECC have resulted in a few changes to the proposed RHI, namely the way in which RHI will be calculated and which technologies will be applicable, with Air Source Heat pumps recently being re-introduced into the RHI Scheme.

2.3 Payments - Generation Tariff

All payments will be made based upon metered rather than estimated kilowatt hours, therefore to qualify for the tariffs the gross amount of electricity produced by the generator, the amount that is exported and the amount that is imported would all be required to be metered. The decision to base payments on the metered generation rather than the installed capacity encourages the installation of technologies in appropriate locations i.e. where optimum generation can be achieved. Where multiple technologies are installed within the same building / site, the generator will receive different payments from each of the technologies as they have individual generation tariffs.

Generation tariff which is to be a fixed payment from the electricity supplier for every kWh generated. Once a tariff band has been allocated, this is the tariff that the system will receive for the full tariff lifetime i.e. if a wind turbine earns 28p/kWh in the first year, it will earn 28p/kW in the 20th year, although it should be noted that the tariffs will be index-linked for inflation.

2.4 Export Tariff

The export tariff is dependent on the deal provided by the proposed supplier, but is generally a minimum of 4.91p/kWh, which is in addition to the generation tariff for every kilowatt hour exported to the wider electricity market i.e. if 2kW PV array installed then potential income of 0.74p/kWh (generation tariff) PLUS 4.91p/kWh (export tariff).

2.5 Further Information

Ofgem (http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx) act as

administrators for the Feed in Tariffs, with further guidance available from the DECC

Department of Energy and Climate Change

(http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx).

3 ALTERNATIVE / RENEWABLE ENERGY TECHNOLOGY OVERVIEW

At present the UK utilises fossil fuels to provide the majority of its energy, with the most significant proportion via natural gas. Renewable energy currently contributes to approximately 3% of the total. However, due to changes in legislation, this value is set to rise significantly.

Renewable energy comes from sources that are essentially inexhaustible, including the sun, wind, flowing water and the heat of the Earth. Its use can provide many benefits, including:

- The use of secure, local and replenishable sources.
- Reduced dependence upon non-renewable energy
- Improved air quality.
- Reduced carbon dioxide and other greenhouse gas emissions.

The benefits of the various LZC technologies in respect to their effectiveness at reducing the depletion of natural fossil fuels are summarised in Tables 2 & 3, Appendices 3. The primary drivers for such technologies as an alternative to the more traditional methods of services generation are clearly demonstrated with reduced carbon dioxide and other greenhouse gas emissions. However, the adaptation of our environmental responsibilities comes at an economic price.

When comparing the renewable technologies with their traditional counterparts, the initial upfront financial outlay may not be favourable towards renewables. Similarly, it can also be observed from the analysis that the option that demonstrates the greatest energy reduction does not result in the greatest reduction in Carbon Emissions. However, a whole life costing analysis has been undertaken to compare the equivalent annual weighted cost with the comparative annual operating cost to provide an assessed comparative payback indicator to assist the Trust in the decision process.

The analysis can take into consideration the different forms of government financial incentives (as appropriate to the site) from revenue streams such as Renewable Obligation Certificates (ROC's), Climate Change Levy (CCL), the proposed Renewable Heat Incentives (RHI's), Feed In Tariffs (FIT's) and the cost allowances associated with the Carbon Reduction Commitment (CRC) that all help to make the LZC options more attractive, whilst recognising the environmental benefits that these technologies will provide.

Table 2, Appendix 3 provides a matrix comparing the LZC energy solutions considered against baseline option 1 where no LZC technologies have been applied.

The options include individual LZC technologies such as Bio Diesel, Biomass and Solar PV; and options to consider grouping of appropriate technologies to optimise their potential to reduce carbon emissions can be considered to provide diversified resilience to the developments energy supplies.

Table 3, Appendix 3 provides an indication of the availability of a particular LZC technology and is useful in assessing their contribution they make to the overall energy utilisation of the building. This is useful in assessing the interaction that is likely to occur when multiple technologies are combined to satisfy the energy loads of the site, and the impact that this has on reducing running costs.
The following section of the report will provide a brief explanation of the various LZC Technologies available and will then assess the feasibility of their use within this development.

Low and Zero Carbon technologies include:

- Ground Source Heat Pumps
- Air Source Heat Pumps
- Photovoltaic Panels
- Solar Thermal Collectors
- Small Scale Hydro
- Wind
- Tidal
- Wave
- CHP (fed by natural gas, bio gas and biomass)
- CCHP
- Community CHP Heating Schemes
- Biomass boilers
- Fuel cells (not limited to hydrogen)
- Hydrogen generation
- Heat exchange recovery systems

Each of the available technologies applicable to this site will be assessed in the following sections for viability of inclusion. Each technology will be assessed in relation to energy generation, noise levels, payback periods, fuel type and available grants amongst other factors.

Due to site location the following technologies are not applicable and will not be included in this feasibility report – small scale hydro, water source heat pumps (WSHP), wind, tidal and wave. There are also technologies, such as fuel cells and hydrogen generation, that are not developed sufficiently or are not able to be mass produced to allow for installation on commercial sites.

Although it is important to consider all LZC technologies and to encourage the growth of those technologies which are relatively unknown, it is also important to be realistic and select technologies that will be viable in both operational and financial terms. It should be noted that although the financial cost is not considered a viable reason to reject certain technologies, it is in the best interest to select a technology that is cost effective and best suited to its application.

3.1 Ground Source Heat Pump

3.1.1 Introduction

Ground source heat pumps (GSHP's) are widely used in buildings, both residential and commercial, for space heating/cooling and domestic hot water (DHW) provision. Applications include hospitals, offices, schools, shops, hotels, sports complexes, institutional buildings etc. In Northern and Western Europe the market is growing due mainly to increased building occupation density and the subsequent demand for space cooling.

The principal issues with Ground Source Systems are ground related; the practicality of installation and the outputs to be expected are ultimately ground related and subject to local geological surveys, which are usually carried out by contractors specialising in groundwater boreholes.

The first stage is for the contractor to carry out a desktop study using local geological records, which can give an accuracy of up to 95% as to the likely yield of the site. If the desktop uncovers any uncertainties, then a test borehole will need to be carried out on site.

The most cost effective ground solution is to install horizontal coils into trenches circa 1500mm deep. However, if space is limited or if there is bedrock/large boulders within 1500mm of the surface, it will be necessary to sink vertical collectors in boreholes. For horizontal installations with "typical" ground conditions, around 50 – 80m of trench pipework is required for 1 kW of heat output. Due to space limitations, vertical boreholes were considered for this analysis.

Vertical boreholes have a diameter of approximately 100-150mm, with each borehole to be spaced at 5-6m distance, and with each metre of ground loop typically providing approximately 50W, 4-5kW of heat can be produced per borehole.

A GSHP system is composed of an electric / gas powered vapour compression cycle heat pump unit linked to a closed loop heat exchanger buried in the ground. Most commonly they are indirect systems, using either water or anti-freeze solution to circulate through sealed thermoplastic underground loops, whilst the energy is transferred to the refrigerant circuit through a separate heat exchanger.

Closed loop ground source heat pumps utilise low level heat created through solar gains to the surrounding ground. GSHP systems operate by circulating fluids (typically refrigerant gases and a compressor) either through horizontal ground trenches; known as 'slinkys' or through closed loop vertical boreholes. The GSHP systems can also work in reverse to provide cooling, whichever mode of operation the system is in the pipework extracts or disperses heat to the ground and a heat exchanger within the heat pump utilises the heat/coolth from the fluid.

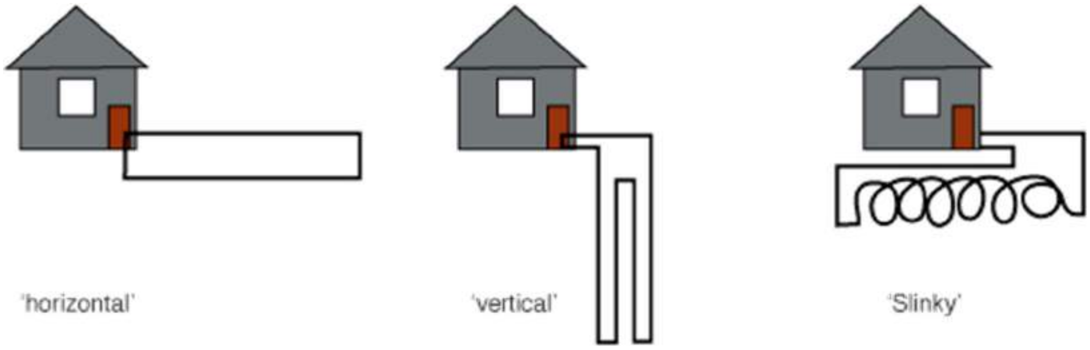

Figure 2 - Basic GSHP Schematic

3.1.2 Building Heating Distribution System Integration and DHW Provision

The network of in-ground heat exchangers can be used with a range of building heating and cooling distribution systems. These may include central systems with all heat pumps in a central plant room, modular systems with dedicated heat pumps and ground loops in individual zones, or distributed systems where the GSHP is used to replace the boiler and cooling tower in a building water loop heat pump system. Depending upon heating system design, different heating water flow temperatures may be required. In general, ground source heat pumps reach a maximum flow temperature of approximately 55ºC.

To achieve a high performance factor, a flow temperature as low as possible (Typically 35ºC) should be sought using underfloor heating. The lower the temperature differences between the heat source (ground) and the energy-using system (heating system), the higher the performance factor. Typical coefficients of performance (COP's) of 4 are common, which corresponds to a quadrupling of power output in comparison to the electrical power input. This figure will either increase or decrease depending upon the relationship of duty compared to the building demand and any weather compensation capabilities.

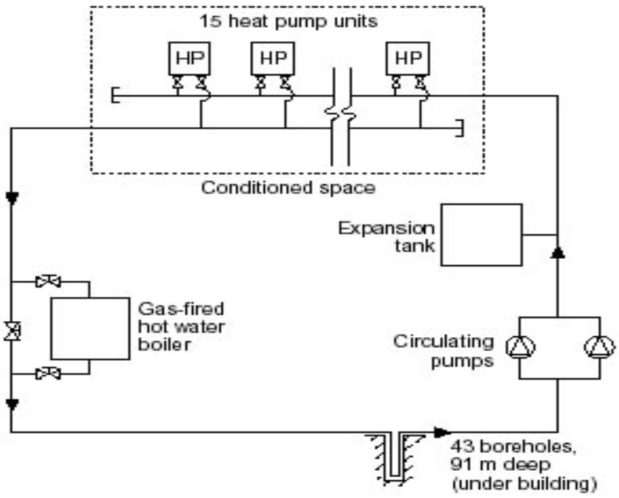

Figure 3 - An Example Multiple GSHP Schematic

In contrast to space heating, DHW requires a generally consistent hot water volume and temperature level all year round. With a maximum water flow temperature of 55ºC, the achievable DHW cylinder storage temperature is approximately 45ºC. Greater cylinder storage temperatures are achievable via supplementary electrical immersion or instantaneous DHW heaters downstream of the cylinder. Preferably, domestic hot water should be heated during the night (beneficial tariffs), thereby enabling the heat pump heating output available during the day solely for heating purposes.

3.1.3 Natural Cooling

GSHP's perform due to stable source temperatures (~ 10ºC in the UK); however, energy consumption is still regarded as high. An energy lean approach could be to use the natural cooling function of the GSHP. This uses minimal power consumption for circulating pumps whilst the heat pump mechanism remains out of operation. The ground temperature (approx. 8ºC – 12ºC) can be utilised for cooling via a heat exchanger which is connected in series in the primary circuit for system separation.

This system can be used in conjunction with fanned convectors, cooled ceilings, underfloor heating systems, concrete core tempering etc.

3.1.4 Economics and Performance

The horizontal closed loop would require large areas of open land free from services and obstructions and would prove difficult to apply for this development and will be subject to a suitable geological ground survey, consideration could be given to using a vertical closed loop system. These types of system would require no ground water abstraction or discharge licences, and dependent upon the building foundation solution can potentially be integrated as a vertical energy pile.

For the purpose of this analysis the visitor car park to the southern side of the site is considered the most favourable location for a closed loop ground source well field.

*It should be noted that final sizing of ground loops for GSHPs is a complex process with a significant number of variables, hence it must be emphasised that these figures are purely to give an indication of the broad extent of installation required. Ground Source Heat Pump systems also have very low maintenance costs and can be expected to provide reliable and environmentally friendly heating for in excess of 20 years.

Accurate sizing is essential as excessive equipment capacity is frequently associated with disproportionate system costs. Therefore, it is primarily necessary to establish the standard building heat requirement.

The capital cost of a GSHP is made up of the equipment costs for the heat pump unit, the ground coil piping, the distribution system and the corresponding installation costs. The cost for a borehole based ground installation and heat pump will be considerable if this option is to be given further consideration.

Payback times for GSHP systems when compared with alternative systems depend on the relative energy costs. For systems used in commercial / institutional buildings the economics are not as favourable when compared to other technologies. These are larger systems designed to provide heating and cooling, and there are some economies of scale.

Summary of points to consider are:

Pros :

- Well established technology, high reliability, minimal maintenance and long equipment lifetimes.
- Ability to provide space heating/cooling and domestic hot water.
- GSHP, qualify for the Renewable Heat Incentive at higher rates when compared to ASHP.

- Utilisation of renewable energy, high energy efficiency, low associated CO_2 emissions and zero local pollution.
- Calculation of reduction in carbon dioxide emissions will depend on the COP of the GSHP
- Higher COP compared to ASHP
- Average energy savings ≥ 50% compared with direct electric heating.
- Reduced running/maintenance costs than many alternative systems.
- Low noise, good aesthetics and security.
- No fuel storage required, although the boreholes/trenches will need to be taken into
- Consideration when drawing up a construction programme.
- Refrigerants available with zero ODP and GWP.
- Increased safety, no fuel tank requirements/combustion or explosive gases.

Cons :

- Market barriers include, cheap fossil fuel alternatives, awareness and perceived reliability/performance problems.
- Relatively high capital costs.
- If utilised for heating regime alone then the full value of the system is not realised.
- Fuel costs potentially higher than a gas/oil boiler.
- Requirement for land use to facilitate boreholes/trenching
- Underfloor heating is most suited to heat pump solutions due to the low grade heat that is produced. Separate boiler / generation plant would be required to provide the higher temperature LPHW required to generate DHWS. If underfloor heating is not considered the most appropriate heat distribution system, then oversized radiators or fan assisted convectors would be required.
- Will require electric booster if using GSHP to provide DHW
- Utilise electricity to operate (more expensive & carbon-intensive fuel source than gas or oil).
- Like ASHP, the anticipated noise levels of GSHP do not exceed the levels of normal conversation. However attenuation measures would be implemented if the installed plant caused an increase in the existing background noise level, particularly if Pol 05 (BREEAM 2011) is to be targeted.
- Higher capital cost compared to ASHP.

Ground source heat pumps are an expensive solution to heat/cool a building and the number of boreholes required to suit the building demands over a 24 hour period will be significant.

3.2 Air Source Heat Pump

3.2.1 Introduction

Air Source Heat Pumps (ASHP's) apply the same technology as discussed for the GSHP, but use the external ambient air rather than a closed circuit pipe loop buried in the ground. They are similarly applied in residential and commercial buildings for space heating/cooling and domestic hot water (DHW) provision.

The seasonal performance of the heat pump unit is not as high as that offered by an equivalent GSHP system. This is due to the unit being exposed to lower external ambient temperatures during colder weather periods when compared to that of the GSHP alternative. Heat extracted from the external air is transferred to the indoor distribution system for space heating purposes and hot water provision. During the summer the system can be reversed to provide space cooling, using the external ambient air as a heat sink to absorb the heat removed from the building.

Air Source Heat Pumps absorb heat from the external ambient air to space heating for the building. ASHP can extract useful heat from air at temperatures as low as -15°C. Air-to-air ASHP systems provide treated air, which is circulated through a dry heating system; whilst air-to-water systems utilise a wet heating system typically through radiators or an underfloor system.

The benefits of ASHP are similar to Ground Source Heat Pumps. Neither type of system requires the storage of external fuel. The system runs on electricity and is vastly more efficient than an electrical/gas supplied heating system as for every unit of electricity used to power the pump, approximately 3-4 units of heat can be produced. ASHP presents a financial advantage over GHSP because they do not have any drilling/excavation requirements.

It should be noted that this past couple of winters has shown that ASHP experience a considerable drop in the coefficient of performance (COP) once outdoor temperatures reach -10°C and below.
ASHP, in the form of a VRF system, can be a very efficient way of providing heating and cooling, where used throughout a building. VRF is more than just a heat pump; it also includes heat recovery which improves efficiency by diverting exhaust heat from the fan coil units in cooling mode to areas that require heating, this significantly improves the efficiency of the system, and works well in building where there is a combination of heating a cooling required.

Figure 4 - Example of an ASHP

3.2.2 Building Heating Distribution System Integration and DHW Provision

The ASHP technology would connect into the range of building heating and cooling distribution systems. These may include externally located central systems where the heat pumps replace the conventional centralised air cooled chiller plant or internally within a central plant room (connected to the outdoor heat exchanger via a refrigerant circuit).

Systems can be de-centralised with dedicated heat pumps connected to individual rooms/zones, with the energy transferred between the internal and external units via local refrigerant pipework.

Dependent upon the heating system design, different heating water flow temperatures may be required and similar to ground source heat pumps can reach a maximum heating water flow temperature of approximately 55℃, albeit there are now technologies available that have the potential to raise water flow temperatures to 70℃ for the purpose of domestic hot water, albeit, there is a significant drop off in its COP related performance.

To achieve high performance factors, the temperature differences between the heat source and the energy-using system (heating system) should be minimised with average coefficients of performance (COP's) typically approaching 3.7, and will always be less than that offered by an equivalent GSHP solution. This figure will either increase or decrease depending upon the relationship of duty compared to the building demand, external air temperature and any weather compensation capabilities.

In contrast to space heating, DHW requires a generally consistent hot water volume and temperature level all year round. Whist there is the potential for the ASHP system to offer a maximum water flow temperature of 70℃, the achievable DHW cylinder storage temperature could be lower. To ensure that the cylinder storage temperatures are maintained, supplementary heating via electrical immersion or instantaneous DHW heaters downstream of the cylinder would be required as described for the GSHP.

3.2.3 Economics and Performance

For this technology to be considered the location and strategy for applying ASHP's will dictate where this technology can be applied. ASHP's would tend to supplement the heating provided by the central boiler plant to serve air handling plant.

Accurate sizing of the plant is essential with minimum turndown capacities typically being 50% (when compared to that of GSHP's where a value approaching 20% would be more typical).

Without the additional costs associated with the ground coil distribution system, payback times for an ASHP systems are significantly lower than that of an equivalent GSHP solution but higher compared with other alternative systems, this being very much dependent upon the relative energy costs. For systems used in commercial / institutional buildings the economics are not as favourable when compared to other technologies.

Summary of points to consider are:

Pros :

- Well established technology, high reliability, minimal maintenance and long equipment lifetimes.
- Ability to provide space heating/cooling and domestic hot water.
- Utilisation of renewable energy, high energy efficiency, low associated CO_2 emissions and zero local pollution.
- Average energy savings ≥ 50% compared with direct electric heating.
- Reduced running/maintenance costs when compared to many alternative systems.
- Low noise, good aesthetics and security.
- No fuel storage required.
- Refrigerants available with zero ODP and GWP.
- Increased safety, no fuel tank requirements/combustion or explosive gases.
- Payback periods depend on the fuel being replaced & ASHP are a good option where gas is unavailable.
- Where no cooling is required, underfloor heating is most suited to heat pump solutions due to the low grade heat that is produced.
- Air-to-air ASHP have a better coefficient of performance (COP) compared with air-to-water ASHP
- Air-to-air ASHP have a comparable/higher COP compared to GSHP; (whilst air-to-water ASHP have a lower COP compared to GSHP).
- No fuel storage required, although there will be a space requirement for the internal and external components of the system
- Lower capital costs compared to GSHP

Cons :

- ASHP, unlike GSHP, no longer qualify for the Renewable Heat Incentive.
- Lower COP compared to GSHP Calculation of reduction in carbon dioxide emissions will depend on the external temperature.
- Consideration should be given to a 7000 litre thermal buffer tank to maintain heating whilst the ASHP undergoes its defrost cycle (Typically 20 minutes).
- Air-to-air ASHP require a ventilation system with fans to circulate the warm air.
- Separate boiler / generation plant would be required to provide the higher temperature LPHW required to generate DHWS. If underfloor heating is not considered the most appropriate heat distribution system, then oversized radiators or fan assisted convectors would be required.
- Utilise electricity to operate (more expensive & carbon-intensive fuel source than gas or oil)
- Air Source Heat Pumps are no longer considered under the proposed Renewable Heat Incentive.
- It can be seen from the figure below that the noise levels of the air source heat pumps units (both indoor and outdoor) do not exceed the level of a normal conversation. However attenuation measures would be implemented if the installed plant caused an increase in the existing background noise level, particularly if Pol 05 (BREEAM 2011) is to be targeted.

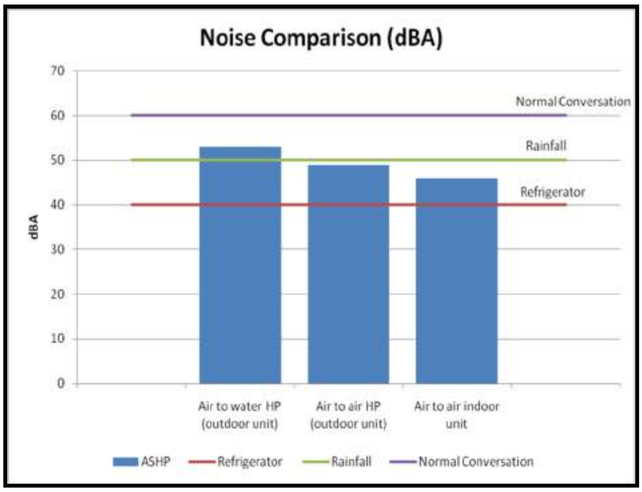

Figure 5 - Noise Comparison – ASHP vs. Common Noise Sources

3.3 Photovoltaics (PV)

3.3.1 Introduction

Photovoltaic (PV) cells convert the sun's energy directly into electrical energy using semiconductor technology. The electricity generated is used to power ordinary electrical equipment e.g. appliances, computers and lighting.

The cells can be made from a number of materials, however silicon based cells are the most common. When the silicon is exposed to light, electrical charges are generated and this is conducted away as direct current. There are three different types of silicon cell and their efficiencies at converting solar energy to electrical energy vary. Generally, the more costly the cell the more efficient the electricity generation. Since the electrical output from a single cell is small, multiple photovoltaic cells are connected together in series and encapsulated into modules containing a number of cells in order to generate sufficient output voltage. In turn the modules are connected in series and parallel to form arrays. The PV module is the principle building block of a PV system and any number of arrays can be connected together to give the desired electrical output. The electrical power output can be harmonised with grid electricity and fed back into the network. To achieve this, an inverter is required to convert the direct current (DC) power generated into useful alternating current (AC). Figure 9 illustrates the process from PV array to distribution board (and exportation to the grid).

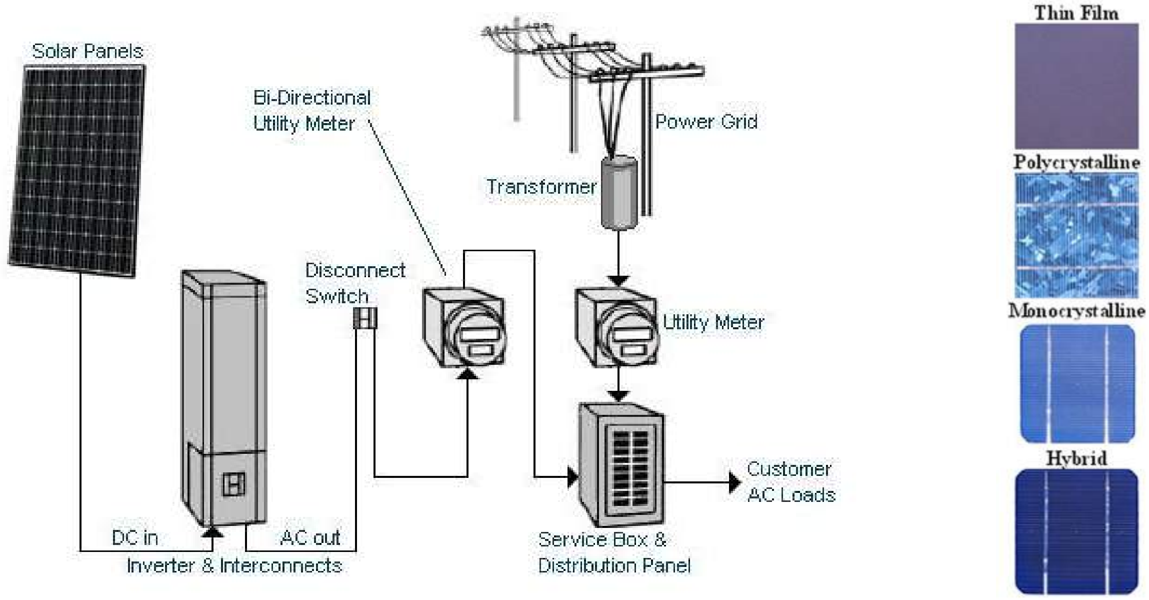

Figure 6 - Schematic of PV System/VP Cell Types

There are a number of PV cells available which offer different efficiencies and characteristics;

- Polycrystalline (Poly-Si) is made from thin slices cut from a block of silicon crystals. Polycrystalline arrays requires around 12 m^2 per kWp

- Monocrystalline is made from thin slices cut from a single crystal of silicon. Monocrystalline arrays requires around 11 m^2 per kWp

- Thin Film technology (also known as Amorphous A-Si) is made from a very thin layer of semiconductor atoms deposited on a glass or metal base. Thin Film technology offers the most flexibility as it can be applied to building facades etc. However Thin Film requires around 24 m^2 per kWp.

- Relatively new to the PV market are hybrid cells which combine monocrystalline with thin film technology as a more-efficient alternative to thin film cells at higher temperatures.

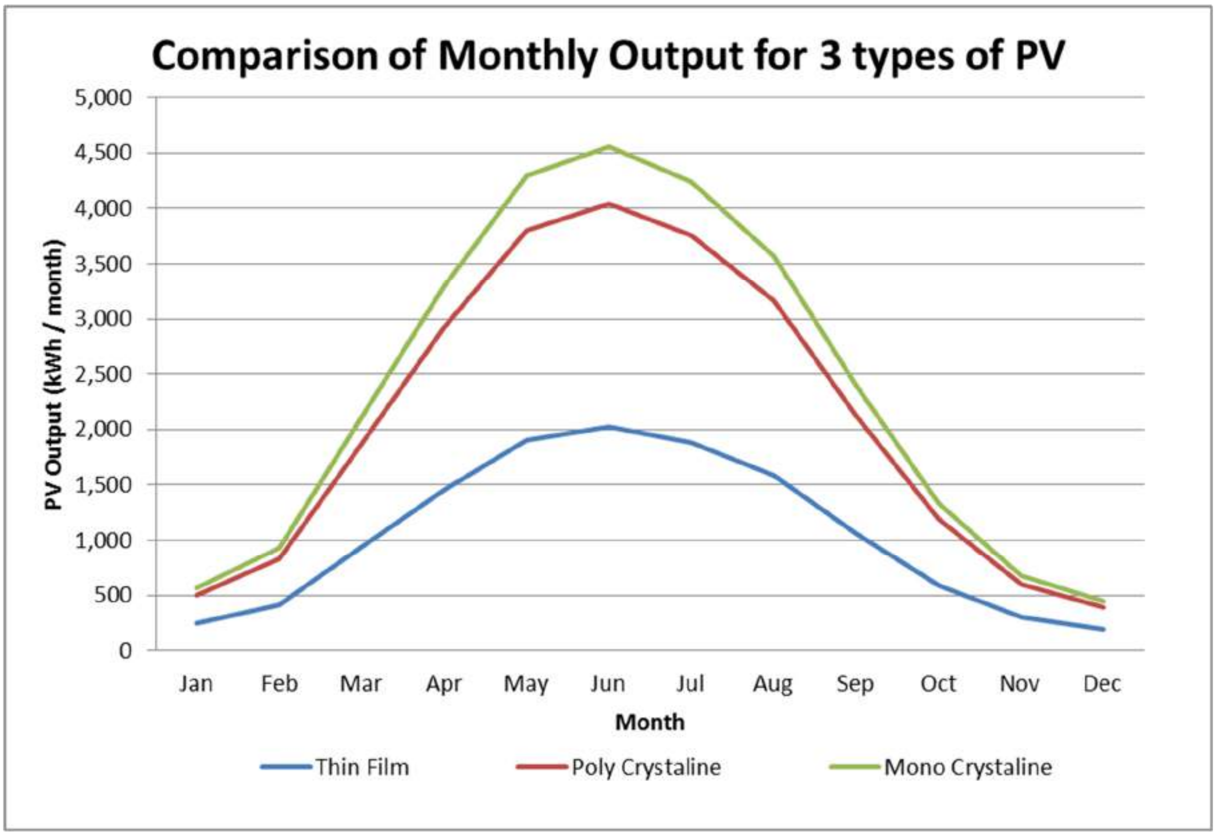

Figure 7 - Comparison of Monthly Output from a 300m² of Different PV Array Types

3.3.2 Building Incorporation

Modules are commercially available in a variety of configurations, including:

- Framed and unframed standard panels.
- Glass-glass semi-transparent laminates.
- Roof tiles (for building-integrated applications).

PV systems can be incorporated into buildings in various ways:

- Sloping rooftops are an ideal site - where modules can simply be mounted using frames.
- Within the actual building fabric e.g. PV roof tiles are fitted as traditional tiling.
- Integral to building facades, canopies and skylights etc.

Any shading of a PV array adversely affects power output, and even small amounts of shading (e.g. 5% of one panel) can reduce the output of much larger sections of the array. This is because PV cells need to connected in series strings to increase the output voltage, and each string can only generate as much current as the weakest cell in the string (e.g. a shaded cell). During the detailed design stage shading needs to be thoroughly assessed and optimum positioning evaluated.

In the UK, arrays should be orientated as close to South-facing as possible with a 30º tilt (as measured from horizontal). Tilt is more critical than azimuth however a tilt of between 10 and 55º should result in less than 5% loss compared to optimum.

With regards to electrical requirements, the Distribution Network Operator (DNO) will need to be contacted to apply for a grid connection for the system and to commission the installation. Also, appropriate plant room or roof space will be required for location of inverters and distribution boards.

	Orientation: Compass bearing (°) measured from north													
			West 270°	255°	240°	SW 225°	210°	195°	South 180°	165°	150°	SE 135°	120°	105°	East 90°
Horizontal (°)	Angle (°) from horizontal	0	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
		10	89%	91%	92%	94%	95%	95%	96%	95%	95%	94%	93%	91%	90%
		20	87%	90%	93%	96%	97%	98%	98%	98%	97%	96%	94%	91%	88%
		30	86%	89%	93%	96%	98%	99%	100%	100%	98%	96%	94%	90%	86%
		40	82%	86%	90%	95%	97%	99%	100%	99%	98%	96%	92%	88%	84%
		50	78%	84%	88%	92%	95%	96%	97%	97%	96%	93%	89%	85%	80%
		60	74%	79%	84%	87%	90%	91%	93%	93%	92%	89%	86%	81%	76%
		70	69%	74%	78%	82%	85%	86%	87%	87%	86%	84%	80%	76%	70%
		80	63%	68%	72%	75%	77%	79%	80%	80%	79%	77%	74%	69%	65%
Vertical (°)		90	56%	60%	64%	67%	69%	71%	71%	71%	71%	69%	65%	62%	58%

55%	60%	65%	70%	75%	80%	85%	90%	95%	100%

Less Efficient — More Efficient

Note: Near horizontal 0° angles are not recommended as self-cleaning cannot be relied on up to about 10°. Source Guide to the installation of PV systems, 2nd Edition.

Figure 8 - Orientation Calculation – Efficiency of PV System

Another small scale application utilising solar power would be for Energy Consumption Displays in Reception areas, for example.

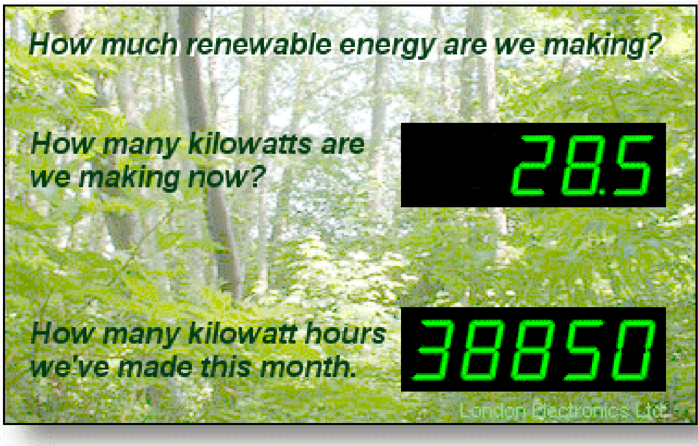

Figure 9 - Solar Powered Energy Display

3.3.3 Economics and Performance

PV systems supply electricity to many applications in the UK, often operating in conjunction with connection to the local electricity network in order that demand is met during conditions of low insolation (e.g. cloudy days). In addition, grid connection allows the installation to operate as an electricity producer and sell excess or unwanted electricity back to the grid.

Photovoltaics offer clean (zero CO_2 emissions for electricity generation), long life, low maintenance electricity generation with no moving parts and are also aesthetically appealing – an excellent 'green branding' tool. However, like most renewable energy technologies dependent on weather, the supply of power is intermittent, although the system can be designed to use all the energy onsite cumulatively, with the grid connection as a reservoir. PVs have a high capital cost, however, they can be cost competitive with some of the more expensive cladding materials.

Government funding from the Feed In Tarriff payment scheme is making PV a more attractive solution given the reduced payback periods which will now allow the system to pay back within the lifetime of the product.

PV may prove to be a challenge to incorporate into the existing building stock and potentially integrated into the roof of new build elements and the relative locations of the panels placed to ensure that no shading obstructions from adjoining roof structures impact on their siting.

Areas of roof required to make the carbon emissions will be significant and make this technology inappropriate as a standalone system and would only be considered as a supplementary technology in support of other LZC technologies not affected by the base load electrical profile.

Summary of points to consider are:

Pros :

- Photovoltaic panels are not a source of noise.

- Require no additional plant storage, just a connection to the main distribution board & a meter; in addition to the G59 equipment required.

- Excess electricity generated can be exported back to the Grid and would benefit for the “export” tariff under the Feed-In Tariff scheme in addition to the “generation” tariff.

- Reduction in carbon dioxide emissions will be directly linked to the amount of mains electricity displaced as there is no fuel required to operate the photovoltaic panels.

- Each kWp could generate approximately 1006kWh/yr (orientation, tilt and location will impact on this figure).

- With the potential health issues associated with the application of solar hot water systems in health care building, a PV system may be selected in favour of a solar thermal system when additional LZC systems may to be considered to provide the primary low carbon energy source, supplemented by a PV system as demonstrated in Phase 1 loads associated with option 11.

Cons :

- Structural calculations will be required to determine the load impact on building.

- Photovoltaic Panels compete with the same roof space as that of solar thermal collectors

- Higher capital costs associated of PV would favour a solar thermal systems.

3.4 Solar Thermal Collectors

3.4.1 Introduction

Solar thermal heating refers to heating systems that harness incoming solar radiation using panel collectors on the roof or façade of a building to heat air or water and convert this to useful heat for space or hot water pre-heating in a building. Solar technologies are commercially available in two forms – flat plate collectors (FPC) or evacuated tube collectors (ETC).

Wind and cold temperatures have less effect on the efficiency of ETC due to the vacuum which greatly reduces the conductive and convective losses. ETC have another advantage over the FPC in that they can operate in sub-zero temperatures without expensive specialist “anti-freeze” systems.

- ***Flat plate collectors*** use a flat black absorption plate with copper tubing bonded to the back. Water is passed through the tubing, removing heat from the plate. Where there is less of a collector space constraint, flat plate collectors are much cheaper than evacuated tube collectors.

- ***Evacuated tube collectors*** consist of highly efficient heat conductors (perhaps solid or containing a fluid) within evacuated glass tubes that are designed to maximise the energy collected from solar radiation and minimise radiation losses. The tubes are connected to a highly insulated manifold heat exchanger, where the water is heated.

Ideally, to provide optimum output, the panels need to face south, at least between E and SE or W and SW and the collectors need a tilt of the roof between 30°C and 60°C similar to that of PV arrays and should not be shaded by any obstructions. The collectors can be installed horizontally or vertically, (although this reduces their efficiency).

Figure 10 - Evacuated Tube Solar Water Heating

Flat plate solar collectors can produce similar heat output to evacuated tube collectors, but generally only during warm, still, sunny conditions. When averaged over an entire year, evacuated tube collector heat output per net m^2 of absorber area, is around 25% to 40% greater that a flat plate collector.

The fluid is sometimes used directly from the collector for water heating, but is more commonly used to transfer the heat to a separate water supply that is then used in a conventional way. Most systems are robust and reliable, giving on average 20 years useful service.

3.4.2 Building Incorporation

Solar thermal systems for water heating generally integrate into existing heating systems (e.g. gas-fired) by using either a single hot water cylinder with two heating coils, or two separate cylinders. The system would be heavily insulated, and the tank would probably be tall and thin to enable stratification of the heated water. A large enough heat store is required to

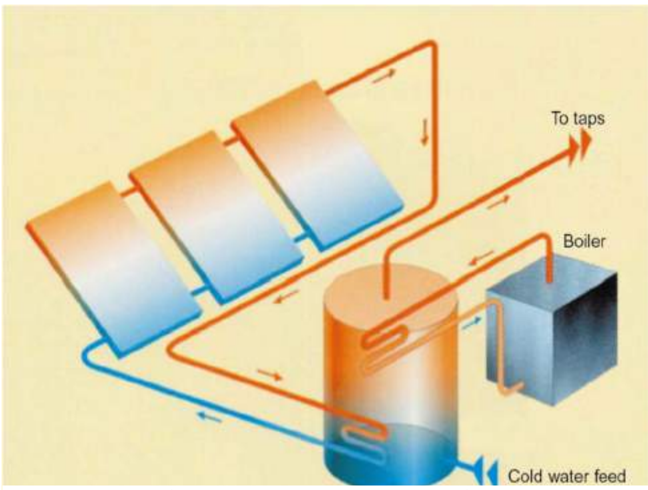

Figure 11 - Schematic of a Typical Solar Heating System

absorb summer peaks without overheating or boiling within the storage tank. The solar heating system must be combined with another heating system to provide a top up during winter months (when there is less insulation) and further boost temperatures if necessary.

A pump is used to circulate the fluid that enables the heat transfer, the energy requirement of which and any associated control systems) must be taken into account in the design.

As for PV, collectors in the UK should be orientated as close to South-facing as possible with a 30º tilt (as measured from horizontal). Tilt is more critical than azimuth however a tilt of between 10 and 55º should result in less than 5% loss compared to optimum.

Solar access should also be considered in respect to potential shading from obstacles such as buildings, adjacent roof lines, flues and trees.

Appropriate plant room space will be required for the storage tank and due account should be taken of the necessary pipework and pumping. System manufacturers can advise on this.

3.4.3 Economics and Performance

Through known occupancy figures it is possible to calculate the worst case daily hot water consumption and determine the system size and area of roof panel required to meet any percentage of the demand.

Due to climatic conditions, less solar insolation is available when space heating is most demanded (Mornings / evenings and winter months), whilst peak hot water generation will be during the summer months. The graph shown below illustrates the percentage solar coverage for a 24 m² array throughout an English year. It can be seen that it is necessary to use an additional DHW system to cover the load not met by the solar collectors, especially during the winter months.

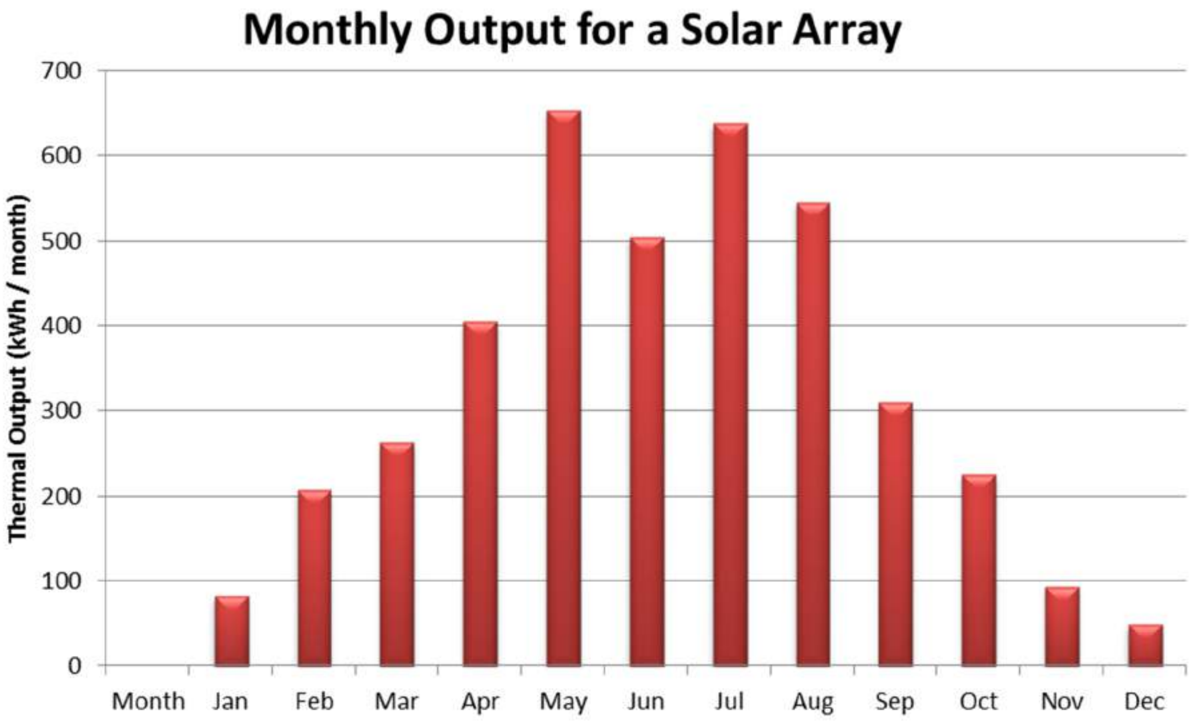

Figure 12 - Solar Hot Water Annual Solar Coverage

The solar contribution proportion of the annual hot water load profile from the array will not be able to accommodate the building demand profile without significantly increasing the amount of pre tank storage that is not recommended if issues relating to Legionella are to be minimised and for these reasons is not considered to be appropriate for healthcare buildings and has neen discounted from this study.

Active solar hot water does provide a relatively simple environmentally friendly methodology to produce DHW, however, combined operation with another heating system is necessary to provide top-up and boost temperatures when required. The technology is well suited to applications with consistent water demand patterns. There is a relatively high capital cost but payback periods are favourable for long term projects, especially in conjunction with grant funding.

Summary of points to consider are:

Pros :

- Solar thermal collectors are not a source of noise.
- Eligible for Renewable Heat Incentive
- Reduction in carbon dioxide emissions will be directly linked to the amount of mains gas displaced as there is no fuel required to operate the solar thermal collectors (however power is required to operate the circulator pump).

- Each m² of collector is anticipated to generate approximately 140kWh / 190kWh for Flat Plate and Evacuated Tube respectively (orientation, tilt and location will impact on this figure).

- Solar Thermal Collectors compete with the same roof space as solar PV but also for the same solar irradiation. It would be anticipated due to the higher capital costs associated with PV that a solar thermal system may be selected in favour of a PV array, provided that the health risks associated with water pre heating can be mitigated.

Cons :

- Will require a thermal storage vessel.

- Structural calculations will be required to determine the load impact on building.

- It is not feasible to export excess heat back to the Grid and therefore should be sized in line with the development's requirements.

3.4.4 Hydro Electric Power

On the basis that there are no rivers to provide the potential to drive a small scale hydro-electric turbine in the locality of this site, this technology has not been given further consideration.

3.5 Wind Power

3.5.1 Introduction

Wind turbines convert the kinetic energy of the wind to electrical energy. Energy from wind has traditionally been confined to exposed sites, where ground level wind speeds are higher than in town centres. However, interest in urban wind power is on the increase. Careful attention to siting can deliver attractive payback periods.

As the UK is the windiest country in Europe, wind power is one of the UK's most promising renewable technologies. Wind turbines are a technically proven technology using aerodynamic forces (lift & drag) to produce mechanical power that can then be converted to electricity.

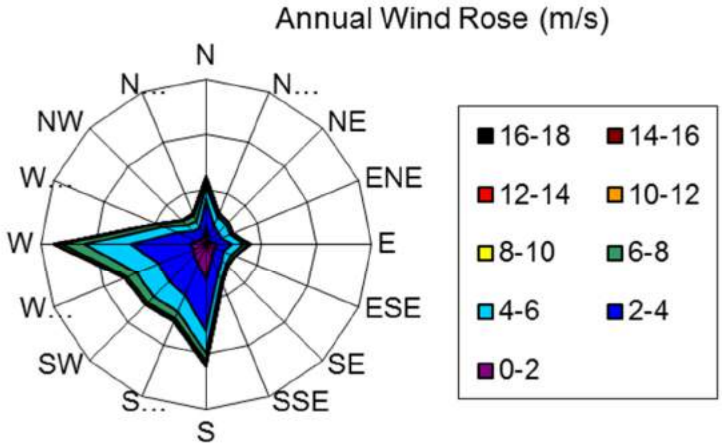

Figure 13 – Typical Wind Rose showing prevailing wind direction and speed

While wind speeds close to the urban surface are generally much lower than in exposed open-terrain at the same height, roof-mounted turbines offer the prospect of increased wind speeds not just through height but also due to the shape and orientation of the profiled roofs.

An alternative to horizontal Wind Turbines, is the use of Vertical Wind Rotors which are independent of wind direction and do not affect Microwave Links.

In the UK, the wind provides a major renewable source for generating electricity and wind energy installations can range from small domestic turbines to large commercial wind farms.

Turbine siting is crucial for maximising both energy generation and public acceptance. The power generated from the wind varies with a cubic of the wind speed e.g. a doubling of the wind speed leads to an eight-fold increase in electrical power. It is therefore imperative that turbine location is considered carefully.

A site's wind resource is normally assessed for a year before deciding whether to proceed with a wind development. In urban settings, the impact of the buildings themselves will play a crucial role in determining the air flow velocities of the site.

For example, when wind hits a building the flow may separate, creating a turbulent region at the upwind edge. The free-stream airflow is deflected upwards and the wind speed is higher in this area above the separation region because the streamlines of the flow are compressed. A wind turbine needs to be located clear of the turbulent regions and in this region of higher air speed.

Wind turbines can be either ground based or roof mounted. The tower for any ground mounted turbine should be at least 10m in height (dependent upon the rotor diameter) in order to provide the necessary ground clearance as well as to benefit from higher wind speeds. Similarly, roof-mounted turbines capitalise on higher wind speeds further from the ground level, whilst an aerodynamically beneficial roof shape can direct wind towards the turbine. As the energy available from wind increases as the cube of the wind speed (v3), specifically designed roofs can significantly increase the performance of wind turbines.

Maintaining safe distances between adjacent building, cars and housing, combined with potential planning constraints that usually dictate that turbines are located at least 75m from housing and 50m from a buildings, will make this an unviable solution for this site.

3.5.2 Horizontal Axis Wind Turbines (HAWT)

There are wide variety of sizes and configurations available. This section deals with horizontal axis wind turbines.

Micro turbines can provide up to 5kW of electricity and are generally used to power distinct plant or equipment items. They can be building or ground mounted. Small scale wind turbines can provide up to 50kW of electricity and would have rotor blade diameters of up to about 15m. This type would be ground mounted and connect into the local site infrastructure, with generating capacity increasing with the swept area of the turbine.

Figure 14 - Horizontal Axis Wind Turbine

HAWT are more efficient than VAWT turbines with power generation starting at lower cut in speeds of 2m/s, allowing them to potentially operate for up to 79% of the year based on CIBSE Birmingham TRY weather data.

Medium scale turbines include the following sizes: 100kW to 1MW, with a typical ground mounted tower height of 30m and rotor diameters of up to 50m. Medium scale wind turbines are capable of dealing with higher wind speeds and do not cut out until 20m+/s.

Medium and larger scale wind turbines tend to have much larger blade diameters, which means more of the wind energy is utilised and more energy can be generated. Modern turbine design has decreased the noise level of the turbines when operational.

Due to the scale of the medium and larger scale wind turbines they are best suited to open low rise sites or offshore, rather than urban locations, and areas with less sensitive planning requirements.

3.5.3 Vertical Axis Wind Turbines (VAWT)

The design of wind turbines has progressed considerably, and in addition to the standard rotor blade horizontal axis wind turbines described above, there are turbines designed specifically for use within urban environments where the average wind speeds are lower and there is more turbulence. VAWT have a helical design which virtually eliminates noise and vibrations typical of large wind turbine generators. Its blades, spars and torque tubes are made of robust carbon fibre and moving parts are sealed to minimise maintenance.

The power generation for this type of turbine starts at a windspeed of 4m/s, this makes them less efficient when compared to the traditional HAWT turbine and on this basis, will only operate for 39% of the year based on the CIBSE TRY Newcastle weather data considered in this assessment.

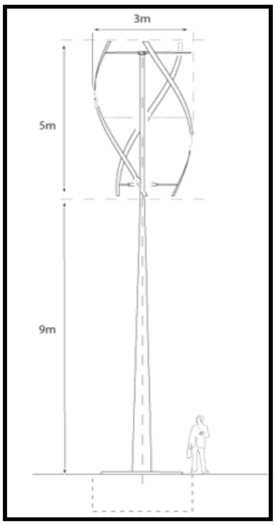

Figure 15 - Vertical Axis Wind Turbine

The turbine automatically cuts out for safety reasons in wind speeds over 19m/s, albeit, an analysis of the CIBSE TRY weather data suggests this would be an unlikely occurrence.

3.5.4 Economics and Performance

Turbines may generate DC or AC electricity. In both cases, some balance of systems is required before this electricity can be fed to the electrical grid, which will include some power regulation equipment and an electrical meter. In the case of DC generation, inverters will be required to convert this to AC for subsequent feed to the grid. The electricity would be fed into the site side electricity distribution system, metered and sold in a similar fashion to the electricity from the Photovoltaics.

Summary of points to consider are:

Pros :

- Eligible for the Feed-in Tariffs
- VAWT are noise free

Cons :

- The placement of wind turbines for maximum efficiency results in a high degree of visibility. Planning permission is almost always required; however, planning regulations have recently been amended in favour of renewable energy projects. There will inevitably be a number of issues of concern in a planning application.
- Proximity of residential buildings has the potential for objections from residents.
- Output dependent on wind speed, location, mounting height and obstructions such as trees and buildings
- Mounting height likely to be at least 15m to increase viability of the turbine
- There may be some noise associated with the operation of a HAWT, particularly with the close proximity of housing
- Flicker from wind turbines
- Impact on microwave links, albeit this is of a lesser issue with VAWT.
- Structural issues
- Safety issues relative to the turbine location relative to buildings and roads
- higher cut in velocity associated with VAWT make them less financially viable

3.6 Tidal and Wave Power

Whilst Hydro Power on the River Tweed has been applied for the first time in Selkirk to produce enough energy to power 200 homes, on the basis it is impractical for this site to drive a small scale hydroelectric turbine 0.5 km from the site, this technology has not been given further consideration..

3.7 Combined Heat and Power CHP

3.7.1 Introduction

Heat from electricity generation is usually wasted in a power station, for example in the vast cooling towers associated with traditional coal fired power stations. CHP units provide on-site generation of electricity, whilst utilising the heat that is a by-product of the generation process to provide hot water, space and process on the site. Clearly this more efficient fuel use leads to both cheaper energy costs (both heating and electricity) and substantial environmental savings.

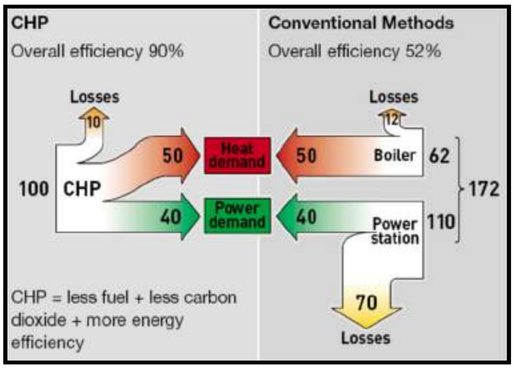

Figure 16 - CHP/Conventional Energy Efficiency

Heat from electricity generation is usually wasted in a power station, for example in the vast cooling towers associated with traditional coal fired power stations. CHP units provide on-site generation of electricity, whilst utilising the heat that is a by-product of the generation process to provide hot water, space and process on the site. Clearly this more efficient fuel use leads to both cheaper energy costs (both heating and electricity) and substantial environmental savings.

CHP units can be an economical alternative method of providing heat & power that emit less carbon than conventional methods for a range of buildings. In any building with a constant heat and power base load all year round, CHP is often the single biggest measure for reducing building-related CO_2 emissions & running costs.

CHP units can be categorised as “micro (<10kW$_e$)”, “small-scale (<2MW$_e$)” and “large-scale (>2MW$_e$)”. CHP units can be combined with an absorption chiller if there is a sufficient cooling requirement; this often helps make a CHP proposal viable in terms of good quality CHP requirements. A proportion of the simultaneous heating and electrical demands of the development could be met through CHP with accumulation tanks supplying a proportion of the peak heating requirements. CHP could be gas fired, alternatively to increase the carbon savings on site biomass or biofuel fuels could be used to supply the CHP unit. A “Quality Assured” CHP scheme would potentially also generate revenue savings via Climate Change Levy exemptions (albeit from the 1st April 2013, the Government have withdrawn the CCL exemption and CHP LEC’s are no longer available through Ofgem) and Enhanced Capital Allowances schemes.

3.7.2 Economics and Performance

As a general rule, CHP devices work best when they run at a steady rate, supplying a base energy load across the site. The high capital cost of a CHP device requires that it operates for as many hours as possible in order to ensure reasonable payback times. This requires careful consideration of the heat and power loads on the site.

Typically, Gas CHP engines can generate heat and electricity in a 2:1 ratio (small scale units). However for larger size units above 0.5 MWe the heat to electric ratio reduces to approximately 1:1.

Bio-diesel CHP units have typical heat to power ratio's of 1:1 throughout their range and biomass CHP units can be as high as 5:1 ratio's. As more heat is generated than electricity, the CHP should usually be sized to provide a base heat load to the site rather than the base electric load. Sizing of CHP plant is crucial – too large and there will be waste heat (thereby reducing the efficiency); too small and the economies of scale are not realized.

Figure 17- Containerised CHP Plant

Often in projects such as this where there is a low summer thermal load, the CHP unit has the potential of operating for reduced hours unless careful consideration is given to the thermal buffering capacity of the system.

Whilst CHP units are generally able to modulate down to 50% of their peak electrical output, at low load the CHP unit still generate heat outputs of upto 90% of their peak output requirement. Modulating the operation of the plant will help to increase the operating hours of the plant and therefore increasing its efficiency, however, to maximise the plants operation during warmer weather periods, the integration of a thermal store is essential.

Because the capital cost of CHP decreases with the size of unit installed, CHP generally lends itself to a large centralised plant with a distributed heating system. This implies that a district heating system must be installed throughout the site, with central mains circulating hot water around the site. Usually the mains will be fed from a central boiler plant that would integrate the CHP unit and a number of secondary boilers, with the CHP unit acting as lead boiler.

Because CHP plant is significantly more expensive than boiler plant, it is economic to size the CHP plant on the base heat load, whilst a number of boilers are installed to provide heat at peak load and to act as backup. The buffering capacity of the system (including the water capacity within live primary circulating Pipework) assists with the optimum running and availability of the plant and for the purpose of this assessment the availability of the plant has been set at 90%.

The choice of CHP fuel will influence the effect the CHP device has on the environment. Some CHP devices will accept a number of fuels. For example turbines designed for natural gas tend to accept other gaseous fuels such as propane or biogas. However, the choice of fuel will influence the choice of CHP device.

At present, gas is the cheapest, most widely used and most readily available fuel for CHP devices.

Natural gas does not contain as much carbon as other fossil fuels. As a result natural gas is the most environmentally sound of all available fossil fuels, due to the low carbon dioxide emissions resulting from its combustion.

Bio fuels (such as timber) have a negligible effect on the environment. This is because organic matter is built up from carbon dioxide originally in the atmosphere, so when it is burnt it simply returns the carbon dioxide to the atmosphere. As a result, biofuels may be considered net CO_2 neutral if the wood used is sustainably grown. There are a number of different types of bio-fuel available for use in a CHP device, ranging from wood chip to bio gas.

Due to the high heat to power ratio offered by Biomass CHP, combined with the high thermal capacities generated by this type of plant, discounts Biomass CHP as a viable option.

Whilst Pure Plant Oil (PPO) CHP plant has the potential to offer substantial carbon savings compared to other technologies such as Gas CHP, it does not satisfy the requirements of either BREEAM or Planners as a renewable technology, since it uses a first generation fuel product and for this reason, has also been discounted as a suitable fuel source for this site.

Other second generation fuels are available on the market such as bio-diesel (fish oil derivative) and have been considered in this analysis, providing substantial carbon savings but at the expense of high replacement, maintenance and operating cost when compared to a similar sized gas CHP unit. The sourcing of this fuel product has proved problematic and is considered inappropriate for further consideration. With cost being a primary driver, gas CHP is considered the favoured CHP solution with a reduced carbon benefit to the Trust.

Summary of points to consider are:

Pros :

- Generates both electricity and heat

- Gas CHP uses a fossil fuel (although less carbon intensive and cheaper than electricity or oil)

- Does not require an additional fuel store (if natural gas is primary fuel).

- Reduction in carbon dioxide emissions due to generation of electricity using a less carbon intensive fuel; on the other hand, this results in an increase in the amount of primary fuel utilised.

- Best utilised in buildings with a high heating rather than cooling demand, otherwise tri-generation would need to be further consideration.

- Ideally CHP should operate for more than 5000 hours per annum, such as hospitals and hotels

- Best suited to projects with large heat sink such as swimming pool or large DHW load such as hotels

Cons :

- With the exception of Biomass CHP, CHP does not qualify for the RHI or FIT schemes
- Biomass and Bio Diesel both require consideration to be given to additional fuel stores
- There may be some noise associated with the operation of a CHP unit, however, attenuation measures would be installed, particularly if Pol 05 – Noise Pollution (BREEAM 2011) is to be targeted.
- Nitrous Oxide emissions are potentially high (particularly with the biomass and bio diesel plant options) and consideration may need to be given to taller chimneys or particulate filters fitted on to the exhaust gas discharge.

3.8 Combined Cooling Heat and Power (CCHP)

CCHP using an absorption chiller would be a potential option if cooling is a dominant part of the building services philosophy to provide a clean technology for cooling, heating and electrical demand.

Initial studies indicate a low requirement for cooling and on this basis CCHP would not be the favoured option. It is understood that an absorption chiller is utilised on the site, and the cooling load profiling for the existing system needs to be better understood and the energy profiles updated to establish if this particular technology is to be given further consideration.

3.9 Biomass Heating

3.9.1 Introduction

Biomass installations use the energy from renewable sources to heat buildings and generate hot water. There are many sources of biomass that can be used; however, the two most popular energy crops currently in use are wood chip and wood pellet.

Most biomass used today is home grown energy. Wood-logs, chips, bark and sawdust-accounts for about 79 percent of biomass energy.

In terms of its effect on the environment, the combustion (direct or indirect) of biomass as a fuel also returns CO_2 to the atmosphere. However this carbon is part of the current carbon cycle: it was absorbed during the growth of the plant over the previous few months or years and, provided the land continues to support growing plant material, a sustainable balance is maintained between carbon emitted and absorbed and is essentially considered to be a carbon neutral approach.

To be called a true renewable energy source if the fuel has come from a sustainable source (i.e. it is processed and replenished). It should also be used close to where it was originally grown to reduce secondary CO_2 emissions incurred through transportation.

3.9.2 Biomass Supply

The Biomass Task Force identified that there were approximately 4.8-5.7Mtoe of biomass resource available for bioenergy production (Source: DEFRA UK Biomass Strategy Document - May 2007).

In their report, entitled "UK Biomass Strategy", DEFRA state that they "believe there is significant potential to expand the UK supply of biomass without any detrimental effect on food supplies and in a sustainable manner by:

Figure 18 - Wood Energy from Managed Wood Sources

- sourcing an additional 1 million dry tonnes of wood per annum from currently unmanaged woodland in England, and from increasing the recovery of wood for energy from managed woodland and other sources of wood waste products across the UK

- Increasing the amount of perennial energy crops produced in the UK to meet market demands – with the potential to use up to a further 350,000 hectares across the UK by 2020. This brings the total land availability for biofuel and energy crops to around 1 million hectares, equivalent to 17% of total UK arable land

- increasing supply from organic waste materials such as manures and slurries, certain organic wastes, source separated waste biomass and waste derived Solid Recovered Fuels (SRF)

By expanding existing biomass supplies in this way it is estimated that the potential future biomass resource in the UK to be a total of approximately 96.2 TWh (8.3 Mtoe). If it is assumed UK biofuel crop production can supply half of the 5% (by volume) target for 2010 this gives a total predicted theoretical biomass resource level in the UK of around 10.0 Mtoe. This compares with a total UK energy need of currently 165 Mtoe. These estimates could be considered conservative. It is clear that imports will continue to play a significant role in meeting UK energy needs, particularly for transport fuels and co-firing (electricity produced from fossil fuels co-fired with biomass). It is estimated that current annual imports account for the equivalent of some 54TWh. This figure is expected to grow".

The Woodfuel Strategy for England seeks to bring an additional 1m tonnes (2m green tonnes) of wood to market annually by 2020. This represents some 50% of the unharvested available material in English woodlands. The Woodfuel Strategy recommends a combination of capital investment and support, outreach and facilitation and awareness raising to secure this increase. This will bring more woods into productive and sustainable management. The Woodfuel Strategy also acknowledges the need to make the currently fragile wood fuel supply chain more robust.

3.9.3 Economics and performance

A biomass boiler system should be carefully selected to match the base heat load for the building in order to ensure the maximum operational time. Systems usually incorporate gas boilers to meet peaks in the heating season and offer a degree of security should the fuel supply become an issue.

A biomass boiler is typically capable of modulating down to 30% of its peak output. Hence the biomass boiler considered in this analysis and rated at 1600 kW is capable of modulating down to 480 kW.

The biomass storage can be catered for in a number of different ways. Subterranean bunkers and silos are the most common form. However, delivery requirements must be assessed and factored into the siting of the fuel store and plantroom, and for this site subject to approval from the Fire Engineer, the storage of biomass within the Energy Centre roof space is considered to be the most appropriate solution.


Figure 19 - An example Biomass Boiler and Subterranean Fuel Store

In terms of fuel source, there are advantages and disadvantages to using wood pellets, wood chip and logs.

Whilst wood chip is generally cheaper than wood pellet, the chips are less energy dense i.e. you require more chips than pellets to achieve the same thermal output, which in turn increases the fuel storage requirements (see table below). Wood pellets are manufactured to specific guidelines and requirements to ensure consistent quality and output. On the other hand, variables such as number of years of seasoning and moisture content will impact on the thermal output of logs.

Some biomass boilers will comply with the Clean Air Act, and many have low NO_x emissions. Biomass installations require not only boiler space but also fuel storage area, along with a site that is accessible for fuel deliveries.

	Wood Pellets	Wood Chips
Calorific Value	17,3 GJ/t	9.7 GJ/t
-per tonne	4800 kWh/tonne	2700 kWh/tonne
-per m^3	3120 kWh/m^3	600 kWh/m^3
Water content	8%	25%
Density	650 kg/m^3	220 kg/m^3
Ash content (% of mass)	0.50%	1%
Fuel Cost (£/tonne)	£272/tonne	£80 -100/tonne
Summary	+ Standardised fuel - greater reliability	+ Local availability
	+ Smaller fuel store	+ Cheaper than pellets
	+ Less work for services and maintenance	- Large storage space required
	- Higher fuel costs	- High, uniform fuel quality is important, but possibly difficult to obtain
		- More work required for system maintenance

Table 5 - Comparison between Wood Pellet and Wood Chip

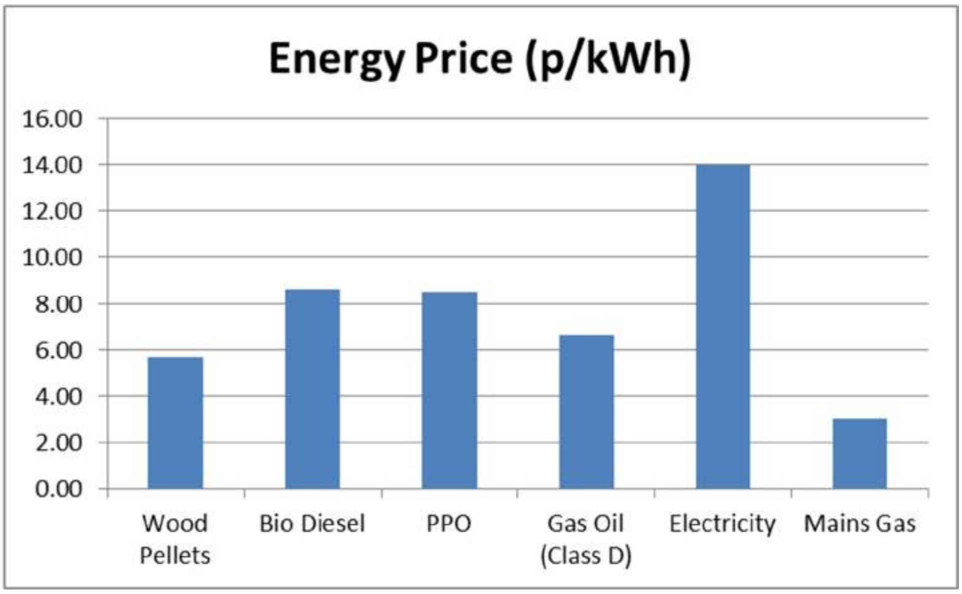

Figure 20 - An Example Fuel Cost Comparison

There is always a challenge to the supplier with the moisture content of the fuel source being difficult to regulate. The option therefore being considered for this site is to supply wood pellets and whilst 13% more costly than woodchip, the amount of storage required is much reduced due to the higher calorific of the fuel at 4800 kWh / tonne and reduced density of fuel at 650 kg/m³, hence a 20 m³ trailer / lorry handling a 12-13 Tonne wood pellet load (equivalent to almost 12 days equivalent storage per delivery) and thereby significantly reducing delivery vehicle size when compared to that of woodchip.

Note

As a rule of thumb following discussions with fuel suppliers, it is sensible to provide at least 10 days worth of fuel between deliveries, and the level of fuel stored on site (with notionally 24 days included in the initial analysis) and the ability of the site to accommodate the delivery is the fundamental issue to be considered. If the site can accommodate the delivery issues then a biomass boiler system (with an appropriate sized thermal buffer vessel) could lend itself to this site, providing improved levels of carbon reduction to that offered by Gas CHP but at an increased cost. Discussions will need to be established with the Trusts preferred fuel supplier to establish the nearest depot to the site to minimise storage, delivery logistics, minimum delivery quantities, delivery frequency, fuel specification, haulage charges and any other specific requirements in respect to supply contract arrangements, should this option be the preferred solution.

Summary of points to consider are:

Pros :

- Tried and tested technology that works well if run continuously, not conducive to being run intermittently.

- Eligible for Renewable Heat Incentives

- Reduction in carbon dioxide emissions will depend on a number of factors such as fuel type (pellet or chip) and boiler efficiency but as the carbon dioxide emission factor for both pellet and chip is 15 times smaller than that of natural gas, there will be a significant reduction in CO_2 emissions.

- Each m³ of fuel will generate approximately 3120 kWh (wood pellet), 600 kWh (wood chip). This will however be dictated by the moisture content of the fuel.

- Biomass can benefit from reduced carbon emissions when compared to other technologies considered.

Cons :

- There may be some noise associated with the operation of a biomass boiler; however attenuation measures would be installed, particularly if Pol 05 (BREEAM 2011) is to be targeted.

- Access for lorries delivering the fuel.

- Additional space requirements in the form of fuel storage and ash handling (that will require good vehicular access). This will vary depending on fuel choice – pellets require less storage space than wood chip. A fuel storage area capable of supporting a minimum 2 weeks supply plus a notional 10 day reserve is considered acceptable on most projects but needs to be agreed with the supplier. Availability of the fuel source from the supplier could influence the size of storage area required.

- Additional space requirement for a thermal buffer vessel; however, assists in maximising the base heat load potential of the boiler.

- It is not feasible to export excess heat back to the Grid and therefore should be sized in line with the development's requirements.

- Provision of a suitable supply chain for biomass fuel with supplies within 30km – 60km of the site.

- Nitrous Oxide emissions are potentially high and will vary between boiler suppliers and could result in taller chimneys or particulate filters fitted on to the exhaust.

3.9.4 CO_2 Emissions Associated with Delivery of Wood Chips

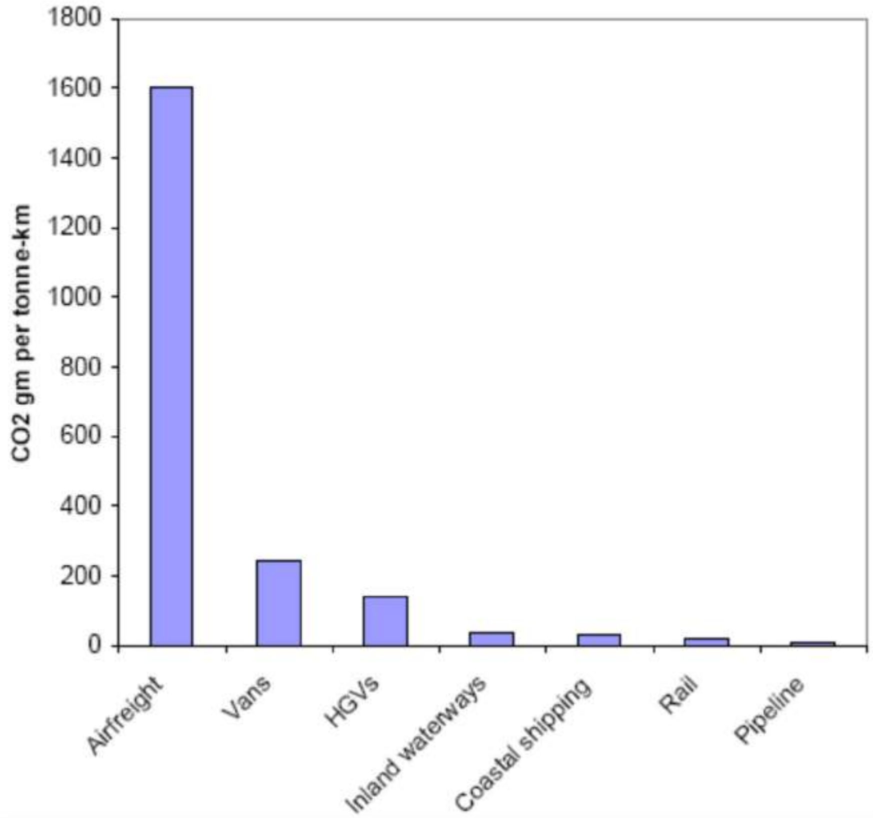

Figure 21 - C02 Emissions from HGV's based on 178G CO2/Tonne-KM (source McKinnon 2007)

3.10 Fuel Cell Technology

Fuel cells and other emerging technologies offer the potential for enormous energy and carbon dioxide emission savings in the future. It is important that in 25 years' time when the services are ready for replacement that the most efficient system available at that time are investigated and installed.

4 LZC TECHNOLOGIES – ENERGY PROVISION

Technology	GSHP	ASHP	Solar Thermal	Wind	Biomass	CHP	Solar PV
Power Output				✓		✓	✓
Heat Output	✓	✓			✓	✓	
DHW Output		✓	✓		✓	✓	
Potential to Feedback to Grid				✓		✓	✓
Orientation/Site Specific	✓	✓	✓				✓
Potential Grants Available	✓	✓	✓	✓	✓	✓ (Biomass/ Bio Diesel)	✓

Table 6 - Technologies and their Capabilities

5 RESULTS

5.1 Summary

This report provides an overview of the predicted energy demand profile for the development that needs to be developed to reflect the actual energy of the site, and identifies the beneficial reductions in carbon emissions that can be achieved, using Low and LZC carbon technologies, that would need to be considered to achieve any specific targets to be set by the Trust.

5.2 Conclusions

The report has identified the Energy Targets that are achievable through the application of various renewable energy technologies based on the parameters defined in Appendix 1 of the report.

The report has provided an overview of the predicted energy demand profile for the site, and outlines the beneficial reduction in carbon emissions using low or zero carbon technologies to be developed with the Trust to achieve the targets set by Local Planning and UK targeting legislation.

The efficiency of the production and distribution of energy is only one element of the overall site energy usage and the following energy reduction / efficiency measures will also significantly contribute to the overall reduction in the buildings energy usage:

5.3 Energy Reduction Measures

- Optimising fenestration to balance increase in natural day lighting against increased heating.
- Optimising fenestration design to promote natural ventilation where room function permits without unacceptably frequent occurrences of high summertime temperatures.
- Optimising fabric “U” Values and reduce building heat losses
- Use of stack ventilation (Double height spaces such as the Atria)
- Use of building projections to give shading from solar gain
- Use of sun control glazing
- Maximising the use of natural ventilation by practical internal room planning in order to minimise areas that will require ventilation or air conditioning for operational reasons being located on the perimeter at the expense of accommodation which can be naturally ventilated.
- Improved levels of air permeability.

5.4 Energy Efficiency Measures

- Energy efficient luminaries (using low loss high frequency control gear).

- High efficiency lamps
- Lighting control systems (where appropriate)
- High efficiency low loss motors will generally be fitted to all HVAC plant
- Power factor correction, with harmonic filtering if demonstrated to be appropriate
- Heat reclaim on ventilation systems via plate heat exchangers to transfer heat between extract and supply air streams where significant energy savings can be achieved.
- Variable volume systems wherever appropriate by the use of inverter drives to minimise Specific Fan Powers on air systems and pumping power on water systems during periods of low demand.
- Temperature compensation of heating circuits, with pumps turning off when the ambient temperature rises above 21°C.
- Temperature set back applied to heat emitter circuits serving day only occupied areas by means of diverter valves, when areas of building are not in use.
- The ability to switch plant off when not required.
- Energy consumption regulated, monitored and controlled by a Building Management System.
- To allow the Energy Manager to have accurate and real time data regarding how the systems are performing to allow energy usage to be optimised.
- Separate sub metering provided to all local departmental switchboards to provide performance monitoring of the energy used for comparison on a year on year basis.
- Departmental heat metering of Clinical GP.
- Functions incorporated into the design to alert the operators if plant is taken out of 'Auto' mode, ensuring energy is conserved and kept to an absolute minimum.

5.5 Renewable Technologies "Being Green"

Consideration has been given to 'green' technologies to provide an overview to the potential solutions for the site, where possible these have been assessed and regarded as a potential solutions or eliminated on logistical grounds. Further studies will be required to test against the targets set and refined against more accurate energy usage data for the site, that can only be applied to:

- Combined Heat & Power Plant (Bio diesel and biomass CHP)
- Biomass heating to supplement the base load of the building heating and hot water demand

- Active solar hot water
- Ground source heat pumps to provide underfloor heating and cooling
- Solar PV
- Wind turbines to support the hospitals electrical demand.

The above form the basis of our initial assessment.

The results of the study provides an initial indication of how particular LZC carbon technologies will assist in managing the energy consumed by the development and secure the Carbon Reduction Strategy for the site.

6 LZC FEASIBILITY SUMMARY

Ground Source Heat Pumps (GSHP): As a standalone system a GSHP solution is not able to significantly reduce the carbon emissions when compared against other technologies; this factor combined with the high capital outlay and the low grade of heat achieved and potential geological issues on the site make this an unviable solution.

Air Source Heat Pumps (ASHP): Without the additional costs associated with the ground coil distribution system, payback times for an ASHP systems are significantly lower than that of an equivalent GSHP solution but higher compared with other alternative systems, this being very much dependent upon the relative energy costs. As a standalone system this technology does not perform as well as other technologies to achieve a reduced carbon emission and is not considered to be a viable option.

Photo Voltaic Panels (PV): PV even taking into consideration the Feed in tariffs would not be a financially viable standalone solution for the carbon saving that it generates when compared to other technologies. The technology is useful to supplement other technologies such as biomass energy solutions if further reduced carbon emissions need to be afforded.

Solar Thermal: The load profiling for this site does not suit this particular project, making it unviable for this site.

Wind: Giving due consideration to the relationship of the buildings on and adjacent to the site where they must be located at least 75m from housing and 50m from a building, and not allowed to overhang any roads, the application of wind turbines will prove difficult to get through planning for this particular site.

Biomass: This solution has the potential to be the preferred technology if carbon reduction is to be maximised on the site, provided that the storage and delivery issues for the fuel source can be addressed.

Whilst operating costs will be higher than gas CHP, they will be lower than the Red Diesel/PPO CHP options.

Combined Heat & Power (CHP): Whilst Red Diesel CHP is able to offer a comparable potential for carbon reduction to that of biomass solution, the plant reliability, fuel sourcing issues, replacement, maintenance and operating cost potential make this option cost prohibitive when compared to biomass and Gas CHP alternatives. The sourcing of the fuel product based upon previous experience with this type of technology makes it inappropriate to consider Diesel CHP.

Considering Pure Plant Oil CHP, the costs are likely to remain higher than those of the Biomass and Gas CHP options and the cost of PPO plant will be an overriding factor, making it cost prohibitive and as a first generation fuel source could not be considered to be an accredited technology for BREEAM compliance.

The carbon emissions benefits are much reduced for the Gas CHP option, when compared to either the bio-diesel CHP and Biomass technologies. However, on the basis that bio-diesel will not be implemented and if fuel storage / delivery preclude the biomass option, Gas CHP would be the favoured solution for the site.

APPENDIX 1

Modelling Parameters

APPENDIX 2

Energy Analysis

Project: Royal Shrewsbury Hospital, Shrewsbury Option C2 - RSH (Emergency)

Project No: M4556

Energy Type	Load Type	Annual Energy Consumption			
		kWh	GJ	GJ/100m³	%
Heating	Space Heating via Gas	14,361,469	51,701	20.0	36%
	Fresh Air Load Heating Gas	9,570,147	34,453	13.3	24%
	Domestic Hot Water Gas	5,610,837	20,199	7.8	14%
Electric	Lighting	2,555,572	9,200	3.6	6%
	Pumps	495,400	1,783	0.7	1%
	Fans	3,181,655	11,454	4.4	8%
	Room Cooling	266,281	959	0.4	1%
	AHU Cooling	524,060	1,887	0.7	1%
	Small Power	3,497,939	12,593	4.9	9%
Total		40,063,360	144,228	55.7	100%

Building Parameters:

Floor Area : 46,850 m² comprising 22,751 m² existing accommodation and 24,099 m² of New Build

Total Volume: 258780 m³

- The assessed heating to electrical energy split is 74 % / 26 %.

Project: **Royal Shrewsbury Hospital, Shrewsbury Option C1 RSH (Emergency)**

Project No: **M4556**

Energy Type	Load Type	Annual Energy Consumption			
		kWh	GJ	GJ/100m³	%
Heating	Space Heating via Gas	15,275,052	54,990	21.2	31%
	Fresh Air Load Heating Gas	10,215,742	36,777	14.2	21%
	Domestic Hot Water Gas	6,567,853	23,644	9.1	13%
Electric	Lighting	4,204,693	15,137	5.8	9%
	Pumps	815,371	2,935	1.1	2%
	Fans	5,234,562	18,844	7.3	11%
	Room Cooling	439,813	1,583	0.6	1%
	AHU Cooling	872,257	3,140	1.2	2%
	Small Power	5,755,254	20,719	8.0	12%
Total		49,380,597	177,770	68.7	100%

Building Parameters:

Floor Area : 54,841 m² comprising 22,748 m² existing accommodation and 32,093 m² of New Build

Total Volume: 258780 m³

- The assessed heating to electrical energy split is 65 % / 35 %.

Project: **Royal Shrewsbury Hospital, Shrewsbury Option B - PRH (Emergency)**

Project No: **M4556**

Energy Type	Load Type	Annual Energy Consumption			
		kWh	GJ	GJ/100m³	%
Heating	Space Heating via Gas	14,127,265	50,858	19.7	40%
	Fresh Air Load Heating Gas	8,165,236	29,395	11.4	23%
	Domestic Hot Water Gas	2,597,512	9,351	3.6	7%
Electric	Lighting	2,555,572	9,200	3.6	7%
	Pumps	495,400	1,783	0.7	1%
	Fans	3,181,655	11,454	4.4	9%
	Room Cooling	266,281	959	0.4	1%
	AHU Cooling	524,060	1,887	0.7	1%
	Small Power	3,497,939	12,593	4.9	10%
Total		35,410,921	127,479	49.3	100%

Building Parameters:

Floor Area : 21,689 m² comprising 7,605 m² existing accommodation and 14,084 m² of New Build

Total Volume: 258780 m³

- The assessed heating to electrical energy split is 70 % / 30 %.

APPENDIX 4

Documents

- Trust's Sustainable Development Management Plan?
- Trust Energy Carbon data for all Current site 2007/ 2008
- Northumberland County Council Development Control Policy?

APPENDIX 5

Low and Zero Carbon Analysis

- Notes – To assist understanding the data contained in the Tables
- Table 1 – Option Summary ranked according to lowest carbon emission
- Table 2 – Energy Overview
- Table 3 – Carbon Emission & Cost Overview

APPENDIX 5

Option C2 – RSH (Emergency)

TABLE 2 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Assessed Annual Energy Requirement																Low Carbon / LZC Energy Source	Low carbon / LZC Energy Source Contribution	Energy Benchmark	
		Gas Boilers		Gas CHP		PPO CHP			Bio-Mass		Electric		Green Elec Export	Total		Grid diplaced Elec			(%)	(GJ/100m³)	Rank
		(KWh)	(GJ)	(KWh)	(GJ)	(KWh)	consumption per month	(GJ)	(KWh)	(GJ)	(KWh)	(GJ)	(KWh)	(KWh)	(GJ)	(KWh)	(GJ)				
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 6814 kW heating. Cooling provided by 2 chillers each rated at 1611 kW. Peak hourly electrical demand for site anticipated to be 2.94 MVA	35,503,987	127,814								10,648,895	38,336		46,152,882	166,150			N/A		64.2	**5**
2	As Option 1, with provision of 2 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 35000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 11928 kW.	19,302,112	69,488	25,822,990	92,963						1,051,746	3,786		46,176,848	166,237	9,597,149	34,550	CHP (Gas)	55.9	64.2	**6**
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 12028 kW.	19,865,727	71,517						11,752,099	42,308	10,648,895	38,336		42,266,721	152,160			Biomass	27.8	58.8	**2**
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	19,865,727	71,517						11,752,099	42,308	10,648,895	38,336		42,266,721	152,160			Biomass	27.8	58.8	**2**
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	15,974,210	57,507			7,779,272	75,539	28,005	0		7,754,186	27,915		31,507,668	113,428	2,894,709	10,421	CHP (Gas Oil)	18.0	43.8	**1**
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 6814 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	35,503,987	127,814								10,392,921	37,415		45,896,908	165,229	127,987	461	Solar PV	0.3	63.8	**4**

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

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TABLE 3 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Carbon Emissions					Assessed LZC Source Operating Period	Assessed LZC Source Availability	Revenue Streams						Comparative Annual Operating Costs		
		(kg CO2)	(kg CO2 / m²)	(T CO2/ 100 m³)	% Reduction	Rank	(Hours)	(%)	ROC's	ROC buy back rate (p/kWh)	CCL (£)	ROC (£)	RHI (£)	FIT (£)	(£)	Energy Saving Relative to Option 1 (£)	Rank
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 6814 kW heating. Cooling provided by 2 chillers each rated at 1611 kW. Peak hourly electrical demand for site anticipated to be 2.94 MVA	11,278,024	165.6	4.358	0.0%	**6**									2,555,965	0	**6**
2	As Option 1, with provision of 2 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 35000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 11928 kW.	8,773,356	128.8	3.390	22.2%	**2**	7,884	90.0%	N/A	N/A		N/A	0	N/A	1,500,998	1,054,967	**1**
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 12028 kW.	8,857,702	130.1	3.423	21.5%	**3**	8,224	93.9%					265,820		2,486,166	69,799	**4**
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	8,857,702	130.1	3.423	21.5%	**3**	8,224	93.9%					265,820		2,261,701	294,264	**3**
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	7,669,287	112.6	2.964	32.0%	**1**	7,884	90.0%	N/A	N/A		N/A			2,079,796	476,169	**2**
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 6814 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	11,163,992	163.9	4.314	1.0%	**5**	5,015	57.2%					0	947	2,519,181	36,784	**5**

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

APPENDIX 5

Option C1 – RSH (Emergency)

TABLE 2 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Assessed Annual Energy Requirement																Low Carbon / LZC Energy Source	Low carbon / LZC Energy Source Contribution	Energy Benchmark	
		Gas Boilers		Gas CHP		PPO CHP			Bio-Mass		Electric		Green Elec Export	Total		Grid diplaced Elec			(%)	(GJ/100m³)	Rank
		(KWh)	(GJ)	(KWh)	(GJ)	(KWh)	consumption per month	(GJ)	(KWh)	(GJ)	(KWh)	(GJ)	(KWh)	(KWh)	(GJ)	(KWh)	(GJ)				
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Cooling provided by 2 chillers each rated at 2821 kW. Peak hourly electrical demand for site anticipated to be 4.95 MVA	38,523,853	138,686								17,449,937	62,820		55,973,790	201,506			N/A		77.9	**5**
2	As Option 1, with provision of 2 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 25000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 13225 kW.	22,260,352	80,137								5,807,785	20,908		53,781,162	193,612					74.8	**3**
				25,713,025	92,567											11,642,152	41,912	CHP (Gas)	47.8		
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 13325 kW.	22,875,035	82,350								17,449,937	62,820		52,077,071	187,477					72.4	**1**
									11,752,099	42,308								Biomass	22.6		
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 13325 kW.	22,875,035	82,350								17,449,937	62,820		52,077,071	187,477					72.4	**1**
									11,752,099	42,308								Biomass	22.6		
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	34,570,592	124,454								14,555,878	52,401		56,326,340	202,775					78.4	**6**
						7,199,870	69,913	25,920								2,894,059	10,419	CHP (Gas Oil)	12.8		
									0												
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	38,523,853	138,686								17,193,963	61,898		55,717,816	200,584					77.5	**4**
																127,987	461	Solar PV	0.2		

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

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TABLE 3 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Carbon Emissions					Assessed LZC Source Operating Period	Assessed LZC Source Availability	Revenue Streams						Comparative Annual Operating Costs		
		(kg CO2)	(kg CO2 / m²)	(T CO2/ 100 m³)	% Reduction	Rank	(Hours)	(%)	ROC's	ROC buy back rate (p/kWh)	CCL (£)	ROC (£)	RHI (£)	FIT (£)	(£)	Energy Saving Relative to Option 1 (£)	Rank
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Cooling provided by 2 chillers each rated at 2821 kW. Peak hourly electrical demand for site anticipated to be 4.95 MVA	14,863,528	218.3	5.744	0.0%	**6**									3,598,707	0	**6**
2	As Option 1, with provision of 2 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 25000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 13225 kW.	11,416,273	167.6	4.412	23.2%	**1**	7,884	90.0%	N/A	N/A		N/A	0	N/A	2,252,291	1,346,416	**1**
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 13325 kW.	12,441,264	182.7	4.808	16.3%	**2**	8,208	93.7%					266,207		3,528,204	70,502	**3**
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 13325 kW.	12,441,264	182.7	4.808	16.3%	**2**	8,208	93.7%					266,207		3,303,739	294,967	**2**
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	13,855,072	203.5	5.354	6.8%	**4**	7,884	90.0%	N/A	N/A		N/A			3,551,568	47,139	**4**
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	14,749,496	216.6	5.700	0.8%	**5**	5,015	57.2%					0	947	3,561,923	36,784	**5**

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

APPENDIX 5

Option B – PRH (Emergency)

TABLE 2 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Assessed Annual Energy Requirement: Gas Boilers (KWh)	Gas Boilers (GJ)	Gas CHP (KWh)	Gas CHP (GJ)	PPO CHP (KWh)	PPO CHP consumption per month	PPO CHP (GJ)	Bio-Mass (KWh)	Bio-Mass (GJ)	Electric (KWh)	Electric (GJ)	Green Elec Export (KWh)	Total (KWh)	Total (GJ)	Grid diplaced Elec (KWh)	Grid diplaced Elec (GJ)	Low Carbon / LZC Energy Source	Low carbon / LZC Energy Source Contribution (%)	Energy Benchmark (GJ/100m³)	Rank
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 5541 kW heating. Cooling provided by 2 chillers each rated at 1611 kW. Peak hourly electrical demand for site anticipated to be 2.94 MVA	29,924,480	107,728								10,648,895	38,336		40,573,375	146,064			N/A		56.4	**5**
2	As Option 1, with provision of 1 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 20000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 10231 kW.	21,671,949	78,019	12,152,694	43,750						4,507,436	16,227		38,332,079	137,995	6,141,459	22,109	CHP (Gas)	31.7	53.3	**3**
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	14,419,313	51,910						11,752,099	42,308	10,648,895	38,336		36,820,307	132,553			Biomass	31.9	51.2	**1**
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	14,419,313	51,910						11,752,099	42,308	10,648,895	38,336		36,820,307	132,553			Biomass	31.9	51.2	**1**
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	25,966,715	93,480			7,203,161	69,945	25,931	0		7,754,234	27,915		40,924,110	147,327	2,894,661	10,421	CHP (Gas Oil)	17.6	56.9	**6**
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	29,924,480	107,728								10,392,921	37,415		40,317,401	145,143	127,987	461	Solar PV	0.3	56.1	**4**

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

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TABLE 3 - Royal Shrewsbury Hospital, Shrewsbury - Low Carbon / Renewable Energy Source Option Appraisal

Option	Primary Energy Source	Carbon Emissions					Assessed LZC Source Operating Period	Assessed LZC Source Availability	Revenue Streams						Comparative Annual Operating Costs		
		(kg CO2)	(kg CO2 / m²)	(T CO2/ 100 m³)	% Reduction	Rank	(Hours)	(%)	ROC's	ROC buy back rate (p/kWh)	CCL (£)	ROC (£)	RHI (£)	FIT (£)	(£)	Energy Saving Relative to Option 1 (£)	Rank
1	Baseline based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 5541 kW heating. Cooling provided by 2 chillers each rated at 1611 kW. Peak hourly electrical demand for site anticipated to be 2.94 MVA	10,251,171	150.5	3.961	0.0%	**6**									2,388,580	0	**6**
2	As Option 1, with provision of 1 No. 850 kWhth (1030 kWhe) Gas fired CHP plant installed complete with 20000 Litre thermal buffer tank and 1 Gas fired duty boilers and 1 No. Standby boiler each rated at 10231 kW.	8,233,060	120.9	3.181	19.7%	**3**	7,884	90.0%	N/A	N/A		N/A	0	N/A	1,645,780	742,799	**1**
3	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 324 m³ wood pellet biomass store via hook bins (providing 24.1 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	7,855,344	115.4	3.036	23.4%	**1**	8,224	93.9%					263,647		2,324,947	63,633	**3**
4	As Option 1, with provision of 1 No. 1600 kW Biomass boilers (operating throughout the year)Installation complete with a 20000 Litre thermal buffer, 1700 m³ wood pellet biomass store via hook bins (providing 126.2 days supply with plant operating at its full rated capacity), and 1 No. Gas fired duty boilers and 1 No. Standby boiler each rated at 9481 kW.	7,855,344	115.4	3.036	23.4%	**1**	8,224	93.9%					263,647		2,100,482	288,098	**2**
5	As Option 1,with provision of a 492 kWhth (410 kWhe) Red Diesel CHP plant complete with 15000 Litre thermal buffer tank, 50,000 Litre oil tank (providing 17 days supply with CHP plant operating at its full rated capacity).	9,242,079	135.7	3.571	9.8%	**4**	7,884	90.0%	N/A	N/A		N/A			2,341,439	47,140	**4**
6	As Option 1 based on 2 Gas fired duty boilers and 1 No. Standby boiler each rated at 7463 kW heating. Electrical supply supplemented with a Monocrystaline Photovoltaic collector array occupying a nominal roof area of 1400 m².	10,137,140	148.9	3.917	1.1%	**5**	5,015	57.2%					0	947	2,351,796	36,784	**5**

Energy Benchmark based on a net heated volume of 258780 m³ and an area (excluding plantrooms, risers, unheated voids and lift shafts) of 68100 m². Options are ranked according to their lowest Carbon Emission.

APPENDIX 6

Performance & Cost Illustration

- Gas CHP Option

VOLUME 4: TECHNICAL RISK REGISTER

Sustainable Services Project (SSP)

Technical Risk Register

riderhunt | The Shrewsbury and Telford Hospital NHS Trust

Version:	4	Risk Champion:	Ben Brookes		
Date:	24-Oct-16	Updated by:	Ben Brookes	Stage:	OBC- Final

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
Statutory Risks									
St1	Statutory	Planning approval not obtained	Early discussions held with Planners during OBC. Planning to be developed during FBC. Planning Advisor to be appointed during FBC.	2	5	10	Kate Shaw	OPEN	
St2	Statutory	Unreasonable or onerous planning conditions	Early discussions held with Planners during OBC. Planning to be developed during FBC. Planning Advisor to be appointed during FBC.	3	3	9	Kate Shaw	OPEN	
St3	Statutory	Building regulations approval is not obtained; project is not developed in line with building regulations	Design to be developed in line with latest building regulations. Building control officer to be appointed during FBC.	2	4	8	Alison Evans	OPEN	
St4	Statutory	Cost of compliance with Part L2 of the Building Regulations becomes onerous.	Design to be developed in line with latest building regulations. Costs to be monitored. Potential energy supply contracts to be considered.	2	3	6	Mike Singleton	OPEN	
St5	Statutory	Project does not comply with fire regulations, and/or is not in line with Trust fire processes	Design to be developed in line with latest building regulations. Early engagement with Trust Fire Advisor.	1	5	5	Alison Evans	OPEN	
St6	Statutory	Non-standard approach, fire engineered solution or provision of sprinklers required	Design to be developed in line with latest building regulations. Early engagement with Trust Fire Advisor.	1	4	4	Mike Singleton	OPEN	
St7	Statutory	Project does not achieve the required BREEAM rating	Traget BREEAM rating Excellent for New Build and Very Good for Refurb. BREEAM considered in design from SOC stage. BREEAM Advisor appointed during OBC, and initial BREEAM review undertaken- which achieved targets.	2	3	6	Alison Evans	OPEN	
St8	Statutory	Early studies not completed or cost of BREEAM becomes onerous	Traget BREEAM rating Excellent for New Build and Very Good for Refurb. BREEAM considered in design from SOC stage. BREEAM Advisor appointed during OBC, and initial BREEAM review undertaken- which achieved targets.	2	3	6	Alison Evans	OPEN	
St9	Statutory	Project does not achieve required standards for control of infection	Early and ongoing engagement with Trust Infection Control team. Experienced healthcare designers employed.	1	5	5	Alison Evans	OPEN	
St10	Statutory	New infection control risks or measures become apparent	Early and ongoing engagement with Trust Infection Control team. Experienced healthcare designers employed.	3	3	9	Ross Mushet	OPEN	
St11	Statutory	Project does not achieve required standards for privacy and dignity	Design progressed to latest standards, but agreement with the Trust may be required for backlog/ refurb areas.	2	4	8	Kate Shaw	OPEN	
St12	Statutory	Project does not achieve required standards for number of single rooms	Design progressed to latest standards, but agreement with the Trust may be required for backlog/ refurb areas.	4	3	12	Kate Shaw	OPEN	
St13	Statutory	Project does not comply with the CDM regulations	All designers are designing to CDM 2015. Principal Designer appointed. PD has written to Trust.	1	5	5	Kate Shaw	OPEN	
St14	Statutory	Project does not comply with requirements relating to asbestos	Asbestos review held at OBC and register obtained from the Trust. Ongoing close liaison with Trust Estates team.	1	5	5	Dave Thomas	OPEN	

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Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
St15	Statutory	Changes in the law and/or national guidance during the course of the project	No control measures. Any changes to be reviewed with the Trust. Contingency provided.	2	3	6	Kate Shaw	OPEN	
St16	Statutory	Changes in interpretation of guidance during scheme development	All decisions to be documented. Issues to be escalated to the Trust through the Transformation Team.	3	3	9	Ross Mushet	OPEN	
Design									
D1	Design	The Trust Brief is not provided or is not clear	Initial brief developed for OBC. Full Trust Brief document to be produced and agreed during FBC.	2	4	8	Kate Shaw	OPEN	
D2	Design	The Trust Brief is not adequately fixed and changes as the project progresses	Initial brief developed for OBC. Full Trust Brief document to be produced and agreed during FBC. Regular reviews held. Changes are escalated to the Trust through the Transformation Team.	3	3	9	Kate Shaw	OPEN	
D3	Design	The design progresses not in line with the agreed Trust Brief	Designers to monitor design against the brief. Any derogations to be agreed and documented.	2	4	8	Alison Evans	OPEN	
D4	Design	The required standards for a modern acute hospital are not achieved (HTM, HBN etc)	Designers to ensure design is in line with standards. Any derogations to be agreed and documented.	1	4	4	Alison Evans	OPEN	
D5	Design	The required standards for a modern hospital supercede HTM/HBN guidance	Designers to review and advise the Trust of any areas where this occurs.	2	3	6	Alison Evans	OPEN	
D6	Design	There is inadequate engagement with clinical users and/or issues with engagement	Engagement programme held with clinical users during OBC. Further detailed engagement during FBC planned. Issues are escalated to the Trust through the Transformation Team.	1	4	4	Kate Shaw	OPEN	
D7	Design	There is inadequate engagement with non-clinical users and/or issues with engagement	Engagement programme held with non-clinical users during OBC. Further detailed engagement during FBC planned. Issues are escalated to the Trust through the Transformation Team.	2	4	8	Kate Shaw	OPEN	
D8	Design	Trust has conflicting views, is not clear on what is required, and/or does not make decisions	Initial brief developed for OBC. Full Trust Brief document to be produced and agreed during FBC. Regular reviews held. Changes are escalated to the Trust through the Transformation Team.	3	3	9	Kate Shaw	OPEN	
D9	Design	Trust does not approve or sign-off design at required points	Project Manager to monitor and escalate any issues to Trust through the Transformation Team.	2	4	8	Ben Brookes	OPEN	
D10	Design	Clinical model is not clear	Initial brief developed for OBC. Full Trust Brief document to be produced and agreed during FBC. User engagement to review all aspects of clinical model.	2	4	8	Kate Shaw	OPEN	
D11	Design	Non-clinical requirements are not clear	Initial brief developed for OBC. Full Trust Brief document to be produced and agreed during FBC. User engagement to review all aspects of non-clinical model.	2	3	6	Kate Shaw	OPEN	
D12	Design	Trust working practices and operational policies not known or understood	Trust to issue whatever documents are in existence. Transformation Team to review gaps.	2	3	6	Ross Mushet	OPEN	

Sustainable Services Project (SSP)

Technical Risk Register

riderhunt | The Shrewsbury and Telford Hospital NHS Trust

Version:	4	Risk Champion:	Ben Brookes		
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Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
D13	Design	Trust clinical activity not understood or inadequately modelled- resulting in under or over capacity	Designers engaging with teams through user engagement. SHP undertaking peer review at key stages.	2	3	6	Alison Evans	OPEN	
D14	Design	Design is over-specified or over-designed	Designers designing to required standards. Reviews at key stages held.	2	2	4	Alison Evans	OPEN	
D15	Design	Derogations from standards not approved or signed off	Derogation schedule to be populated and signed off at key stages. Any derogations at OBC captured in derogations schedule.	2	4	8	Ben Brookes	OPEN	
D16	Design	Project team fail to utilise best practice or knowledge from elsewhere	Designers are all healthcare specialists. Design being monitored. Peer review being undertaken.	1	1	1	Alison Evans	OPEN	
D17	Design	Design not in line with approved space standards	SHP have produced Schedule of Accommodation for OBC in line with best practice and standards. Any derogations are being agreed.	1	3	3	Alison Evans	OPEN	
D18	Design	Inadequate flexibility in design	Design being reviewed at key points. Trust requirements for flexibility to be determined further during FBC.	2	3	6	Alison Evans	OPEN	
D19	Design	Inadequate consideration is given to IT requirements	IT have been engaged, with several meetings held during OBC. Initial IT requirements considered at OBC stage (eg hub room expansion). IT workstream and Technical workstream both reviewed at Project Team.	1	3	3	Ross Mushet	OPEN	
D20	Design	Inadequate consideration is given to Trust FM requirements (hard and soft)	FM team have been engaged with during OBC, and initial FM requirements considered in OBC stage design.	2	3	6	Ross Mushet	OPEN	
D21	Design	Inadequate plant maintenance, access and replacement space allowed	M&E Engineers to ensure incorporated into design. Trust Estates Team to review and comment.	1	3	3	Mike Singleton	OPEN	
D22	Design	Inadequate consideration is given to commercial opportunities in design	Initial commercial requirements considered during OBC and incorporated into design (eg retail to atria areas).	1	2	2	Alison Evans	OPEN	
D23	Design	Structural framing not adequately considered	Early framing report produced during OBC which has informed emerging layout plans.	1	3	3	David Middleton	OPEN	
D24	Design	Level of BIM not determined early	BIM requirements determined at OBC stage and initial meeting held, which are to be developed further during FBC.	3	3	9	Alison Evans	OPEN	
D25	Design	Future maintenance and replacement requirements not fully considered	Designers to ensure incorporated into design. Trust Estates Team to review and comment.	2	3	6	Mike Singleton	OPEN	
D26	Design	Wayfinding and access not adequately considered early	Architectural design incorporates initial wayfinding requirements. To be developed during FBC.	2	2	4	Alison Evans	OPEN	
D27	Design	Artwork and visual identity not considered early	Architectural design to incorporate potential artwork requirements. To be developed during FBC.	2	2	4	Alison Evans	OPEN	
D28	Design	The equipment planning is inadequate and/or the procurement of equipment is unable to be carried out	Equipment workstream established and initial allowances made for OBC.	2	4	8	Ross Mushet	OPEN	
D29	Design	Developing medical equipment imposes additional space and services requirements on the building and engineering systems	EBME engaged during OBC,and initial EBME requirements considerated in OBC stage design.	2	2	4	Ross Mushet	OPEN	

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riderhunt — The Shrewsbury and Telford Hospital NHS Trust

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Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
D30	Design	Changing planning and environmental legislation imposes an increased demand for renewable energy	No control measures. Any changes to be reviewed with the Trust. Contingency provided.	2	3	6	Dave Thomas	OPEN	
D31	Design	Disparity between new and retained areas causes contrast in service provision	Designers aware of issue. All standards to be agreed with the Trust. To be included in Brief.	4	3	12	Kate Shaw	OPEN	
D32	Design	Trust aspiration to retrospectively adopt changing guidance	Designers aware of issue. All standards to be agreed with the Trust. To be included in Brief.	2	3	6	Mike Singleton	OPEN	
D33	Design	For areas to be refurbished structural condition of existing frame poor	Structural inpsection of areas in question once fully exposed, followed by, if required, further invasive work and structural remedial works	2	3	6	David Middleton	OPEN	
D34	Design	Difficulties with clashes between new and existing foundations at interfaces of new/existing buildings	Trialholes against existing buildings to delineate existing foundations to be undertaken.	3	2	6	David Middleton	OPEN	
Site / Estate									
S1	Site/ Estate	Inadequate understanding of existing site	Existing record drawings reviewed in detail, site walk-overs taken place, and surveys commissioned during OBC. Further detailed work to be progressed during FBC.	2	3	6	David Middleton	OPEN	
S2	Site/ Estate	Inadequate understanding of existing buildings	Existing record drawings reviewed in detail, site walk-overs taken place, and surveys commissioned during OBC. Further detailed work to be progressed during FBC.	2	3	6	David Middleton	OPEN	
S3	Site/ Estate	Inadequate understanding of existing services/ infrastructure	Existing record drawings reviewed in detail, site walk-overs taken place, and surveys commissioned during OBC. Further detailed work to be progressed during FBC.	2	3	6	Mike Singleton	OPEN	
S4	Site/ Estate	Existing site, buildings, and/or infrastructure not as anticipated	Existing record drawings reviewed in detail, site walk-overs taken place, and surveys commissioned during OBC. Further detailed work to be progressed during FBC.	3	3	9	Mike Singleton	OPEN	
S5	Site/ Estate	Existing backlog or condition issues present over and above considered in SSP	Backlog surveys have been undertaken, which have been provided to the designers. SSP addresses large amounts of backlog. Residual backlog reviewed.	3	4	12	Dave Thomas	OPEN	
S6	Site/ Estate	Poor ground conditions, and/or ground conditions not understood	Existing record drawings reviewed, site walk-overs taken place, Desktop survey and full intrusive Site Investigation undertaken during OBC.	2	3	6	David Middleton	OPEN	
S7	Site/ Estate	Contamination could be present in the ground	Existing record drawings reviewed, site walk-overs taken place, Desktop survey and full intrusive Site Investigation undertaken during OBC.	2	3	6	David Middleton	OPEN	
S8	Site/ Estate	Ecological issues could be present (bats, trees etc)	Existing record drawings reviewed, site walk-overs taken place, surveys commissioned as appropriate during OBC. Ecology advisor appointed during OBC.	2	2	4	Alison Evans	OPEN	
S9	Site/ Estate	Site levels could present an issue for design and/or increase costs (cut & fill /retaining walls)	Existing record drawings reviewed, site walk-overs taken place, Topographical survey undertaken during OBC, and initial cut & fill exercise undertaken.	2	2	4	David Middleton	OPEN	

Sustainable Services Project (SSP)

Technical Risk Register

Version:	4	Risk Champion:	Ben Brookes		
Date:	24-Oct-16	Updated by:	Ben Brookes	Stage:	OBC- Final

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
S10	Site/ Estate	Existing building levels may create an issue for design	Existing record drawings reviewed, site walk-overs taken place, Topographical survey undertaken during OBC, and initial cut & fill exercise undertaken.	2	2	4	Alison Evans	OPEN	
S11	Site/ Estate	Existing drainage may not have capacity to serve new development	Existing record drawings reviewed, site walk-overs to take place, Drainage survey to take place during FBC.	3	3	9	David Middleton	OPEN	
S12	Site/ Estate	Existing M&E services have insufficient capacity to serve new development and/or capacity not understood.	Existing record drawings reviewed, site walk-overs taken place, Capacity review undertaken during OBC.	3	3	9	Mike Singleton	OPEN	
S13	Site/ Estate	Condition of existing M&E services is not adequate and/or is not understood	Existing record drawings reviewed in detail, site walk-overs taken place, Surveys commissioned during OBC.	3	3	9	Mike Singleton	OPEN	
S14	Site/ Estate	Highways / access issues are not understood or dealt with	Highways advisor appointed during OBC. Initial review undertaken.	2	2	4	Alison Evans	OPEN	
S15	Site/ Estate	Public transport requirements and/or access to the sites are not understood or dealt with	Transport advisor appointed during OBC. Initial meeting held with Trust. OBC-stage transport study and report produced.	2	2	4	Alison Evans	OPEN	
S16	Site/ Estate	Ambulance access not adequately considered	Engagement with WM Ambulance held during OBC.	2	3	6	Ross Mushet	OPEN	
S17	Site/ Estate	Helipad location and access not adequately considered	Engagement with Air Ambulance held during OBC. Helipad specialist to be appointed during FBC.	2	3	6	Alison Evans	OPEN	
S18	Site/ Estate	Parking requirements are not worked through or adequately considered	'Transport advisor appointed during OBC. Initial meeting held with Trust. OBC-stage transport study and report produced. Trust Travel Plan updated during OBC. Transport sub-group to be set up.	3	3	9	Kate Shaw	OPEN	
S19	Site/ Estate	The required parking may require significant capital cost	New car parking assumed to be procured through an externally funded deal (eg CP plus), or a separate revenue-based business case	2	3	6	Kate Shaw	CLOSED	
S20	Site/ Estate	The project may impact on other items of backlog	Backlog surveys have been undertaken, which have been provided to the designers. Estates team have engaged extensively with Technical Team through OBC.	3	3	9	Dave Thomas	OPEN	
S21	Site/ Estate	The project may impact on other infrastructure	Estates team have engaged extensively with Technical Team through OBC.	3	3	9	Dave Thomas	OPEN	
S22	Site/ Estate	The project may affect other clinical services (eg radiology, imaging, pathology)	Support services engagement undertaken during OBC. Issues to be incorporated into design.	4	3	12	Ross Mushet	OPEN	
S23	Site/ Estate	The project may affect other non-clinical services (eg FM, medical records, security)	Support services engagement undertaken during OBC. Issues to be incorporated into design.	4	3	12	Ross Mushet	OPEN	
S24	Site/ Estate	The project may impact on other capital projects	Estates team have engaged extensively with Technical Team. SSP project is under the jurisdiction of the Trust's development team, which link to the Transformation Team.	2	2	4	Ross Mushet	OPEN	

Sustainable Services Project (SSP)

Technical Risk Register

Version:	4	Risk Champion:	Ben Brookes
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Stage:	OBC- Final		

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
S25	Site/ Estate	Other capital projects may impact on the project	Estates team have engaged extensively with Technical Team. SSP project is under the jurisdiction of the Trust's development team, which link to the Transformation Team.	2	2	4	Ross Mushet	OPEN	
S26	Site/ Estate	The existing hospital services will need to remain operational until the project is delivered	Initial review of clinical and non-clinical requirements undertaken during OBC. Phasing and sequencing review held for all options. To be developed for FBC.	3	4	12	Dave Thomas	OPEN	
S27	Site/ Estate	The existing infrastructure will need to remain operational until the project is delivered	Initial review of infrastructure requirements undertaken during OBC. Phasing and sequencing review held for all options. To be developed for FBC.	3	3	9	Dave Thomas	OPEN	
S28	Site/ Estate	Innaccuracy of existing Trust record information	Existing record drawings reviewed in detail, site walk-overs taken place, and surveys commissioned during OBC. Any issues to be escalated. Further detailed work to be progressed during FBC.	3	3	9	Dave Thomas	OPEN	
S29	Site/ Estate	Limited accessibility to survey existing building areas in sensitive locations.	Walkovers and surveys to take place as far as practical. Contingency to be provided.	3	2	6	Ross Mushet	OPEN	
S30	Site/ Estate	Existing drainage damaged and therefore requires repair	Drainage CCTV and where applicable remedial works/diversion works.	3	2	6	David Middleton	OPEN	
S31	Site/ Estate	Change in use in existing areas alters ground level pop up positions therefore requiring siginificant slab break outs	Cross check drainage plans and proposed layouts to minimise disruption to existing ground slabs.	3	1	3	David Middleton	OPEN	
S32	Site/ Estate	There may be residual backlog which remains and is not addressed as part of the SSP project	Estates team to review what residual backlog remains and ensure the Trust team are sighted on this.	3	4	12	Dave Thomas	OPEN	
S33	Site/ Estate	Refurbishment may not fully address the backlog issues present (eg light touch may mean M&E issues left)	Estates team to review what residual backlog remains and ensure the Trust team are sighted on this.	3	3	9	Dave Thomas	OPEN	
S34	Site/ Estate	There may be unknown backlog items uncovered during the works, or backlog is worse than reported	No real mitigation possible- allow for in contingency.	3	3	9	Dave Thomas	OPEN	
S35	Site/ Estate	Problems occur in existing estate before SSP addresses the area	Programming of critical backlog items to be reviewed; possible early addressing of issues to be considered. Contingency to be included.	3	4	12	Dave Thomas	OPEN	
S36	Site/ Estate	Critical backlog work may be required to be undertaken before SSP addresses the area, resulting in additional costs	Programming of critical backlog items to be reviewed; possible early addressing of issues to be considered. Contingency to be included.	3	4	12	Dave Thomas	OPEN	
S37	Site/ Estate	Backlog deteriorates and increases during SSP timelines	Programming of critical backlog items to be reviewed; possible early addressing of issues to be considered. Contingency to be included.	3	4	12	Dave Thomas	OPEN	
S38	Site/ Estate	Condition of existing concrete may be poor (eg HAC, high carbonation, Chloride etc)	Survey work to be done at appropriate time. Contingency to be included.	3	2	6	David Middleton	OPEN	

Sustainable Services Project (SSP)

Technical Risk Register

Version: 4	Risk Champion: Ben Brookes		
Date: 24-Oct-16	Updated by: Ben Brookes	Stage:	OBC- Final

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
Commercial/ Financial/ Contractual									
C1	Commercial / Financial	The capital budget for the scheme is not adequate or realistic	Rider Hunt have provided a High Level Cost Estimate for OBC, with suitable allowances for contingency and optimism bias.	2	5	10	Neil Nisbet	OPEN	
C2	Commercial / Financial	The required capital is not available	Ongoing reviews held between Trust and NHSI. Alternative plans to be put in place should sufficient capital not be released by the centre.	3	4	12	Neil Nisbet	OPEN	
C3	Commercial / Financial	Over optimistic VAT reclaim in business case; and/or VAT reclaim determined by HMRC is less than anticipated at Business Case	Conservative allowance made for OBC. Contingency to be provided.	2	4	8	Neil Nisbet	OPEN	
C4	Commercial / Financial	The capital expenditure is not managed within the budget as the scheme progresses	Cost reporting at regular intervals. Full affordability check undertaken for OBC.	2	4	8	Ben Brookes	OPEN	
C5	Commercial / Financial	A decision on the procurement route is not made in line with the required project timescales	Assumed procurement route for the OBC is to use ProCure22, however final decision is dependent on capital funding.	2	3	6	Ben Brookes	OPEN	
C6	Commercial / Financial	The project is not attractive to commercial investment, should this be required	Assumed procurement route for the OBC is to use ProCure22, however final decision is dependent on capital funding. Design team developing design which would be attractive to commercial investment, should this be required.	3	3	9	Ben Brookes	OPEN	
C7	Commercial / Financial	Costs to achieve OBC and FBC are not managed or controlled	Fees and budgets established for each stage, and Trust/ Rider Hunt then monitoring expenditure.	2	3	6	Ben Brookes	OPEN	
C8	Commercial / Financial	Costs to achieve OBC and FBC are not value for money	Rider Hunt ensuring appropriate procurement is undertaken for all OBC and FBC design and support, in line with Trust's SFIs and framework rules.	2	3	6	Ben Brookes	OPEN	
C9	Commercial / Financial	The chosen procurement route is not compliant with the Trust's SFIs and/or does not offer value for money	Assumed procurement route for the OBC is to use ProCure22, however final decision is dependent on capital funding.	2	4	8	Ben Brookes	OPEN	
C10	Commercial / Financial	Third party energy suppliers contracts may be difficult to adapt	Contracts to be understood early. To be considered in design.	3	3	9	Martin Foster	OPEN	
C11	Commercial / Financial	Inflation may increase from published levels, resulting in increased capital cost	Inflation included within costs at current Pubsec levels. Contingency allowance to be made.	3	3	9	Neil Nisbet	OPEN	

Sustainable Services Project (SSP)

Technical Risk Register

riderhunt — The Shrewsbury and Telford Hospital NHS Trust

Version:	4	Risk Champion:	Ben Brookes
Date:	24-Oct-16	Updated by:	Ben Brookes
Stage:	OBC- Final		

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
Management									
M1	Management	NHSI (TDA) reject SOC, or make significant changes to scope	SOC produced in line with guidance and best practice. Regular reviews with NHSI held.	2	5	10	Neil Nisbet	OPEN	
M2	Management	Technical aspects of OBC not progressed in line with timescales.	Structure and work requirements for OBC established. Rider Hunt managing process. Regular technical team meetings held, and progress reports produced by team members.	2	4	8	Ben Brookes	OPEN	
M3	Management	Options appraisal not progressed at appropriate time	Trust team reviewing with Future Fit. Technical workstream to adapt to requirements.	3	3	9	Kate Shaw	CLOSED	
M4	Management	Options appraisal produces inaccurate output	Trust team reviewing with Future Fit. Technical workstream to adapt to requirements.	3	3	9	Kate Shaw	CLOSED	
M5	Management	OBC timescales not realistic or achievable	Programme developed by Transformation Team and Rider Hunt.	2	2	4	Ben Brookes	CLOSED	
M6	Management	OBC timescales are too long, resulting in loss of momentum and additional/ abortive costs	Programme developed by Transformation Team and Rider Hunt. Some items are outside of SaTH's control.	2	2	4	Ben Brookes	CLOSED	
M7	Management	Preferred site is chosen too late, or decision not taken	Preferred site identified as part of OBC options appraisal, subject to public consultation.	3	4	12	Kate Shaw	OPEN	
M8	Management	Insufficient capacity within Technical Workstream	All designers selected for their capability and capacity. Rider Hunt to manage overall deliverables for OBC and FBC, and escalate any issues to the Trust.	1	4	4	Ben Brookes	OPEN	
M9	Management	Insufficient capability within Technical Workstream	All designers selected for their capability and capacity. Rider Hunt to manage overall deliverables for OBC and FBC, and escalate any issues to the Trust.	1	3	3	Ben Brookes	OPEN	
M11	Management	Technical aspects of the Outline Business Case are incomplete or inaccurate	Structure and work requirements for OBC established. Rider Hunt managing process.	2	4	8	Ben Brookes	CLOSED	
M12	Management	Change in Trust staff over the period of the development may result in changes to decisions	All decisions to be documented. Issues to be escalated to the Trust through the Transformation Team. Robust governance in place.	3	3	9	Kate Shaw	OPEN	
Programme/ Build/ Phasing									
P1	Programme / Build	Inadequate consideration is given to phasing/ sequencing leading to issues arising during the works	Initial phasing developed at SOC. Full phasing and sequencing review held during OBC, to ensure it works for all options. To be worked up in detail during FBC.	2	3	6	Ben Brookes	OPEN	
P2	Programme / Build	Programme not worked through, or not deliverable	Dates, phasing, and sequencing determined at OBC for all options. To be worked up in detail during FBC.	2	3	6	Ben Brookes	OPEN	
P3	Programme / Build	Issues arise as a result of working adjacent to live departments and/or the need to keep the department operational during the works	Requirements understood, and design mitigates wherever possible. Full phasing and sequencing review held during OBC. To be worked up in detail during FBC.	3	4	12	Kate Shaw	OPEN	

riderhunt   The Shrewsbury and Telford Hospital NHS Trust

Sustainable Services Project (SSP)

Technical Risk Register

Version:	4	Risk Champion:	Ben Brookes
Date:	24-Oct-16	Updated by:	Ben Brookes
Stage:	OBC- Final		

Ref.	Category	Risk	Mitigation	Probability	Impact	Risk Score	Risk Owner	Status	Comments
P4	Programme / Build	Access not maintained during the works	Requirements understood, and design mitigates wherever possible. Full phasing and sequencing review held during OBC. To be worked up in detail during FBC.	2	3	6	Ben Brookes	OPEN	
P5	Programme / Build	Problems arise due to unknown or unforeseen issues working within an existing building	Surveys to be undertaken. Contingency allowance to be made.	3	3	9	Dave Thomas	OPEN	
P6	Programme / Build	Usual construction risks are encountered- such as poor ground, weather, insolvency of subcontractors etc etc.	Contingency allowance to be made.	3	2	6	Ben Brookes	OPEN	
P7	Programme / Build	Asbestos is found within the existing buildings	Asbestos review held at OBC and register obtained from the Trust. Ongoing close liaision with Trust Estates team.	3	3	9	Dave Thomas	OPEN	
P8	Programme / Build	Unknown live services are encountered under the ground or within the existing building	Existing record drawings to be reviewed, site walk-overs to take place, surveys to take place during OBC. Contingency allowance to be made.	2	3	6	Dave Thomas	OPEN	
P9	Programme / Build	Hospital operations are affected by noise and/or dust as a result of the works	Requirements to be mitigated wherever possible during design.	2	4	8	Ben Brookes	OPEN	
P10	Programme / Build	Trust is unable to, or encounters issues with, maintaining the existing departments as operational throughout the works	Requirements understood, and design mitigates wherever possible. Full phasing and sequencing review held during OBC. To be worked up in detail during FBC.	3	3	9	Kate Shaw	OPEN	

VOLUME 5: BREEAM ASSESSMENTS

hrs
SERVICES
LIMITED

22nd August 2016

Alison Ewins
BREEAM Assessor

New Build Areas, SaTH
Ref No: 123599

HRS Services Ltd
The Maltings
81 Burton Road
Sheffield
S3 8BZ

BREEAM Healthcare Pre-Assessment Report 2014

HRS have been providing a Nationwide Service for over 20 Years

Head Office: HRS Services Ltd, The Maltings, Burton Road, Sheffield, S3 8BZ | Tel: 0114 2723004 | Fax: 0114 2723003
Southern Office: HRS Services Ltd, PO Box 3410, Swindon, SN5 5YP | Tel: 01793 871715
www.hrsservices.co.uk

Contents

Prepared by:
HRS Services Ltd
81 Burton Road
Sheffield S3 8BZ
Tel 01142723004
sew@hrsservices.co.uk

Introduction

BREEAM (Building Research Establishment's Environmental Assessment Method) is a voluntary scheme that works by awarding credits for meeting different environmental targets. It is the worlds longest established and most widely used environmental assessment method and winner of the 'Best Program Award' at the 2005 Tokyo World Sustainable Building Conference.

The scheme works by awarding credits for sustainability issues that are split into nine categories; Management, Health and Well Being, Energy Transport, Water, Materials, Waste, Land Use and Ecology and Pollution. The points are added together to give a final BREEAM rating of Pass, Good, Very Good, Excellent or Outstanding.

HRS Services Ltd have been commissioned to carry out a pre assessment BREEAM New Construction Healthcare 2014 assessment by AHR Architects on the new build areas at SaTH.

This initial assessment provides the design team and client with details of the rating we believe to be achievable at this early stage. The pre assessment has been carried out using BRE software and information provided by the design team has been entered.

The predicted BREEAM rating for the new development was Excellent. A score of 70.60% was initially deemed achievable following discussions between the design team and Alison Ewins

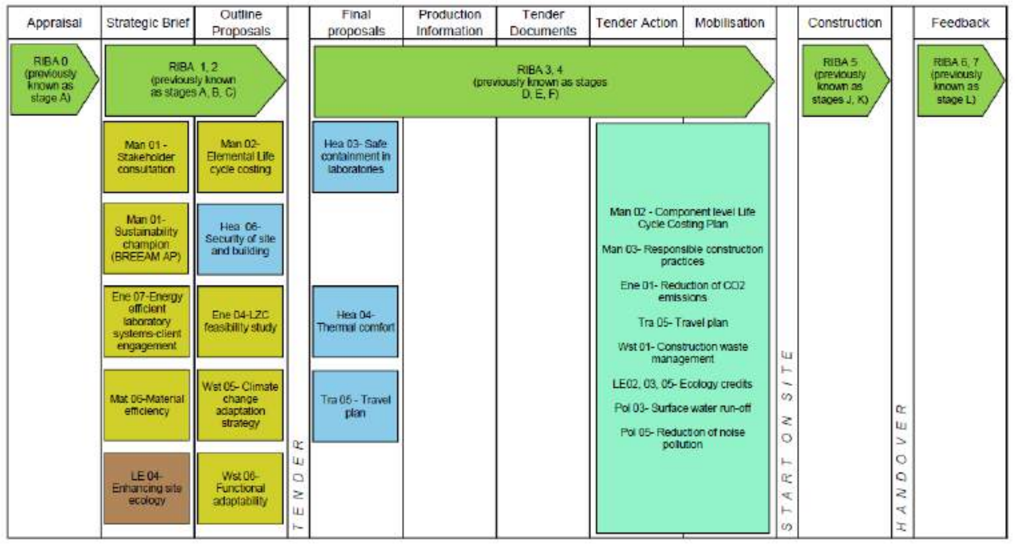
The table below shows the percentage scores required for the BREEAM ratings.

BREEAM rating	% score needed
Unclassified	<30
Pass	≥30
Good	≥45
Very Good	≥55
Excellent	≥70
Outstanding	≥85

The table below shows the BREEAM minimum standards required to achieve the applicable rating.

	BREEAM Rating/Minimum number of credits				
BREEAM Issue	PASS	GOOD	VERY GOOD	EXCELLENT	OUTSTANDING
Man 03 – Responsible construction practices				1	2
Man 04 – Commissioning and handover				Criterion 10	Criterion 10
Man 05 – Aftercare				1	1
Ene 01 – Reduction of energy use and CO_2 emissions				5	8
Ene 2 - Energy monitoring (First sub-metering credit)			1	1	1
Wat 1- Water consumption		1	1	1	2
Wat 2 - Water monitoring (Criterion 1)		1	1	1	1
Mat 3 – Responsible sourcing (Criterion 3)	1	1	1	1	1
Wst 1 – Construction waste management					1
Wst 3 – Operational waste				1	1
LE3 – Mitigating ecological impact			1	1	1

Time limited credits



Optional credits

There are a number of additional credits not assumed at pre-assessment stage which may be gained at a later stage when further evidence is provide or if changes are made to the project.

As the predicted score is only just over the 70% needed for an Excellent rating the 'at risk' and additional credits should not be considered optional at this stage. To give some margin the design team should be aiming to achieve at least 75% in case any credits we have assumed in this pre-assessment prove too difficult to achieve.

This pre-assessment has been based on limited information and no formal evidence. The requirements set out in the tables below give a brief overview of each credit. For the formal BREEAM certification detailed requirements are defined in the BRE guidance and must be met to achieve credits. This will include evidence in the form of plans, photographs, letters, specification and reports.

It should be noted that a number of BREEAM credits, including some optional credits, are time limited. Action is required at a specific RIBA stage to allow the credit to be awarded. Refer to table on Page 5 for time limited credits.

The following optional credits could be investigated to increase the target score:

Man 01 Sustainability Champion (design) – 1 credit

- A Sustainability Champion has been appointed to facilitate the setting and achievement of BREEAM performance targets for the project. The design stage Sustainability Champion is appointed to perform this role during the feasibility stage (RIBA Stage 1).
- The defined BREEAM performance target(s) has been formally agreed between the client and design/project team no later than the Concept Design stage (RIBA Stage 2).
- To achieve this credit at the interim design stage assessment, the agreed BREEAM performance target(s) must be demonstrably achieved by the project design. This must be demonstrated via the BREEAM assessor's design stage assessment report.

Man 01 Sustainability Champion (monitoring progress) – 1 credit

- The Sustainability Champion criteria above have been achieved.

- A Sustainability Champion is appointed to monitor progress against the agreed BREEAM performance target(s) throughout the design process and formally report progress to the client and design team.
- To do this the Sustainability Champion must attend key project/design team meetings during the Concept Design, Developed Design and Technical Design stages, as defined by the RIBA Plan of Work 2013, reporting during, and prior to, completion of each stage, as a minimum.

Man 02 Elemental life cycle cost (LCC) – 2 credits

- An outline, entire asset elemental life cycle cost (LCC) plan has been carried out at Process Stage 2 (equivalent to Concept Design - RIBA Stage 2) in line with 'Standardised method of life cycle costing for construction procurement' PD 156865:20081. 2.
- The elemental LCC plan:
  a) Provides an indication of future replacement costs over a period of analysis as required by the client (e.g. 20, 30, 50 or 60 years);
  b) Includes service life, maintenance and operation cost estimates.
- Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design/specification to minimise life cycle costs and maximise critical value.

Man 02 Component level LCC option appraisal – 1 credit

- A component level LCC option appraisal has been developed by the end of Process Stage 4 (equivalent to Technical Design – RIBA Stage 4) in line with PD 156865:2008 and includes the following component types (where present):
  a) Envelope, e.g. cladding, windows, and/or roofing
  b) Services, e.g. heat source cooling source, and/or controls
  c) Finishes, e.g. walls, floors and/or ceilings
  d) External spaces, e.g. alternative hard landscaping, boundary protection.
- Demonstrate, using appropriate examples provided by the design team, how the component level LCC cycle appraisal has been used to influence building and systems design/specification to minimise life cycle costs and maximise critical value.

Man 03 Sustainability Champion (construction) – 1 credit

- A Sustainability Champion is appointed to monitor the project to ensure ongoing compliance with the relevant sustainability performance/process criteria, and therefore BREEAM target(s), during the Construction, Handover and Close Out stages (RIBA Stages 5 and 6).To do this the Sustainability Champion will ideally be site based or will visit the site regularly to carry out spot checks, with the relevant authority to do so, and will require action to be taken to address shortcomings in compliance. The Sustainability Champion will monitor site activities with sufficient frequency to ensure that risks of non-compliance are minimised. They will report on progress at relevant project team meetings including identifying potential areas of non-compliance and any action needed to mitigate.
- The defined BREEAM performance target forms a requirement of the principal contractor's contract

Hea 02 Volatile organic compound (VOC) emission levels – 1 credit

- The formaldehyde concentration level is measured post construction (but pre-occupancy) and is found to be less than or equal to 100µg/m^3 averaged over 30 minutes (WHO guidelines for indoor air quality: Selected pollutants, 2010).
- The total volatile organic compound (TVOC) concentration level is measured post construction (but pre-occupancy) and found to be less than 300µg/m^3 over 8 hours, in line with the Building Regulation requirements.
- Where VOC and formaldehyde levels are found to exceed the limits defined in criteria 8 and 9, the project team confirms the measures that have, or will be taken, in accordance with the IAQ plan, to reduce the levels to within these limits,
- The testing and measurement of the above pollutants are in accordance with the following standards where relevant:
  - BS ISO 16000-4: 2011 Diffusive sampling of formaldehyde in air
  - BS ISO 16000-6: 2011 VOCs in air by active sampling
  - BS EN ISO 16017-2: 2003 VOCs - Indoor, ambient and workplace air by diffusive sampling
  - BS ISO 16000-3: 20116 Formaldehyde and other carbonyls in air by active sampling.

Wst 02 Recycled aggregates – 1 credit

- The percentage of high grade aggregate that is recycled or secondary aggregate, specified in each application (present) must meet the following minimum % levels (by weight or volume) to contribute to the total amount of recycled or secondary aggregate, as specified in the table below:

Application	Min. % One credit	Min. % Exemplary performance
Bound		
Structural frame	15%	30%
Bitumen or hydraulically bound base, binder, and surface courses for paved areas and roads	30%	75%
Building foundations	20%	35%
Concrete road surfaces	15%	45%
Unbound		
Pipe bedding	100%	100%
Granular fill and capping (see Relevant definitions section)	100%	100%

- The total amount of recycled or secondary aggregate specified, and meeting criterion 1, is greater than 25% (by weight or volume) of the total high grade aggregate specified for the project. Where the minimum level in criterion 1 is not met for an application, all the aggregate in that application must be considered as primary aggregate when calculating the total high grade aggregate specified.
- The recycled or secondary aggregates are EITHER:
  a. Construction, demolition and excavation waste obtained on-site or off-site; OR
  b. Secondary aggregates obtained from a non-construction post-consumer industrial by product source (see

Credit breakdown

Reference	Credit title	Criteria	Potential credits	Credits assumed	Potential Credits	Notes
Man 01	Project brief and design	Will stakeholder consultation (project delivery) take place (prior to end of RIBA stage 2)? Will stakeholder consultation (third party) take place (prior to end of RIBA stage 2)? Will a sustainability champion (design) be assigned? Will a sustainability champion (monitoring progress) be assigned?	1 1 1 1	1 1 0 0	 1 1	
Man 02	Life cycle cost and service life planning	Will an elemental life cycle (LCC) analysis be carried out at RIBA stage 2? Will a component level LCC plan be developed at RIBA stage 4? Will the predicted capital cost be reported?	2 1 1	0 0 0	2 1	
Man 03	Responsible Construction Practices	Pre-requisite- Is all timber used in the project 'legally harvested and traded timber?' Does the principal contractor operate a compliant Environmental Management System (ISO 14001)?	 1	 1		

		Will a construction stage sustainability champion be assigned?	1	0	1	
		Will a considerate constructor's scheme be used by the principal contractor?	2	2		A Considerate Constructors Scheme score of over 40 must be achieved with no section scoring less than 7 points.
		Will site utility be metered/monitored	1	1		
		Will the transport of construction materials and waste to/from site be measured/monitored?	1	1		
Man 04	Commissioning and handover	Will commissioning schedule and responsibilities be developed and accounted for?	1	1		
		Will a specialist commissioning manager be appointed for complex building services?	1	1		
		Will the building fabric be commissioned (air tightness test and thermographic survey)?	1	1		
		Will a training schedule for building occupiers/managers be produced AND will a building user guide be developed?	1	1		
Man 05	Aftercare	Will aftercare support be provided to building occupants?	1	1		Contractor to provide aftercare support
		Will seasonal commissioning occur over 12months once substantially occupied?	1	1		
		Will a post occupancy evaluation be carried out 1 year after occupation by an independent third party?	1	1		
Hea 01	Visual comfort	Will the design provide adequate glare control for the building users/	1	1		The potential for disabling glare will be designed out of all relevant building areas either through building layout and or building

		Will relevant building areas be designed to achieve appropriate daylight factors?	1	0		shading control strategies
		Will the design provide adequate view out for building users?	1	0		
		Will internal/external lighting levels, zoning and controls be specified in accordance with the relevant CIBSE Guides/British Standards?	1	1		
Hea 02	Indoor air quality	Will an air quality plan be produced and building designed to minimise air pollution?	1	1		
		Will the building be designed to minimise the concentration and recirculation of pollutants in the building?	1	0		
		Will the relevant finishes products be specified to meet the VOC testing and emission levels required?	1	1		
		Will formaldehyde and total VOC levels be measured post construction?	1	0	1	
		Will the building be designed to, or have the potential to provide, natural ventilation?	1	0		
Hea 04	Thermal comfort	Will thermal modelling of the design be carried out?	1	1		Full dynamic thermal analysis is carried out in accordance with CIBSE AM11, which demonstrates the building meets the specific criteria. Where air conditioning is present the PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied) indices are reported based on the thermal model.

		Will the thermal model be carried out to show that the building design can be adapted for a projected climate change scenario? Will the modelling inform the development of a thermal zoning and control strategy?	1 1	1 1		
Hea 05	Acoustic performance	Will the building meet the relevant acoustic performance standards and testing requirements for: a. Sound insulation b. Indoor ambient noise level c. Reverberation times?	3	2	1	
Hea 06	Safety and security	Where external site areas are present, will safe access be designed for pedestrians and cyclists? Will a suitably qualified security consultant be appointed and security considerations accounted for?	1 1	0 1		During or prior to Concept Design (RIBA Stage 2), a Suitably Qualified Security Specialist (SQSS) conducts an evidence based Security Needs Assessment (SNA) to develop a set of site specific recommendations or solutions, with the aim to ensure the design of buildings, public and private car parks and public or amenity spaces are planned, designed and specified to address issues identified.
Ene 01	Reduction of CO_2 emissions	Based on the Energy Performance Ratio for New Construction (EPR_{NC}). This is based on the building's modelled; operational energy performance ($mJ{,}m^2$), primary energy consumption (kWh/m2) and CO_2 emissions ($kg\ CO_2/m^2$).	12	5		The proposed building performance will need to be better than the Target Emission Rate (TER) required for Building Regulations. The calculation for allocation of credits will also take into account the proposed building energy demand and energy consumption.

Ene 02	Energy Monitoring	Energy monitoring systems are installed to energy consuming systems accounting for ≥90% of the estimated total annual energy consumption for each fuel to be assigned to the various end-use categories of energy consuming systems. For buildings with a total useful floor area of greater than 1000 sq.m an appropriate energy monitoring and management system must be specified e.g. Building Management System (BMS). BMS or sub-meters will be be specified to monitor energy use by tenant/building function areas?	1 1	1 1		For the following systems (where present); Space heating, Domestic Hot Water, Humidification, Cooling, Fans (major), Lighting, Small power, Any other major energy consuming items where appropriate. Mandatory credit. All energy sub meters have a pulsed output to enable future connection to BMS for the monitoring of energy consumption.
Ene 03	External Lighting	Will external light fittings and controls be specified in accordance with the BREEAM criteria?	1	1		Energy-efficient external lighting (≥ 60 luminaire lumens per circuit watt) is specified and all light fittings are controlled for the presence of daylight.
Ene 04	Low Carbon design	Will passive deign measures be used in line with an analysis carried out during concept design stage (RIBA stage 2 or equivalent)? Will free cooling measures be implemented in the whole building in line with the passive design analysis? Will an LZC technology be specified in line with a feasibility study carried out by the completion of Concept Design stage (RIBA Stage 2 or equivalent)?	1 1 1	0 0 1		LZC feasibility study covering all BREEAM requirements will be produced an LZC technology will be specified and will reduce the building's CO_2 emissions by at least 5%.
Ene 06	Energy Efficient Transportation Systems	Will a transportation system analysis be carried out to determine and specify the optimum number, size and type of lifts that is most energy efficient? Will the relevant energy efficient features criteria be met?	1 2	1 2		
Ene	Energy Efficient	Identify the building's unregulated energy consuming	2	2		

08	Equipment	loads from the list below and for each (where applicable), estimate or model their contribution to the total unregulated energy consumption, assuming a typical/standard specification. a. Small power, plug in equipment ~~b. Swimming pool~~ c. Communal laundry facilities with commercial sized ~~appliances~~ ~~d. Data centres~~ ~~e. IT intensive operating areas~~ ~~f. Residential areas with domestic appliances (individual and communal facilities)~~ g. Healthcare h. Kitchen and catering facilities Of the systems / processes that have a major impact on the total unregulated energy demand, a meaningful reduction in the total unregulated energy demand must be demonstrated through either good practice design or specification.				
Tra 01	Public Transport Accessibility	Credits are awarded on a sliding scale based on the assessed buildings' accessibility to the public transport network.	5	2		A building Accessibility Index of ≥4 will be required.
Tra 02	Proximity to amenities	Are at least 4 of the following amenities within 500m of the proposed building: - 2 from this list- Core amenities (at least 3 must be accessible): Food outlet, access to cash, outdoor space - 2 from this list- Other amenities: access to recreation/leisure facility for sports, postal facility, pharmacy.	1	1		
Tra 03	Cyclist Facilities	Covered, secure and well-lit cycle storage facilities are provided for all building users.	1	1		Number of compliant cycle spaces provided is as follows: 1 for every 10 staff plus 1 for every 2

		Second credit, two of the following must be provided; a) compliant showers, b) compliant changing facilities c) lockers for clothes, d) compliant drying space for wet clothes	1	1		consulting rooms OR 10 beds
Tra 04	Maximum Car Park Capacity	Number of credits awarded is based on number of car parking spaces provided relative to the number of building users and building's accessibility index.	1	1		Maximum of 1 space for every 4 staff plus 1 space for every 4 beds plus 2 spaces for each consulting, examination, treatment, therapy room and A&E cubicle.
Tra 05	Travel Plan	A travel plan has been developed and tailored to the specific needs of the building users.	1	1		
Wat 01	Water Consumption	The specification includes taps, urinals, WCs, showers & kitchen equipment that consume less potable water in use than standard specifications for the same type of fittings.	5	1		Also takes into account rainwater and greywater recycling systems. Assumed that water consumption for the proposed building is 25% less compared against a notional baseline. A minimum of one credit must be achieved.
Wat 02	Water Monitoring	Will there be a water meter on the mains water supply to the building(s) Will metering/monitoring equipment be specified on the water supply to any relevant plant/building areas that consume over 10% of building's water demand? Will all specified water meters have a pulsed output? If the site/building has an existing BMS connection, will all pulsed meters be connected to the BMS?	1	1		The first criteria is mandatory
Wat 03	Water Leak Detection and Prevention	Will a mains water leak detection system be installed on the building's mains water supply?	1	1		Must cover all mains water supply between and within the building and the site boundary. System must be audible when activated, activated when the flow of water passes

		Will flow control devices be installed in each sanitary area/facility?	1	1		through the water meter/data logger at a flow rate above a pre set minimum for a pre set period of time, able to identify different flow and therefore leakage rates over set periods of time, programmable to suit the owner/occupiers water consumption requirements, where applicable designed to avoid false alarms caused by normal operation of large water consuming plant such as chillers. This could be a presence detector and controller, i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed
Wat 04	Water Efficient Equipment	N/A				N/A – assumed that there is no external planting/landscaping or vehicle wash system specified
Mat 01	Life Cycle Impacts	Credits determined on the basis of the building's quantified environmental life cycle impact through assessment of the main building elements. The external walls and roof need to be assessed.	6	5	1	Green guide ratings for materials used in following elements must be considered; External walls, windows, roof, upper floor slab, internal walls and floor finishes / coverings.
Mat 02	Hard Landscaping and Boundary Protection	At least 80% of the combined area of external hard landscaping and boundary protection specifications achieve an A or A+ rating, as defined by the Green Guide to Specification.	1	1		
Mat 03	Responsible Sourcing of Materials	MANDATORY REQUIREMENT Is all timber and timber based products 'Legally harvested and traded timber'? Does the principal contractor source materials for the project in accordance with a sustainable procurement	1	1		

		plan? Each of the applicable specified materials comprising the main building elements are assigned a responsible sourcing tier level and points awarded accordingly	3	1		
Mat 04	Insulation	Is the building targeting an insulating index of 2.5 or more?	1	1		Building insulation products to be Green Guide rated A+ or A.
Mat 05	Designing for durability and resilience	Will suitable durability/protection measures be specified and installed to vulnerable areas of the building? Will the relevant building elements incorporate appropriate design and specification measures to limit material degradation due to environmental factors?	1	1		Must include but not be limited to a) Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc). b) Protection against any internal vehicular/ trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. c) Protection against or prevention from any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the external building façade for all car parking areas and within 2m for all delivery areas.
Mat 06	Materials efficiency	Have opportunities and measures to optimise the use of materials in building design, procurement, construction, maintenance and end of life been identified, investigated and implemented by the design/construction team as appropriate in consultation with the relevant parties at each of the following RIBA stages: a. Preparation and Brief b. Concept Design c. Development Design d. Technical Design	1	1		

		e. Construction				
Wst 01	Construction Site Waste Management	Has a compliant Construction Resource Management Plan (CRMP) been developed? The amount of non-hazardous construction waste ($m^3/100m^2$ or tonnes$100m^2$) generated on site by the development is the same as or better than good or best practice levels. Where existing buildings on the site will be demolished, will a compliant pre-demolition audit of any existing buildings, structures or hard surfaces be carried out?	3 1	2 1		7.5^3 (or 6.5 tonnes) per $100m^2$ GIFA target value
Wst 02	Recycled aggregates	Significant use of recycled or secondary aggregates in 'high-grade' building aggregate uses.	1	0		
Wst 03	Operational Waste	Will appropriate facilities for the storage of operational recyclable waste volumes be provided? If relevant, will a static waste compactor or baler be specified/installed? If relevant, will a vessel for composting suitable organic waste be specified/installed? A tap for cleaning will also be needed.	1	1		It must be clearly labelled for recycling, placed within accessible reach of the building, in a location with good vehicular access to facilitate collections. Size at least $2m^2$ per $1000m^2$ of net floor area OR $4m^2$ per $1000m^2$ where catering is provided.
Wst 05	Adaptation to climate change	Will a climate change adaptation strategy appraisal for structural and fabric resilience be conducted by the end of Concept Design (RIBA Stage 2 or equivalent)? Has this been carried out as a systematic risk assessment (specific to structural and fabric resilience) to identify and evaluate and where feasible mitigate against the impact of the expected increase in extreme weather conditions arising from climate change on the building over the projected life-cycle of the building.	1	1		

Prepared by:
HRS Services Ltd
81 Burton Road
Sheffield S3 8BZ
Tel 01142723004
sew@hrsservices.co.uk

		The assessment should cover the following stages: hazard identification, hazard assessment, risk estimation, risk evaluation and risk management.				
Wst 06	Functional adaptability	Will a building specific functional adaptation strategy appraisal be conducted by the end of Concept Design (RIBA stage 2 or equivalent) and will functional adaptation measures be implemented? Will the functional adaptation measures be implemented (RIBA stage 4) in accordance with the functional adaptation strategy and its implementation plan, where practical and cost effective? Omissions must be justified in writing.	1	1		
LE 01	Site Selection	Will at least 75% of the proposed development's footprint be located on previously been developed land? Is the site deemed to be significantly contaminated?	1 1	1 0		Land must have been developed in the last 50 years for use by industrial, commercial or domestic purposes).
LE 02	Ecological Value of Site and Protection of Ecological Features	Can the land within the construction zone be defined as land of low ecological value'? Will all features of ecological value surrounding the construction zone/site boundary be protected?	1 1	1 1		
LE 03	Mitigating Ecological Impact	What is the likely change in ecological value (plant species richness) as a result of the sites development?	2	2		It has been assumed that there will be no negative change in plant species richness. At least one credit must be achieved for a Very Good rating.
LE 04	Enhancing Site Ecology	Has a suitably qualified ecologist (SQE) been appointed by the end of RIBA Stage 1 to report on enhancing site ecology? Has their report been based on a site visit and will their recommendations be implemented?	2	1		Ecologist must be appointed at RIBA stage 1 to achieve these credits

Prepared by:
HRS Services Ltd
81 Burton Road
Sheffield S3 8BZ
Tel 01142723004
sew@hrsservices.co.uk

						Ecologist appointed and recommendations implemented. No change or negative change in plant species richness
LE 05	Long Term Impact on Biodiversity	Will a Suitably Qualified Ecologist (SQE) be appointed prior to commencement of activities onsite and confirm that all relevant UK and EU legislation relating to the protection and enhancement of ecology has been complied with during the design and construction process? Will a compliant landscape and habitat management plan be produced? Will a Biodiversity Champion be appointed to monitor/minimise impacts of site activities on biodiversity? Will the contractor provide training for the site workforce on how to protect ecology during the project? Will the contractor record actions to protect biodiversity and monitor their effectiveness during construction? Will a new ecologically valuable habitat, appropriate to the local area, be created? Where flora/fauna habitats exist on site, will the contractor programme site works to minimise disturbance?	2	2		All requirements to be addressed
Pol 01	Impact of Refrigerants	Will refrigerant containing systems be installed in the assessed building? Pre-requisite. Do all systems with electric compressors comply with the requirements of BS EN 378:2008 (Part 2 and 3) & where ammonia systems are installed the IoR ammonia Refrigeration Systems Code of Practice?	3	2		

		TWO CREDITS. Will the systems using refrigerants have Direct Effect Life Cycle CO2 equivalent emissions of ≤100kgCO_{2e}/kW cooling /heating capacity? OR Where air conditioning or refrigeration systems are installed the refrigerants used have a GWP of ≤10. ONE CREDIT Will the systems using refrigerants have Direct Effect Life Cycle CO2 equivalent emissions of ≤1000kgCO_{2e}/kW cooling /heating capacity? ONE CREDIT Will a refrigerant leak detection and contaminant system be specified?				
Pol 02	NOx emissions from heating source	1 credit: Dry NOx emissions (measured at 0% excess O2) resulting from meeting heating and hot water demand are ≤100mg/kWh. 2 credits: Dry NOx emissions (measured at 0% excess O2) resulting from meeting heating and hot water demand are ≤70mg/kWh. 3 credits: Dry NOx emissions (measured at 0% excess O2) resulting from meeting heating and hot water demand are ≤40mg/kWh.	3	3		
Pol 03	Surface Water Run Off	What is the actual/likely annual probability of flooding for the assessed site? Will a Flood Risk Assessment be undertaken and ground level of the building/access meet BREEAM criteria?	2	2		

		Will the site meet the BREEAM criteria for peak rate surface water run off? Will the site meet the criteria for surface water run off volume, attenuation and/or limiting discharge? Will the site be designed to minimise watercourse pollution in accordance with the BREEAM criteria?	1 1 1	1 1 1		
Pol 04	Reduction of night time light pollution	1. The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011 2. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. 3. If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes. 4. Illuminated advertisements, where specified, must be designed in compliance with ILP PLG 05 The Brightness of Illuminated Advertisements	1	1		.
Pol 05	Noise Attenuation	Are there any noise-sensitive areas or buildings within an 800m radius of the assessed development? Where noise-sensitive buildings/areas are present, will a noise impact assessment be conducted in compliance with BS 7445 to measure / determine the existing background noise levels and the most exposed/sensitive development and the rating noise level resulting from the new noise source. The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed	1	1		

		noise-sensitive development, must have a difference no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level. Where the noise levels will be greater, measures must be installed to attenuate this at its source.				

Innovation credits

Reference	Credit title	Criteria	Potential credits	Credits assumed	Potential Credits	Notes
Inn. Man03	Responsible Construction Practices	Where post construction, a Considerate Constructors Scheme certificate can be provided demonstrating that the site achieved CCS Code of Considerate Practice with a score of at least 40.	1	1		
Inn. Man05	Aftercare	The following are carried out at quarterly intervals for the first three years after occupation: • Collection of occupant satisfaction, energy consumption and water consumption data • Data is utilised to check that the building is performing as expected and any necessary adjustments are carried out • Targets are set for reducing water and energy consumption and progress monitored towards these • Feedback of " lessons learned" to the design team	1	1		

		and developer for use in future projects • Provision of the actual annual building energy, water consumption and occupant satisfaction to BRE Global				
Inn. Hea01	Visual Comfort	At least 80% of the floor area (for the building spaces/room identified above in the standard requirements) has an average daylight factor of 3% in multi-storey buildings and 4% in single-storey buildings. Average daylight Illuminance must be at least 300lux for 2650 hours per year or more. Minimum daylight Illuminance at worst lit point must be at least 120lux for 3000 hours per year or more.	1	0		
Inn. Hea02	Indoor air quality	Will exemplary level VOCs (products) criteria be met?	2	0		
Inn. Ene01	Reduction of CO2 emissions	Up to four credits. The building achieves an $EPR_{NC} \geq 0.9$ and zero net regulated CO2 emissions. Up to five credits. The building is 'carbon negative' in terms of its total modelled operational energy consumption.	5	0		
Inn. Wat01	Water Consumption	The water consumption for the assessed building demonstrates a 65% improvement compared to a national baseline performance	1	0		
Inn. Mat01	Life Cycle Impacts	Where the green guide exemplary level is complied with.	3	0		

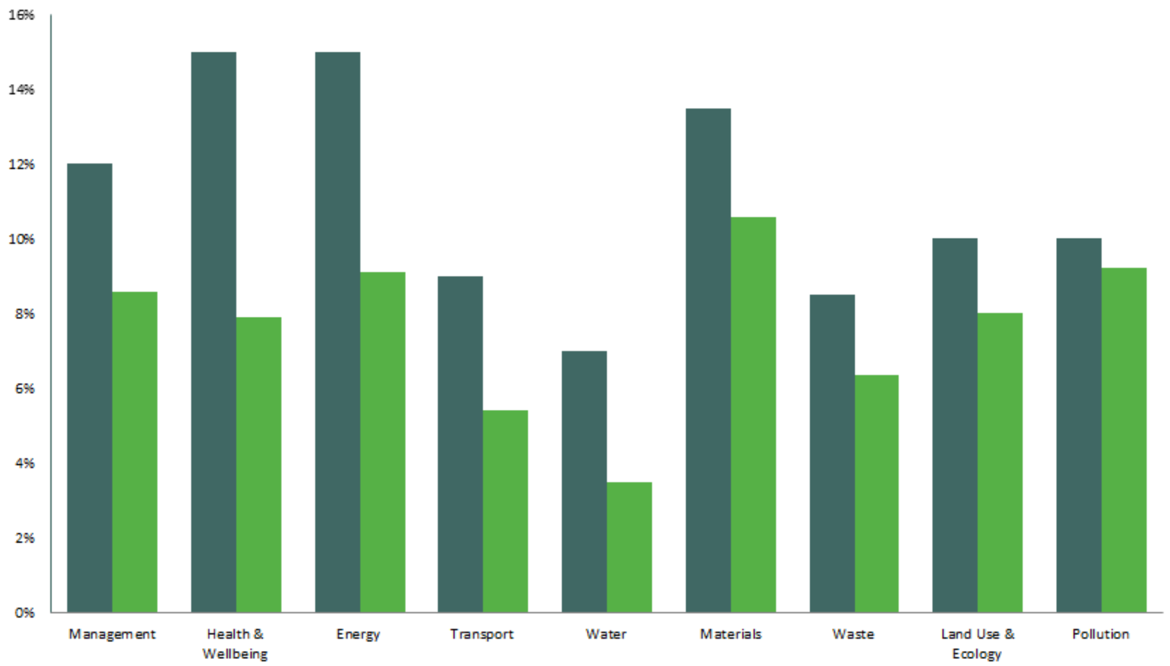
Inn. Mat03	Responsible Sourcing of Materials	Where 70% of the available responsible sourcing points have been achieved.	1	0		
Inn. Wst01	Construction Waste Management	Where non-hazardous construction waste generated by the building's development meets or exceeds the resource efficiency benchmark required to achieve three credits (as outlined in the guidance). Where at least 90% by weight (85% by volume) of non-hazardous construction waste and 95% of demolition waste by weight (85% by volume) and 95% of demolition waste by weight (95% by volume) of excavation waste (if applicable) generated by the build has been diverted from landfill and either: a. Reused on site (in-situ or for new applications) b. Reused on other sites c. Salvaged/reclaimed for reuse d. Returned to the supplier via a 'take-back' scheme e. Recovered from site by an approved waste management contractor and recycled. Where all key waste groups are identified for diversion from landfill at pre-construction stage SWMP.	1	0		
Inn. Wst02	Recycled Aggregate	The total amount of recycled and/or secondary aggregate specified is greater than 35% (by weight or volume) of the total high-grade aggregate specified for the project.	1	0		
Inn. Wst05	Adaptation to climate change	Will exemplary level criteria-Responding to adaptation to climate change be met?	1	0		

Pre assessment result

Overall Building Performance

Building name	SaTH
Indicative BREEAM rating	Excellent
Indicative Total Score	70.6%
Min. standards level achieved	Excellent level

Building Performance by Environment Section



Environmental Section	No. credits available	Indicative no. credits Achieved	% credits achieved	Section Weighting	Indicative Section Score
Management	21	15	71.43%	12.00%	8.57%
Health & Wellbeing	19	10	52.63%	15.00%	7.89%
Energy	23	14	60.87%	15.00%	9.13%
Transport	10	6	60.00%	9.00%	5.40%
Water	8	4	50.00%	7.00%	3.50%
Materials	14	11	78.57%	13.50%	10.60%
Waste	8	6	75.00%	8.50%	6.37%
Land Use & Ecology	10	8	80.00%	10.00%	8.00%
Pollution	13	12	92.31%	10.00%	9.23%
Innovation	10	2	20.00%	N/A	2

Prepared by:
HRS Services Ltd
81 Burton Road
Sheffield S3 8BZ

Tel 01142723004
sew@hrsservices.co.uk


BREEAM®

Code for a Sustainable Built Environment
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BREEAM UK Refurbishment & Fit-out 2014 - Pre-assessment

SaTH

Pre-assessment

25 August 2016 Assessment Report

PwC's BREEAM Outstanding rated One Embankment Place in London. Image Hufton + Crow.

bre

Assessment details

Assessment references

Registration number:	123599	**Date created:**	22/8/2016
Assessor name: First:		**Surname:**	
Assessor licence number:			
Assessor organisation:			
Architect name:			
Developer name:			
Property owner			

Site details

Site name:

Address:

Town:

County:

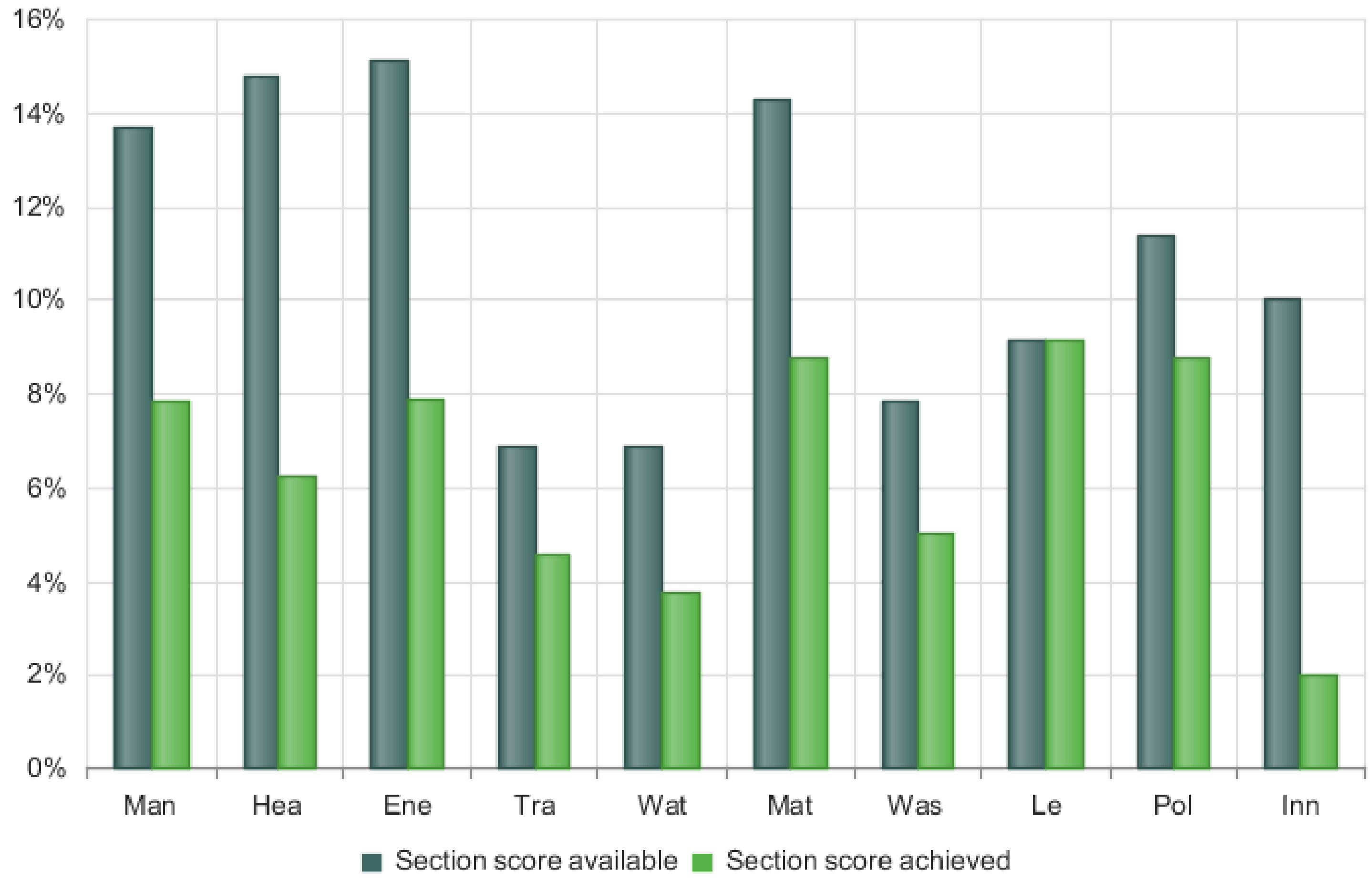
Post code:

Country:

BREEAM Rating

	Credits available	Credits achieved	% Credits achieved	Weighting	Category score
Man	21.0	12.0	57.14%	13.70%	7.83%
Hea	19.0	8.0	42.11%	14.79%	6.22%
Ene	23.0	12.0	52.17%	15.12%	7.88%
Tra	9.0	6.0	66.67%	6.85%	4.56%
Wat	9.0	5.0	55.56%	6.85%	3.80%
Mat	13.0	8.0	61.54%	14.27%	8.78%
Was	11.0	7.0	63.64%	7.85%	4.99%
Le	4.0	4.0	100.00%	9.14%	9.13%
Pol	13.0	10.0	76.92%	11.42%	8.78%
Inn	10.0	2.0	20.00%	10.00%	2.00%
Total	132.0	74.0	56.06%	-	64.02%
Rating	-	-	-	-	Very Good

Performance by environmental category



Issue scores

Please Note: X means the exemplary credit for the relevant issue

Management

Man Management	ManX
12 / 21	2 / 2

Health and Wellbeing

Hea Health & Wellbeing	HeaX
8 / 19	0 / 3

Energy

Ene Energy	EneX
12 / 23	0 / 5

Transport

Tra Transport
6 / 9

Water

Wat Water	WatX
5 / 9	0 / 1

Materials

Mat Materials	MatX
8 / 13	0 / 2

Waste

Was Waste	WasX
7 / 11	0 / 3

Land use and ecology

Le Land use and ecology
4 / 4

Pollution

Pol Pollution	PolX
10 / 13	0 / 1

Innovation

Inn Innovation	InnX
N/A	0 / 10

Initial details

Stage 1 filtering: Scope of the assessment

Part 1 : Fabric and structure : Yes

Part 2 : Core services : Yes

Part 3 : Local services : Yes

Part 4 : Interior design : Yes

Stage 2 filtering: Project specific filtering

Is the project a change of use? (e.g. change from office to a hotel) : No

Are transportation systems specified or present within the refurbishment or fit-out zone? (lifts, escalators, moving walks) : Yes, newly specified transportation systems

Are there laboratories present and if so what % of total building area do they represent : No laboratories present

Laboratory containment area : No laboratories present

Is cold storage specified or present within the refurbishment or fit-out zone? : No

Are there landscaping areas within the refurbishment or fit-out zone/within developer control? : Yes

If the asset undergoing refurbishment or fit-out is part of a larger building, is the cooling generation plant centralised or localised? : Central

If the asset undergoing refurbishment or fit-out is part of a larger building, is the heating generation plant centralised or localised? : Central

Is Wat01 within the scope of the assessment in accordance with Table 42? : Yes

What is the building type? : Healthcare

If Industrial, does the building have office areas? : N/A

Does the building have any unregulated water demands? e.g. irrigation, car washing, or other process related water use : Soft landscaping is present but no irrigation has been specified

Does the building have unregulated energy demands from significantly contributing systems? : Yes

Is the project a simple building? : No

Does the building have external lighting within the scope of works? : Yes

Does the building have any existing or newly specified externally mounted plant? : Yes

If undertaking a Part 4 assessment, is there any equipment specified that requires commissioning (see Man04 CN13) : Yes

Historic building (listed building or building in a conservation area) : No

Category assessment

Management | Man

Man Management

MAN 01 PROJECT BRIEF AND DESIGN

Stakeholder consultation (project delivery) :	1
Stakeholder consultation (third party) :	1
Sustainability champion (design) :	0
Sustainability champion (monitoring progress) :	0

MAN 02 LIFECYCLE COST AND SERVICE LIFE PLANNING

Elemental lifecycle cost :	0
Componnent level LCC plan :	0
Capital cost reporting :	1

MAN 03 RESPONSIBLE CONSTRUCTION PRACTICES

Is all timber used in the project 'legally harvested and traded timber'? :	Yes
Environmental management :	1
Construction stage sustainability champion :	0
Considerate construction :	2
Exemplary level criteria :	Yes
Has the project achieve the minimum standard for an Excellent or Outstanding rating? :	
Monitoring of refurbishment or fit-out site impacts :	0
Utility consumption :	Yes
Transport of construction materials and waste :	Yes

MAN 04 COMMISSIONING AND HANDOVER

Commissioning and testing schedule and responsibilities :	1
Commissioning building services :	1
Testing and inspecting building fabric :	0
Handover :	1
Has criterion 9 been met? :	Yes

MAN 05 AFTERCARE

Aftercare support :	1
Exemplary level criteria :	Yes
Seasonal commissioning :	1
Post occupancy evaluation :	1

Credits awarded : 12.0
Exemplary credits awarded : 2.0

Health and Wellbeing | Hea

Hea Health & Wellbeing

HEA 01 VISUAL COMFORT

Glare control :	1
Daylighting :	0
Exemplary level criteria :	
View out :	0
Internal and external lighting :	1

HEA 02 INDOOR AIR QUALITY

Indoor air quality plan :	1
Ventilation :	0
Volatile organic compounds :	1
Exemplary level criteria :	0
Potential for natural ventilation :	0

HEA 03 SAFE CONTAINMENT IN LABORATORIES - NA

HEA 04 THERMAL COMFORT

Thermal modelling :	1
Adaptation - for a projected climate change scenario :	0
Thermal zoning and controls :	1

HEA 05 ACOUSTIC PERFORMANCE

Acoustic performance :	1

HEA 06 SAFETY AND SECURITY

Security of site and building :	1

Credits awarded : 8.0

Energy | Ene

Ene Energy

ENE 01 ASSESSMENT OPTION	
Which option is being followed :	Option 2a simple estimate (elemental)
ENE 01 - OPTION 2A	
Credits :	5
Exemplary credits :	0
ENE 02 ENERGY MONITORING	
Sub-metering of major energy consuming systems :	1
Sub-metering of high energy load and tenancy areas :	1
ENE 03 EXTERNAL LIGHTING	
External lighting :	1
ENE 04 LOW CARBON DESIGN	
Passive design analysis :	0
Free cooling :	0
Low and zero carbon technologies :	1
ENE 05 ENERGY EFFICIENT COLD STORAGE - NA	
ENE 06 ENERGY EFFICIENT TRANSPORTATION SYSTEMS	
Energy consumption :	1
Energy efficient measures :	2
ENE 07 ENERGY EFFICIENT LABORATORY SYSTEMS - NOTAPPLICABLE	
ENE 08 ENERGY EFFICIENT EQUIPMENT	
Energy efficient equipment :	0
ENE 09 DRYING SPACE	
Credits awarded : 12.0	

Transport | Tra

Tra Transport

TRA 01 SUSTAINABLE TRANSPORT SOLUTIONS	
Sustainable transport options :	2
TRA 02 PROXIMITY TO AMENITIES	
Proximity to amenities :	1
TRA 03 CYCLIST FACILITIES	
Cycle storage :	1
Cylist facilities :	1
TRA 04 MAXIMUM CAR PARKING CAPACITY - NA	
TRA 05 TRAVEL PLAN	
Travel plan :	1
Credits awarded : 6.0	

Water | Wat

Wat Water

WAT 01 WATER CONSUMPTION	
Water consumption :	1
Exemplary level criteria :	
WAT 02 WATER MONITORING	
Water monitoring :	1
Has criterion 1 been met? :	Yes
WAT 03 LEAK DETECTION	
Leak detection system :	1
Flow control devices :	1
WAT 04 WATER EFFICIENT EQUIPMENT	
Water efficient equipment :	1

Credits awarded : 5.0

BREEAM UK Refurbishment & Fit-out 2014 - Pre-assessment

Materials | Mat

Mat Materials

MAT 01 ENVIRONMENTAL IMPACT OF MATERIALS	
Options :	Option 2
Environmental impact of materials :	3
Exemplary level criteria :	
MAT 03 RESPONSIBLE SOURCING OF MATERIALS	
Sustainable procurement plan :	1
Has criterion 1 been met? :	Yes
Responsible sourcing of materials :	1
Exemplary level criteria :	
MAT 04 INSULATION	
Insulation :	1
MAT 05 DESIGNING FOR DURABILITY AND RESILIENCE	
Designing for durability and resilience :	1
MAT 06 MATERIAL EFFICIENCY	
Material efficiency :	1

Credits awarded : 8.0

Waste | Was

Was Waste

WST 01 CONSTRUCTION WASTE MANAGEMENT	
Pre-refurbishment audit :	1
Re-use and direct recycling of materials :	0
Resource efficiency :	2
Diversion of waste from landfill :	1
Exemplary level criteria :	

WST 02 RECYCLED AGGREGATES	
Recycled aggregates :	0
Exemplary level criteria :	

WST 03 OPERATIONAL WASTE	
Operational waste :	1

WST 04 SPECULATIVE FINISHES

WST 05 ADAPTATION TO CLIMATE CHANGE	
Adaptation to climate change - structural and fabric resilience :	1
Exemplary criteria: Responding to adaptation to climate change :	

WST 06 FUNCTIONAL ADAPTABILITY	
Functional adaptabiliy :	1

Credits awarded : 7.0

Land use and ecology | Le

Le Land use and ecology

LE 02 PROTECTION OF ECOLOGICAL FEATURES	
Protecting ecological value :	1

LE 04 ECOLOGICAL ENHANCEMENT	
Ecological enhancement :	1

LE 05 LONG TERM IMPACT ON BIODIVERSITY	
Long term impact on biodiversity :	2

Credits awarded : 4.0

Pollution | Pol

Pol Pollution

POL 01 IMPACT OF REFRIGERANTS	
Impact of refrigerants :	0
Leak detection :	0
POL 02 NOX EMISSIONS	
NOx emissions :	3
POL 03 FLOOD RISK AND REDUCING SURFACE WATER RUN-OFF	
Flood risk management :	2
Exemplary level criteria :	
Surface water run-off :	2
Minimising watercourse pollution :	1
POL 04 REDUCTION OF NIGHT TIME LIGHT POLLUTION	
Reduction of night time light pollution :	1
POL 05 NOISE ATTENUATION	
Noise attenuation :	1

Credits awarded : 10.0

BREEAM UK Refurbishment & Fit-out 2014 - Pre-assessment

Innovation | Inn

Inn Innovation

INN 01 APPROVED INNOVATIONS	
Approved innovations :	0

Credits awarded : 0.0

VOLUME 6: TRANSPORT CONSULTANT

NHS Shrewsbury and Telford

BASELINE TRANSPORT SCOPING STUDY

Report

JMP Consultants Ltd

NHS Shrewsbury and Telford

BASELINE TRANSPORT SCOPING STUDY

Report

JMP Consultants Ltd
3rd Floor
Innovation Court
121 Edmund Street
Birmingham
B3 2HJ
T 0121 230 6010 F 0121 230 6011 E birmingham@jmp.co.uk

www.jmp.co.uk
forwardthinking@jmp.co.uk
facebook.com/jmp.consultants
twitter.com/#!/_jmp
linkedin.com/company/jmp consulting

Report Record

Job No.	Report No.	Issue No.	Prepared	Verified	Approved	Status	Date
MID4356	001	001	JN	SF	AHC	Draft	23/09/2016

Contents Amendments Record

Issue No.	Revision description	Approved	Status	Date
001		AHC	Draft	23/09/2016
002	Following Client Comments	AHC	Draft	28/09/2016

Proud To Care
Make it Happen
We Value Respect
Together We Achieve

JMP Consultants Ltd

Contents

Tables and Figures

Appendices

JMP Consultants Ltd

1 Introduction

INTRODUCTION

1.1 JMP Consultants Ltd has been commissioned by AHR Architects, on behalf of the Shrewsbury and Telford Hospital NHS Trust (SaTH) to provide a review of baseline conditions and future recommendations for the Royal Shrewsbury Hospital (RSH) and the Princess Royal Hospital (PRH) sites.

1.2 The SaTH is reorganising the way the trust will function in the future across the two sites. How the reorganisation is to be implemented across both sites is still to be determined but it will see the concentration of Emergency facilities at one location and at the other, the current Emergency facility will be replaced with a Planned Care Site (PCS).

1.3 This document provides Travel and Transport Planning advice to support the project team with the preparation of the Outline Business Case (OBC) for submission in October 2016.

2 Current Situation

2.1 This chapter examines the baseline conditions at each site, which have been highlighted both through desk-based analysis, and observations undertaken during site visits to each respective site as set out below:

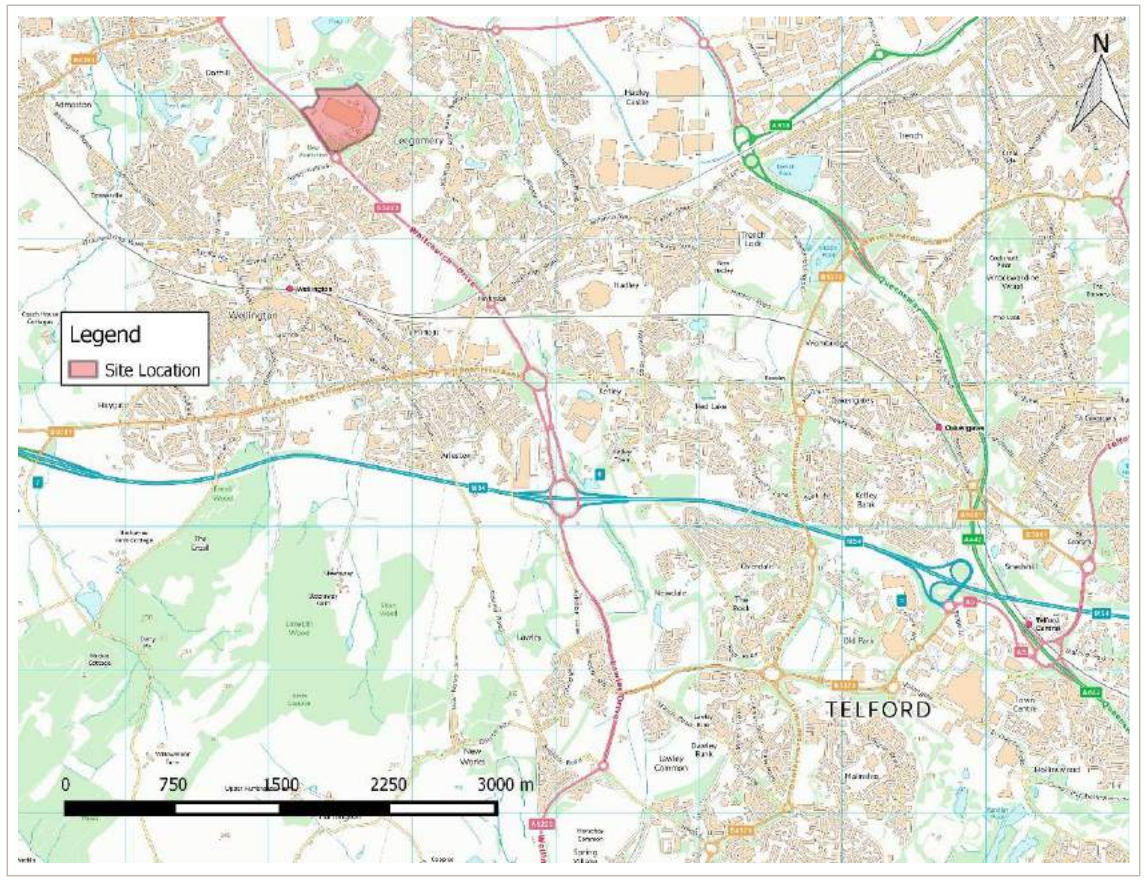
- PRH – Wednesday 24th August, 1:00pm
- RSH – Wednesday 24th August, 2:30pm
- PRH – Thursday 8th September, 3:00pm
- RSH – Thursday 8th September, 1:30pm

2.2 During the site visit the travel distance between PRH and SRH was recorded as 25 minutes.

PRINCESS ROYAL HOSPITAL

2.3 The PRH is located in Apley, approximately 5.5km northwest of Telford Town Centre. It forms the Telford site of the SaTH, providing a range of acute hospital services, mainly for people from Telford, Shropshire, and mid Wales. Apley is a suburban residential area, on the edge of Telford's rural-urban fringe. Figure 2-1 provides an overview of the site location.

Figure 2-1 Site Location - PRH



GIS

ACCESS

2.4 Access to the site can be achieved via the priority junction with Grainger Drive and the northern arm of the Apley Roundabout which serves Whitchurch Drive, Apley Avenue and Grainger Drive. Upon visiting the site free-flowing traffic conditions were observed at each of the access points to the site.

2.5 The site is served internally by an unnamed access road, which encircles the main buildings of the hospital and is accompanied by a substantial provision of allocated parking spaces around the perimeter of the buildings. There is no drop-off zone for taxis onsite, instead taxis were seen queueing outside the main entrance as shown in Figure 2-2.

Figure 2-2 Queueing Outside Main Entrance - PRH

LOCAL HIGHWAY NETWORK

Grainger Drive

2.6 Grainger Drive is a speed-camera safety zone, subject to a 30mph speed limit. The road provides a link through the residential areas of Apley and Leegomery towards Leegate Avenue.

2.7 In the vicinity of the hospital site, footway provision is continuous along each side of the road, and is lit throughout.

Whitchurch Drive (A5223)

2.8 Whitchurch Drive provides connections south from the site towards M54 Junction 6 towards Telford Town Centre via Lawley Drive. B5072 and West Centre Way. North of the site the road connects with the A442 which provides connections to Sleapford, Crudginton and areas further afield.

2.9 The section of the road in the vicinity of the site is predominantly rural in nature and subject to a 40 mph speed limit. Footway provision is continuous along one side of the road and is lit throughout.

JMP Consultants Ltd

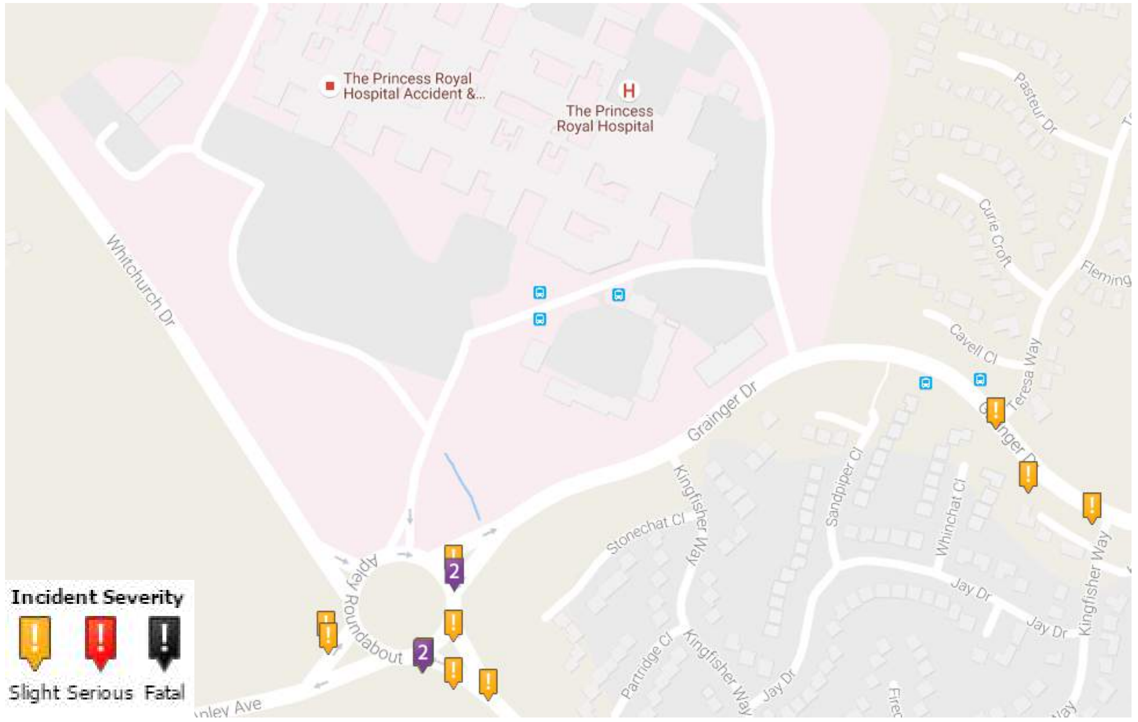
ROAD SAFETY

2.10 Collision data has been sourced for the local highway network to determine if there are any clusters or trends which could potentially be exacerbated by any increases in traffic at the site. Crashmap has been used, as the system provides the most recently published Department for Transport (DfT) collision data, from 2011 to 2015.

2.11 Figure 2-3 shows that there were no collisions recorded at the site access points off Grainger Drive and Apley Roundabout respectively.

2.12 Three ‘slight’ collisions were recorded on Apley roundabout itself, with a further three recorded on the approach from Grainger Drive and two on each of the approaches from Apley Avenue and Whitchurch Drive. Nonetheless, this is a busy roundabout and the cluster of ‘slight’ collisions recorded is to be anticipated given the large number of vehicle movements at this location.

Figure 2-3 Collision Data - PRH



Crashmap

2.13 After reviewing relevant collision data, no abnormal trends or clusters have been identified on the respective routes and these are unlikely to be exacerbated by potential increases in trips generated by the site.

CAR PARKING

Main Entrance – Visitor Parking

2.14 The majority of visitor parking on site is located immediately south of the main entrance to the hospital. The car park can accommodate a total of 356 vehicles, with an additional 6 disabled spaces, however after liaising with the on-site attendant for the car park, it is understood that approximately 140 spaces to the western side of the car park have now been allocated for staff.

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2.15 Visitor parking at the site typically peaks between 2-4pm and 7-9pm, which coincides with peak visiting times at the hospital. As part of the second site visit, undertaken on 8th September, parking surveys were conducted between 1:45 and 2:30pm. At this time no free spaces were observed within the car park and 10 incidences of unallocated parking were recorded.

2.16 During the first visit to the site, the parking attendant indicated that during peak times drivers often park on the grass verges, as there are not enough spaces to accommodate the level of demand at the car park. At the time of the second site visit, all ten incidences of unallocated parking were recorded on the grass verges of the visitor car park.

Main Entrance – Staff Parking

2.17 As stated above, a provision of spaces to the western side of the main entrance car park have now been allocated for staff. Similar to the visitor section of the car park, no free spaces were observed, and 6 incidences of unallocated parking were recorded, all of which were on the grass verges within the car park.

2.18 A further 13 incidences of unallocated parking were recorded along the grass embankments of the unnamed internal access road, which runs adjacent to this car park.

Emergency Entrance – Staff Parking

2.19 To the west of the visitor car park, adjacent to the hospital's emergency entrance, a further 48 spaces are allocated for staff parking. A total of 7 free spaces were recorded at this location.

Women & Children's Ward – Visitor Parking

2.20 A second major area of visitor parking is located to the west of the site, adjacent to the Women and Children's Ward (WCW), which comprises a total of 121 spaces. During peak visiting hours, 2 free spaces were recorded at this location, along with 10 incidences of unallocated parking, predominantly along the access road for the car park, as depicted by Figure 2-4.

Figure 2-4 Overflow Parking Women & Children's Ward Car Park - PRH

Women & Children's Ward (WCW) – Staff Parking

2.21 To the west of the WCW Visitors Car Park, there is a second major area of staff parking, which comprises approximately 249 spaces. Upon visiting the site, approximately 85 free spaces were observed at this location, with no recorded incidences of unallocated parking.

Northern Car Park – Staff Parking

2.22 The main element of staff parking is situated to the north of the site, with a total of 320 spaces. At the time of the site visit, approximately 42 free spaces and 37 incidences of overflow parking were recorded in the vicinity of this car park; the latter were primarily along the grass verges to the east and the access road to the west, adjacent to the WCW.

Figure 2-5 Overflow Staff Parking – Eastern Site Perimeter - PRH

Eastern Car Parks – Visitor Parking

2.23 To the east of the site, adjacent to Ward 16, there is a visitor's car park, comprised of approximately 20 spaces, all of which were in use at the time of the site visit. At this location 15 incidences of unallocated parking were also recorded.

Eastern Car Parks – Staff Parking

2.24 Adjacent to the above referenced visitor car park, there are two staff car parks, outside the Endoscopy and Wrekin Midwifery Units. In total these car parks provide a total of 39 spaces, all of which were in use at the time of the site visit. Furthermore, a total of 41 incidences of unallocated parking were recorded along the grass verges surrounding these car parks.

Apley Clinic – Staff & Visitor Parking

2.25 In contrast to the major parking issues observed across the majority of the hospital site, parking appeared to be relatively well managed outside the Apley Clinic, to the southeast of the site. This car park provided 20 spaces for staff and 19 for visitors, all of which were in use at the time of the site visit. Nonetheless, no incidences of unallocated parking were recorded at this location.

Accommodation Parking – Staff Parking

2.26 Similar to the above, Accommodation Parking, to the southeast of the site, appeared to be relatively well managed. All of the 51 spaces were in use at the time of the site visit, however no incidences of unallocated parking were recorded at this location.

Additional Comments

2.27 In addition to observations made at the main parking areas on site, major issues with regard to unallocated parking were noted on the grass verges immediately east of the site entrance from Grainger Drive. At the time of the site visit a total of 23 vehicles were parked along the grass verges at this location, which has caused major damage to the ground.

Charging

2.28 There is a tiered charging system for visitors on site offering a ranges of rates according to the length of stay:

- 0-30 minutes : Free
- 30 minutes to 2 hours : £2.50
- 2 hours to 5 hours: £3
- 5 hours up to 24 hours: £3.50

2.29 Members of staff are able to purchase a staff parking permit through payroll. Table 2-1 below demonstrates the staff parking charges dependent on their employment type.

Table 2-1 Current Staff Parking Charges

Level of Employment	£ Per Annum(month)
Full Time (greater than 22.5 hours per week) Band 1-7 and F1, F2 (Foundation Years 1 & 2)	90 (7.50)
Part Time (fewer than 22.5 hours per week) Band 1-7 and F1, F2	45 (3.75)
Full Time (greater than 22.5 hours per week) Bands 8 and above and medical and dental staff (excluding F1,F2)	120 (10)
Full Time (fewer than 22.5 hours per week) Bands 8 and above and medical and dental staff (excluding F1,F2)	60 (5)

2.30 One way to improve usage of the staff car park would be through greater parking enforcement. As part of the site visit, parking notices were observed on cars without staff permits. In reference to the SaTH website the following rules apply:

- All vehicles must be parked within the marked bays only.
- No parking on double yellow lines or yellow cross-hatched boxes.
- No parking on the grass.
- Only holders of a blue registered disabled badge are allowed to park in the designated disabled parking spaces. They must display their blue badge and are still required to pay on exit.
- Any vehicle parked on the Trust's sites that causes an obstruction for emergency vehicles risks being damaged and will be issued with a Parking Charge Notice.

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- The owner of any vehicle that causes damage to Trust property will be liable for the full cost of repair/reinstatement of the damaged property.
- Anyone who parks in breach of the rules is liable to be issued, without warning, with a Parking Charge Notice by CP Plus on behalf of the Trust.

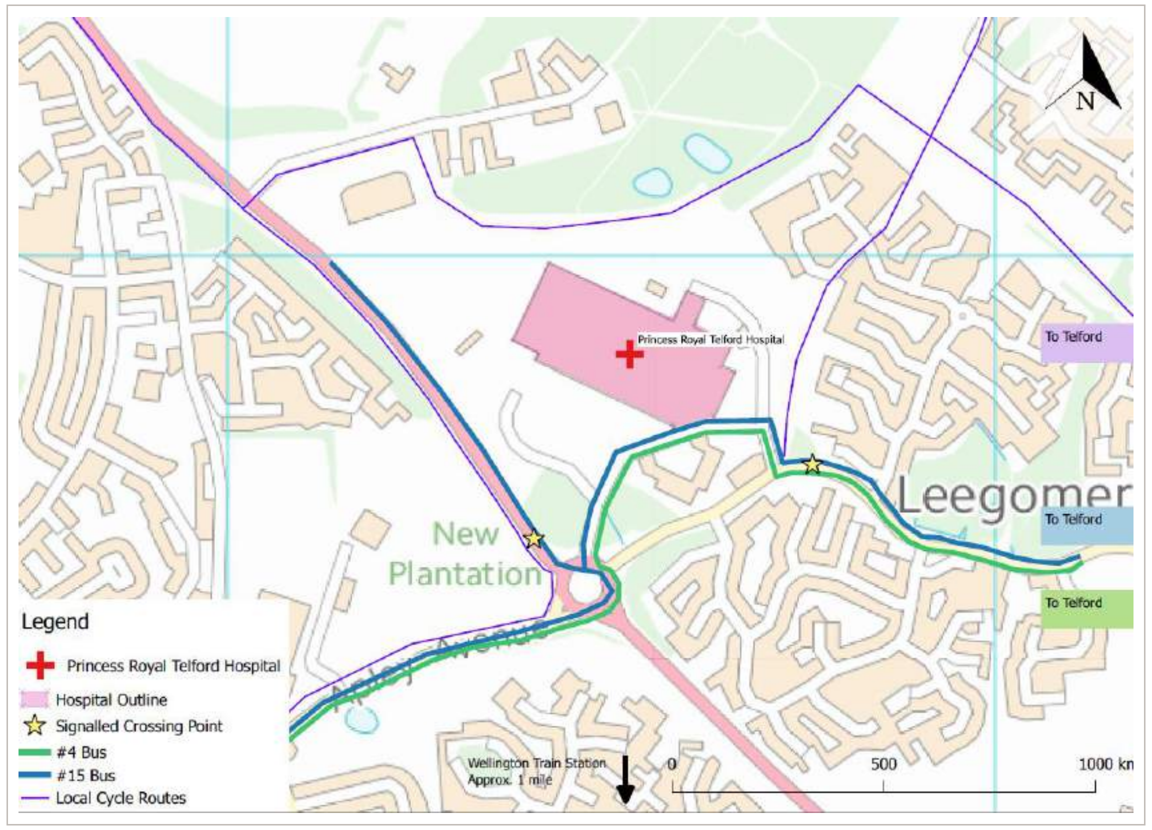
NON-MOTORISED USERS

2.31 The site is relatively poorly connected internally for Non-Motorised Users (NMUs). Whilst the area is generally well lit, footway and cycleway provision is intermittent, making the site feel disjointed. The issue is exacerbated further by the lack of clear onsite signage, which hinders wayfinding for NMUs.

Pedestrians

2.32 Tactile paving is present on both sides of Grainger Drive and a signalled crossing point is present close to the hospital's eastern entrance. At the main hospital entrance on the Whitchurch Drive roundabout, only one signalled crossing point exists, situated to the north, as depicted by Figure 2-6.

Figure 2-6 Accessibility Map - RSH



GIS

Cyclists

2.33 Local traffic free cycle routes surround the hospital site to the north, east and west. The routes provide good links into the centre of Wellington and also connect to National Cycle Route 81 which offers a connection to Telford.

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2.34 There is one bicycle shelter located adjacent to the hospitals main entrance, which can accommodate 27 bikes, however upon visiting the site only two of the spaces were being utilised.

2.35 New cycle shelters are situated adjacent to the Helipad and the WCW, however no bicycles were parked here during the site visit.

PUBLIC TRANSPORT

Bus

2.36 The hospital has a bus station near to the main entrance, which receives a number of services from Telford Town Centre, Wellington and Leegomery, which are detailed below.

Table 2-2 Bus Service Summary - PRH

Route Number	Daytime Frequency	Afternoon Frequency	Evening Frequency
4 – Leegomery – Madeley	5 p/h	5 p/h	4 p/h
15 – Telford – Arleston	1 p/h	1 p/h	1 p/h
16 – Telford – High Ercall	1 service	3 services	No evening service
860 – Lydbury North – Telford	Very infrequent, one service per day		

2.37 Buses from Shrewsbury Bus Station to Telford Town Centre Bus Station take approximately 50 minutes.

Train

2.38 The closest train station to the site is Wellington which is approximately a 24 minute walk. Telford Train Station is situated approximately 5.8km southeast of the site. Both stations are located on the Wolverhampton to Shrewsbury line. A summary of services from Wellington Station is outlined below:

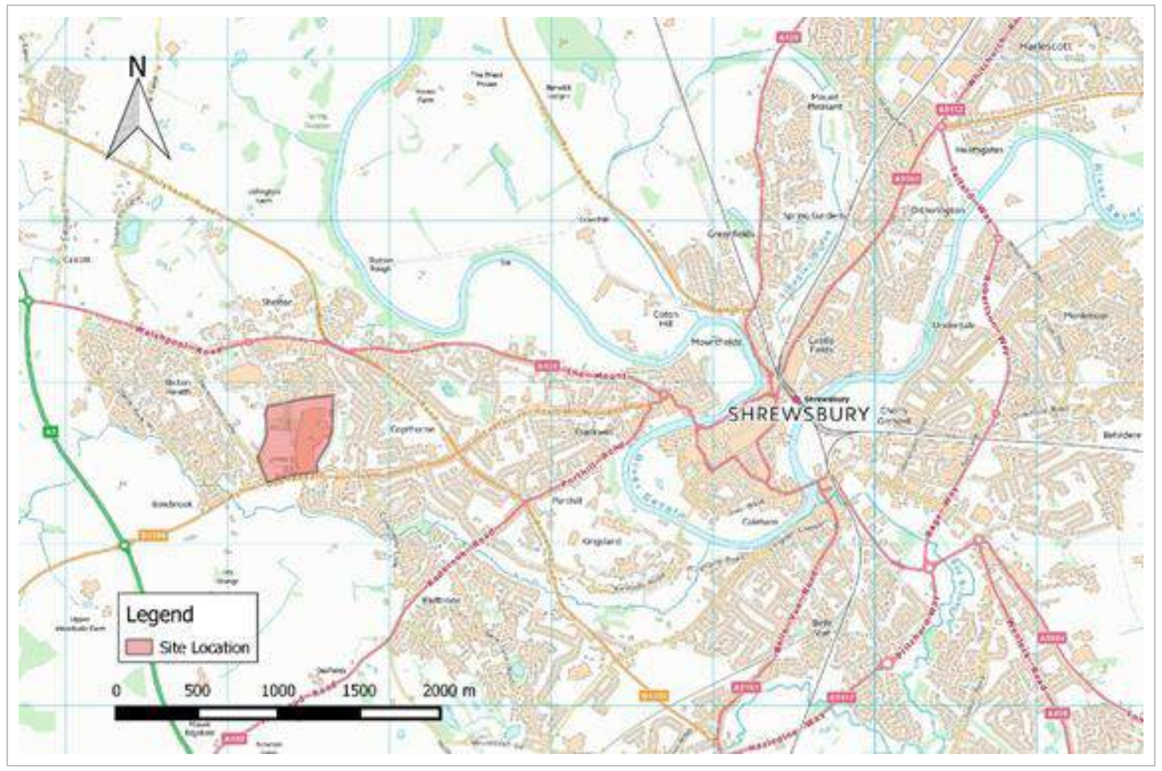
Table 2-3 Telford Train Service Summary - PRH

Route	Daytime Frequency	Afternoon Frequency	Evening Frequency
Wellington – B'ham New Street	2 p/h	2 p/h	2 p/h
Wellington – Shrewsbury	2 p/h	2 p/h	2 p/h
Wellington – Holyhead	2 p/h	1 p/h	1 p/h

ROYAL SHREWSBURY HOSPITAL

2.39 The RSH is located approximately 2.5km west of Shrewsbury Town Centre, and forms the Shrewsbury Site of the SaTH. The site is situated within the residential area of Bowbrook, toward the west of Shrewsbury's urban-rural fringe.

Figure 2-7 Site Location - RSH



GIS

ACCESS

2.40 Access to the site can be achieved via the northern arm of the Mytton Oak Road (B4386) / Seacole Way roundabout and the priority junction of Evolution Road / Mytton Road, both of which are located along the site's southern perimeter.

2.41 The site is served internally by Evolution Road and Edgecombe Way to the southwest, and an unnamed access road, which encircles the main buildings of the hospital and is accompanied by a substantial provision of allocated parking spaces around the sites perimeter.

LOCAL HIGHWAY NETWORK

Mytton Oak Road (B4386)

2.42 Mytton Oak Road (B4386) provides connections from the site west towards the A5, which in turns provides linkages north towards Oswestry and east towards Telford. West of the site Mytton Oak Road becomes Copthorne Road which provides a route towards the centre of Shrewsbury. In the vicinity of the hospital site the road is subject to a 30mph speed limit. Footway provision is continuous along each side of the road, and is lit throughout.

ROAD SAFETY

2.43 Collision data for the local highway network has once again been sourced from Crashmap for the period between 2011 and 2015, to determine if there are any clusters or trends which could potentially be exacerbated by increases in traffic at the site.

2.44 One 'slight' collision was recorded in the vicinity of the site access point off Evolution Road and another 'slight' collision was recorded at the Mytton Road (B4386) / Seacole Way, the northern arm of which provides the primary point of access to the site.

2.45 A cluster of collisions has been identified approximately 0.6miles east of the site, at the B4380 / B4386 roundabout. Six 'slight' collisions were recorded at this location, along with one 'serious' collision. This is a busy roundabout and the cluster of collisions recorded is anticipated to an extent on account of the large number of vehicle movements at this location. Nonetheless, as this cluster is not located in close proximity to RSH it is not anticipated that any developments to the site will have an effect upon these statistics.

Figure 2-8 Collision Data - RSH

Crashmap

CAR PARKING

2.46 At RSH car parking appears to be better managed than at PRH. Double yellow lines along internal access roads were coned to limit overflow parking and grass verges were typically surrounded by fences or high kerbs. Clear signage was also available to discourage parking on grass verges.

Figure 2-9 Parking Signage - RSH

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Mytton Oak Centre –Visitor Parking

2.47 The majority of parking for visitors is located to the east of the site, in three separate car parks. The most southern car park, for the Mytton Oak Centre, comprises a total of 101 spaces, 25 of which were free at the time of the site visit.

Outpatients – Visitor Parking

2.48 The second of the three visitor car parks, for outpatients, comprises a total of 190 spaces. At the time of the site visit a total of 21 free spaces were observed in this car park.

Ward Block – Visitor Parking

2.49 The third car park, Ward Block comprises a total of 195 spaces, three of which were free at the time of the site visit.

Ward Block – Staff Parking

2.50 The northern section of the Ward Block Car Park includes a provision for 61 staff vehicles. No free spaces were observed at the time of the site visit.

Northern Car Parks – Staff Parking

2.51 Approximately 356 spaces are provided for staff to north of the main hospital site, formed of the Treatment Centre (218) and Learning Centre Car Parks (138). 3 free spaces were recorded at the former, along with 9 incidences of unallocated parking, predominantly on grass verges as depicted by Figure 2-10.

Figure 2-10 Staff Parking North - RSH

Northern Car Parks – Visitor Parking

2.52 Approximately 40 spaces for visitors are provided to the north of the site, in two small car parks adjacent to the Endoscopy Unit and Treatment Centre. At the time of the site visit 1 free space was recorded at this location, along with 2 incidences of unallocated parking.

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Staff Parking – West

2.53 The main staff car park is situated to the west of the site, off Evolution Road, and is comprised of 530 spaces. At the time of the site visit 27 free spaces were observed, along with 24 incidences of unallocated parking.

2.54 This car park also contains 22 car sharing spaces, which are favourably located closest to the main hospital buildings. 11 of the 22 spaces were in use at the time of the site visit.

Additional Parking

2.55 Additional car parks situated across the remainder of the site were busy, yet typically well managed. However, 15 incidences of unallocated parking were recorded along Evolution Road, in the vicinity of the Estates Centre.

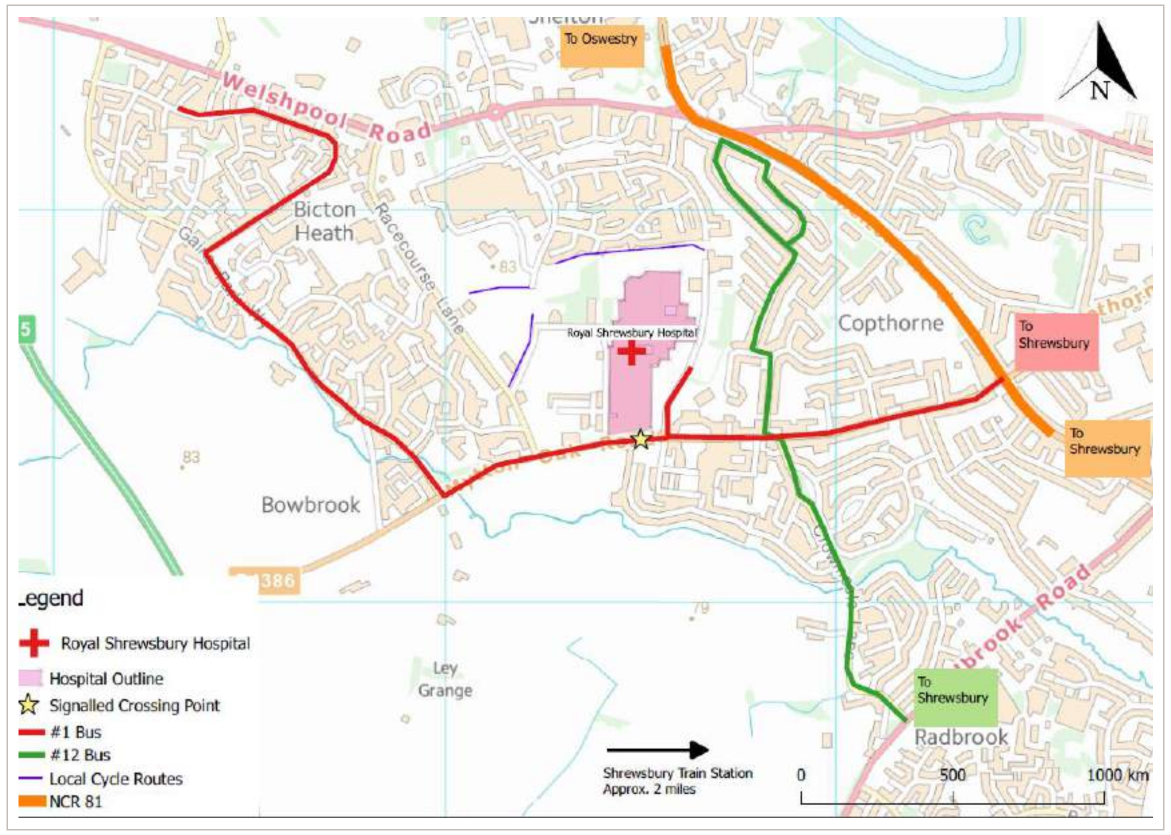
NON-MOTORISED USERS

2.56 The site is reasonably well connected internally for NMUs and is generally well lit. Onsite signage is relatively well placed, providing more convenient access for NMUs than observed at the PRH site.

Pedestrians

2.57 Tactile paving is present on both sides of Mytton Oak Road which runs directly to the south of the site. Pedestrian refuge crossing zones exist along Mytton Oak Road along with a signalled pedestrian crossing point situated to the west of the main entrance of the site as depicted by Figure 2-11 . Pavements and crossing points exist throughout the hospital grounds, providing good access for pedestrians.

Figure 2-11 Accessibility Map - RSH



Cyclists

2.58 Local traffic free cycle routes exist to the north and west of the site. National Cycle Route 81 also runs along the north-east of the site as a traffic free route (a small section of on road cycling also exists). The cycle routes provide strong connections to the centre of Shrewsbury.

2.59 Cycle shelters were also available on site, all of which accommodated at least one bicycle at the time of the site visit. The largest and most widely used cycle shelter is situated adjacent to the main staff car park. This contains 'Sheffield Stands' with the ability to accommodate 24 bicycles. At the time of the site visit, 7 bicycles were parked in this shelter.

Figure 2-12 Cycle Shelters - RSH

PUBLIC TRANSPORT

Bus

2.60 There are six bus services within close proximity of the RSH as detailed in the table below. Only one bus service (no. 1) goes directly into the site.

Table 2-4 Bus Service Summary - RSH

Route Number	Daytime Frequency	Afternoon Frequency	Evening Frequency
1 – Gains Park – Telford Estate	4 p/h	4 p/h	2 p/h
12 – Shrewsbury – Kingswood Estate	1 p/h	1 p/h	No evening service
74 – Shrewsbury – Llantyllin	1 service	1 service	No evening service
X75 Shrewsbury – Rhayadar	2 services	2 services	No evening service
553 – Shrewsbury – Bishop's Castle	2 services	2 services	No evening service
558 Shrewsbury – Montgomery	2 services	1 service	1 service

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Train

2.61 Shrewsbury Train Station is the closest to the RSH, approximately 10 minutes by car and 40 minutes via walking. Table 2-5 provides a summary of rail services from Shrewsbury Train Station.

Table 2-5 Train Service Summary – RSH

Route	Daytime Frequency	Afternoon Frequency	Evening Frequency
Shrewsbury – B'ham New Street	2 p/h	2 p/h	2 p/h
Shrewsbury – Manchester	2 p/h	1 p/h	1 p/h
Shrewsbury – Swansea	1-2 p/h	1-2 p/h	2 p/h
Shrewsbury – Cardiff	2 p/h	1 p/h	2 p/h
Shrewsbury - Holyhead	1-2 p/h	1 p/h	1 p/h

3 Travel Plan Review

Green Travel Plan

3.1 The SaTH produced a Green Transport Plan (GTP) in order to help minimise the impact of staff, patients and visitors on the local highway network. It recognised the issues surrounding car parking at both the PRH in Telford and the RSH at Shrewsbury. It also acknowledges the fact that both sites were constrained by the lack of public transport services for the site users.

3.2 The document outlines:

- What a GTP is;
- The need for a GTP for the Trust;
- Key objectives;
- Measures to be implemented;
- A brief summary of travel to the site;
- Modal shift targets; and
- Implementation and monitoring.

3.3 This GTP does not appear to have a date of issue that we can find however, throughout the document objectives are mentioned for 2008/2009 and so this implies the date being early 2008. It therefore is recommended that the GTP is in need of updating to include measures implemented since the date of issue as well as producing further objectives and targets that may now be more suitable for the sites.

Transport Review and Recommendations

3.4 There is also a Transport Review and Recommendations Report dated July 2011.

3.5 The general findings confirmed a shortfall in parking provision at peak times and at PRH this is likely to increase post-reconfiguration.

3.6 A number of high level measures were identified as being in the following categories:

- Proposals for Change: Strategic Issues such as the development of a 'Parking and Transport Strategy' and establishing and agreeing Parking and Transport Mode Principles; and
- Proposals for Change: Tactical Issues such as increasing staff parking charges and revising Grey Fleet rates to HMRC rates.

Travel and Transport Plan (TTP)

3.7 A TTP has also been produced for SaTH in 2014. The document was written due to the relocation of staff from the Women's and Children's Centre to the RSH site where car parking was already exceeding capacity. The document sets out plans to be implemented in the long term to reduce single occupancy car journeys by 5% to alleviate the parking issues. Measures on how to do this are outlined in the plan along with the predicted amount of car parking spaces which would be released if the measures are successful. This plan and the targets were written to adhere to planning conditions attached to the planning approval for the new Women and Children's units.

3.8 The current failings of the car park management at the sites are acknowledged within the plan as listed below:

- The financial incentives are not large enough to discourage staff from driving to work;

- The pay banding for parking costs means little difference between lower banded staff and senior staff; and
- The penalty system not being adequately enforced to prevent illegal and inappropriate parking.

Staff Travel and Transport Updates

3.9 Two updates have been produced in relation to travel planning which are dated January 2016 and March 2016. These updates have been produced for the Executive Directors and the Trust Board to ensure that the Travel Plans are being monitored and implemented. There is no survey information or target information in these updates, and it is therefore difficult to evaluate current modal shift and whether the targets set have been met.

3.10 The documents provide an update on the various measures and actions mentioned in the Green Travel Plan, The Travel and Transport Plan and the Transport Review and Recommendations. These measures include:

- Employing a Travel Plan Coordinator (TPC);
- Improvements to cycling facilities such as cycle parking, showers and lockers;
- Working with the Trust and Local Authority on improvements to surrounding pedestrian and cycle routes;
- Discounted public transport tickets;
- Promotion and incentivising car sharing;
- Reviewing the car parking permit system;
- Improving the video conferencing facilities;
- Introducing an inter-site shuttle bus service; and
- Reforming the pool car fleet to ensure maximum usage.

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4 Future Scenarios & Recommendations

INTRODUCTION

4.1 This chapter provides a series of future scenarios and recommendations which have been formulated in line with observations made as part of the baseline audit of each site. An initial examination of the following key issues is provided:

- Both Sites
  - Rationale for calculating required additional car park and cycle space provision including multi storey provision
  - Assessment of scope of work to connect to surrounding cycle networks
  - Review of the existing on site roads and radius for proposed vehicle types
  - Travel plan review recommendations
- RSH Site Only
  - Viability of providing a ‘Blue-Light Only Route’ (BLOR)

SITE OPTIONS

4.2 The SaTH is reorganising the way the trust will function in the future across the two sites. How the reorganisation is to be implemented across both sites is still to be determined but it will see the establishment of an Emergency Site at one location and at the other, the current Emergency facilities will be replaced with a PCS.

4.3 Through discussion of the recommendations outline, reference is made the following options for the two trust:

- Option B – New Emergency Site at PRH
- Option C1 – New Emergency Site at RSH
- Option C2 – New Emergency Site at RSH and W&Cs at PRH

CAR PARKING

4.4 As highlighted in the baseline review there are major car parking issues across both sites. There have been some steps made by SaTH to address these issues, most notably at the RSH through better enforcement, however further steps are required to improve the overall car park management. The car parks are managed on behalf of the SaTH by CP Plus, Each site’s parking provision and associated issues are discussed below.

4.5 In order to provide an indication of traffic associated with the proposed options for each site, the TRICS database (v7.3.2) has been interrogated, using sites from the ‘Hospital With Casualty’ and ‘Hospital Without Casualty’ categories. Site surveys have been used to determine, on average, the provision of vehicles travelling to the site as a proportion of total trips. For sites in the ‘Hospital With Casualty’ category, vehicles accounted for 67% of total trips, where as in the ‘Hospital Without Casualty’ category, vehicles accounted for 70% of total trips.

4.6 As set out in Table 4-1, the proposed options for PRH and RSH will result in a transition in the number of Full-Time Equivalent (FTE) staff members employed at each site.

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Table 4-1 FTE Staff Members

Staff	PRH *(% Of Current)*	RSH *(% Of Current)*
Current	2075	2432
Option B	2564 *(124%)*	1943 *(80%)*
Option C1	1181 *(57%)*	3393 *(140%)*
Option C2	1653 *(80%)*	3022 *(124%)*

AHR Architects

4.7 In accordance with traffic profiles obtained from the TRICS database, variations in staff numbers are envisaged to result in equivalent increase in the number of trips associated with each site. From the TRICS data the provision of vehicle trips as a percentage of total trips to the site has been calculated. This has then been applied to the percentage increase in staff for each site option, outlined in Table 4-1. The resulting figure has been applied to parking demand figures set out in Table 4-2, in order to forecast future demand.

Table 4-2 Parking Space Provision

	Capacity	Free Spaces	Unallocated Parking	Demand
PRH	1336	136	145	1345
SRH	1742	91	50	1701

4.8 For example, currently during peak hours there is a demand for 1345 spaces at PRH, which is 9 more than the 1336 capacity. Option B, which will see a new Emergency Site located at PRH, is predicted to result in 124% of the current FTE staff provision on site. For 'Hospital With Casualty' Sites vehicles are predicted to account for 67% of total trips to the site.

4.9 When taking into account current parking demand, and that 67% of new trips associated with the site are likely to be vehicles, it is envisaged that 225 additional spaces will be required on site to accommodate demand.

*Increase in staff * vehicle trips as a proportion of total trips*	*24*0.67=16.08*
*Current parking demand * forecast vehicle trips*	*1345*1.168=1561.276*
Forecast parking demand – current capacity	*1561.276-1336=225.276*
Number of additional spaces required to accommodate demand	***225***

4.10 This method has been employed in order to provide an estimate of required parking demand for each of the Options proposed at PRH and SRH.

Princess Royal Hospital

4.11 As outlined within the baseline audit of the PRH, there appears to be a major issue with regard to unallocated, overflow car parking, particularly along the grass verges of the sites internal access roads.

4.12 Upon visiting the site it would appear that staff vehicles (identified through the display of a staff permit in the vehicle) account for a large proportion of this overflow parking, predominantly along the verges of the access road to the east of the site. As part of the baseline site audit, a total of 97 incidences of unallocated staff parking were recorded on site. At the same time, there were 134 available parking spaces for staff, 85 of which were recorded within the ramped staff car park, to the west of the WCW. Through discussions with the car parking attendant on site, it becomes apparent that this car park has been utilised far less since the allocation of approximately 140 spaces for staff from the main visitor car park on the site. It would appear that staff view the ramped staff park as too remote in relation to their destinations and therefore choose to park inappropriately on grass verges along the internal access road. An element of this may also be down to an unawareness of the availably within the ramped staff car park.

4.13 In light of the above, it is recommended that any car park management promotes greater use of the ramped staff car park, as a method of reducing incidences of unallocated staff parking on site. One way to improve usage of the staff car park would be through greater parking enforcement. Upon visiting the site it would appear that enforcement only occurs for vehicles failing to display a staff permit. To ensure that parking at the site is properly managed, it is recommended that enforcement warnings should be served for vehicles parking inappropriately, regardless of whether they belong to staff or visitors. Such efforts should be supported by clear signage and information to direct staff to available spaces at existing spaces.

4.14 In addition to the principles outlined above, and to further reduce incidences of unallocated staff parking on site, spaces could be formalised adjacent to the Endoscopy Unit. This would provide formalised parking in a location where numerous incidences of unallocated parking are currently observed and provide additional onsite capacity.

4.15 As part of Option B 'for the PRH site, which involves the construction of a new Emergency Site on the existing Main Visitor Car Park, the possibility of a multi-storey car park has been examined. It is envisaged that this could feasibly be delivered on site, situated on land south of the internal access road. Through preliminary analysis it is suggested that this could provide 150 spaces per storey.

4.16 In such a case the topography changes between the existing visitor car park and the adjacent access road will have to be properly considered, in order to provide a pedestrian crossing point between the main hospital buildings and the new multi-storey car park. There is also a potential requirement for the access road to be widened, in order to accommodate increased traffic volumes. This is considered to be feasible given the provision of vacant land adjacent to the road. The potential requirement for a filter lane would also need to be considered, in order to prevent vehicles queueing back along the access road.

4.17 For Option B, using the method outlined in Paragraph 4.4 – 4.6, and assuming that no efforts to promote alternative modes of travel are successful, parking demand on site is rise from 1345 to 1557 spaces. At the time of the site visit, demand was observed at 1345 space, 9 more than the total on site capacity of 1336. Current demand rather than capacity has been used as a base figure for these calculations in order to highlight future demand for parking.

4.18 In this case any new car park would need to account for 221 new spaces, plus the 216 spaces displaced from the visitor centre car park (356 – 140 staff spaces), amounting to a total of 437 spaces. From preliminary analysis of the land to the south of the access road, it would appear that a multi storey car park of 150 spaces per storey could be established, thus suggesting the requirement for a 3 storey car park. Utilising knowledge drawn from previous experience of working on similar schemes, a multi-storey car park of this size would involve a cost of approximately £12,000 per space, thus equating to a total cost of £5.244 million.

4.19 For Option C1 and C2, which involve the situation of a new Emergency Site away from PRH, required parking demand is envisaged to reduce significantly. It is envisaged that Option C1 would result in demand for 397 fewer spaces on site, with Option C2 reducing demand by 182 spaces. In the event of either of these options occurring, it is likely that the requirement for additional parking spaces on site would be eliminated.

4.20 Table 4-3 provides a summary of car parking for each of the proposed options in relation to current capacity and demand at PRH.

Table 4-3 PRH Car Parking Options Summary

	Current Capacity	Current Demand	Future Demand	Net Change
Option B	1336	1345	1557	+221
Option C1	1336	1345	939	-397
Option C2	1336	1345	1154	-182

Royal Shrewsbury Hospital

4.21 Car parking at RSH appears to better managed, however there are still a number of issues which require addressing. Numerous incidences of unallocated parking by staff were observed, which could be addressed through an expansion of staff parking areas in order to meet current demand. This could occur through extension of the main staff car park to the west, or the construction of a multi-storey at this location, as outlined in the proposed options for the site. It is likely that a multi-storey would be the most viable option, given the limitations with regard to available land on site. In this case, further work would be required to determine whether Evolution Road, and in particular the T-Junction with Mytton Oak Road would require upgrading in order to accommodate increased traffic levels

4.22 In reference to the plans for the proposed site options, the construction of a new Emergency Site will result in the displacement of 96 spaces from the main staff car park, which must be factored into consideration when calculating the number of additional spaces required on site. In the case of a multi-storey being constructed, the plans indicate that this will provide a total of 155 spaces per storey, however it must be considered that the ground floor of the proposed location of the multi-storey is currently occupied by surface car parking. Any additional parking will therefore need to be provided on the first floor and above (if necessary).

4.23 As part of Options C1 and C2, the new Emergency Site would be located at RSH, resulting in an increase in trips to the site. For Option C1, assuming that no efforts to promote alternative modes of travel are successful, parking demand on site is predicted to rise from 1701 to 2151 spaces. In this case any new car park would need to account for 409 new spaces, in addition to 96 displaced by the construction of a new Emergency Site and the 155 which currently occupy the land where the new multi-storey is to be situated. In light of this, the multi-storey would need to provide 660 spaces, at a rate of 155 per storey, which would suggest at a minimum a four storey car park would be necessary. As set out above, utilising knowledge from working on similar schemes, a multi-storey car park of this size would involve a cost of approximately £12,000 per space, equating to an approximate cost of £7.5 million.

4.24 With regard to Option C2, again assuming that no efforts to promote alternative modes of travel are successful, parking demand on site is predicted to rise from 1701 to 1977 spaces. In this case any new car park would need to account for 235 new spaces, which again would be in addition to the 96 displaced by the construction of a new Emergency Site and the 155 which currently occupy the proposed location of the new multi-storey. In light of this, the multi-storey would need to provide 486 spaces, at a rate of 155 per storey, which would suggest that a three storey car park would necessary. The 465 spaces required would suggest an approximate total cost of £5.6million.

4.25 For Option B, which involves the situation of a new Emergency Site away from RSH, required parking demand is envisaged to reduce significantly. It is envisaged that Option B would result in demand for 280 fewer spaces on site. In the event of this option occurring, it is likely that the requirement for additional parking spaces on site would be eliminated.

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4.26 Table 4-4 provides a summary of car parking for each of the proposed options in relation to current capacity and demand at PRH.

Table 4-4 SRH Car Parking Options Summary

	Current Capacity	Current Demand	Future Demand	Net Change
Option B	1742	1701	1462	-280
Option C1	1742	1701	2151	+409
Option C2	1742	1701	1977	+235

CYCLE NETWORK CONNECTIONS

4.27 As outlined above, one of the key recommendations for any Travel Plan Review centres on improving access for cyclists, which in turn could potentially encourage staff to arrive at either site by modes other than the car. As part of this, it is necessary to examine the potential scope of works to connect to surrounding cycle networks at each site.

Princess Royal Hospital

4.28 At PRH, there are several local cycle networks surrounding the site, which permeate through the residential areas of Apley and Leegomery, before connecting with National Cycle Route (NCR) 81, which links with Wellington Train Station and Telford. In spite of this, it appears that cycle parking at the site is largely unused. A number of measures could be considered to encourage increased cycle usage for journeys to work.

4.29 In spite of the widespread provision of cycle routes around the site, cycle infrastructure within the site is inadequate. There are no cycle lanes, with cyclists instead using the busy internal access roads, and signage is relatively sparse. Whilst not wishing to overlook the limitations with regard to available space at the site, there is potential space along the grass banks adjacent to the internal access road where a cycle path could be established. These could interlink with external cycle routes to the south of the site, along Whitchurch Drive and Grainger Drive, which benefit from dedicated cycle lanes and signalised crossings.

4.30 Any cycle lanes provided within the site could also interlink with the existing route along the northern site boundary, which provides connections from Apley Castle towards residential areas to the west. This would also provide an alternative route for those wishing to avoid the busy main roads of Whitchurch Drive and Grainger Drive.

4.31 Any new routes within the site should be accompanied by the provision of frequent, clear signage, as wayfinding was identified as a key impediment to NMU access at PRH.

4.32 There are two cycle shelters, located adjacent to the main entrance and the WCW, however at the time of the site visit only two bicycles were parked in these shelters. It is envisaged that use of the shelters could be significantly improved through the measures outlined above.

Royal Shrewsbury Hospital

4.33 At RSH, cycle route provision around the site is relatively sparse. The closest route (NCR 81) is approximately 0.7miles from the site, which provides connections to Shrewsbury Town Centre. In spite of this, cycle use appears to be considerably greater at the site, when compared with PRH. It is envisaged that this may partly be down to the draw from the quiet residential roads surrounding the site.

4.34 Similar to the PRH site, it would again be beneficial to investigate the potential for establishing cycle lanes within the site. Preliminary analysis suggests that there would be a lack of available land given the concentration of development on the site. Nonetheless, there are several potential options which could be explored in order to enhance access for cyclists. For example, there are existing pedestrian routes which connect residential areas to the hospital which could potentially provide a shared space for pedestrians and cyclists thus enhancing permeability for cyclists.

4.35 Access into the north of the site from Starcross Close could be enhanced, perhaps through widening the current access point and providing a separate lane for cyclists. This would provide an established access point to the large residential areas to the north of the site. Alternatively the path to the north which links the hospital to Everly Close, Napolean Drive and Painters Place could also be adapted to make it both more pedestrian, cyclist and disability friendly by widening the path and removing the steps.

4.36 Improvements could also be made to the route through to Westhope Avenue, from the east of the site adjacent to the Shropshire Conference Centre. This is currently narrow and overgrown, with little natural surveillance. Enhancing this route would provide greater access to the large residential area to the east of the site, in addition to a shorter linkage with NCR 81.

4.37 As with the PRH, a greater provision of clear signage could be help enhance access for NMUs, as wayfinding was valued as a key limitation to NMU access as part of the baseline site audit.

ON SITE ROAD ASSESSMENT

4.38 To ensure that ambulances will be able to approach and enter from the new Emergency Site entrance at each location swept path analyses have been undertaken. These are included in Appendix B.

4.39 The scale and layout of the proposed new Emergency Site entrance at PRH is such that ambulances can use the existing access road and follow the circulatory of the new drop off point.

4.40 At RSH two potential 'Blue-Light Only Routes' (BLORs) have been examined through swept-path analysis, which confirms that an ambulance would be able to negotiate these routes, and perform a U-turn in front of the Emergency Site entrance.

BLUE LIGHT ONLY ROUTE (BLOR) – RSH

New Road Across Land Adjacent to Somerby Drive

4.41 Taking into account observations made during the two visits to RSH and preliminary desk-based analysis, the potential establishment of a new blue-light route has been examined. It is envisaged that this will be located to the northwest of the site, crossing a section of green space before joining with Somerby Drive, adjacent to the Redwood Centre, as shown in Appendix A. At this stage is it assumed that this land would be made available.

4.42 Currently Somerby Drive is subject to a 20mph speed limit and acts as a major link for residents to the north and west of the site. The road is of sufficient width to facilitate a route for emergency vehicles, however the potential impact on local residents should be considered and it is likely that there would be opposition to a new route for emergency vehicles adjacent to their properties.

4.43 The BLOR could be provided toward the southern side of the green space, with an element of screening provided in the form of fencing or a continuous tree line to mitigate the impact of noise pollution and visual intrusion on surrounding properties.

4.44 Consideration will need to be made of the future of the play area currently situated within the green space, as this may have to be relocated. The topography of the land will also need to be considered, given that the green space is not at grade with the adjacent internal access road. A cutting into the land will therefore need to be made, in order to maintain a suitable gradient for any adjoining BLOR.

4.45 Within the centre of the green space, there are two large trees it is envisaged, therefore, that the input of an ecologist would be required, in order to determine whether or not these are protected species. However it is believed that the route could be provided without the requirement for either tree to be removed. This will require further investigation.

4.46 Finally it is likely that some of the smaller trees, in addition to existing signage and lighting along the border between the existing green space and the hospital, may need to be removed, to allow the BLOR to integrate with the existing internal access roads. As outlined above, there are considerations to be made in order to provide a new BLOR at this location, nonetheless, it is envisaged that these could be overcome, providing a new access point adjacent to the Treatment Centre Staff Car Park.

Evolution Road

4.47 A second potential option for the BLOR is along the section of Evolution Road to the west of the site, past the Boiler House and Estate, as set out in Appendix A. Evidently this option would not require the same level of intervention as the above option given that much of the BLOR will be along an existing road. This option would, however, be subject to the use of the section of Evolution Road which connects with Racecourse Lane, as outlined below.

Additional Considerations – Both Options

4.48 For both options outlined above access via a BLOR could be further enhanced through utilisation of the section of Evolution Road which connects with Racecourse Lane. Should a connection be provided between Somerby Drive and Evolution Road, emergency vehicles will be able to access and enter the site to the north and south.

4.49 Restrictions would also need to be in place to prevent stopping along both potential BLORs. Adequate signage would be required to prevent members of the public accessing the routes and interfering with the flow of emergency vehicles. It is also recommended that a lighting system be put in place which prioritises emergency vehicles at the point of access into the site.

TRAVEL PLAN REVIEW RECCOMENDATIONS

4.50 Following a review of the documents, and taking into account issues identified as part of the baseline audit of the site, we would advise the following recommendations to be implemented by the Travel and Transport team. The aim would be to provoke a reduction in single occupancy vehicle travel to the site, and to help reduce current car parking issues. Encouraging these changes will have many positive impacts on the sites as they develop, including:

- Improving access for vehicles e.g. deliveries, emergency vehicles,
- Improving access for pedestrians and cyclists
- Improving the car parking and access issues for staff and patients

4.51 With regards to the staff travel and transport updates it is recommended that these are issued quarterly to the Executive Directors and Trust Board to ensure that progress is being made with regards to the actions and measures produced through the Travel Plan documents and the Transport studies. There is no record of a steering group or of who these updates are sent to.

4.52 Although the documents mentioned above are comprehensive and acknowledge many transport issues that have hindered the ability to use sustainable modes of transport to the site, they require updating, especially the GTP and the TTP.

4.53 These should be updated to consider all the measures implemented since 2008 and include monitoring of their success. It is recommended that just one document should be produced to encompass both the

GTP and the TTP to avoid repetition, have joined up measures and consistency, and have clear, realistic and achievable measures and targets. More information on this will be given later in this document.

4.54 To ensure their success GTPs and TTPs require the following::

- Travel Plans should conform to the best practice recommended through the National Planning Policy Framework (NPPF) and National Planning Practice Guidance (PPG), especially with regards to the change of use and relocation of staff.
- Travel Plans should ensure and prove that they are in line with National and Local Policy with specific references to these for a joined up consistent approach.
- An analysis of what is currently available to staff, patients and visitors to help them travel sustainably.
- Travel Plans and actions should be based upon site users travel surveys. These need to be tailored to the specific site user needs, for example staff, patient and visitor needs. In order to have an accurate reflection of what specific barriers there are to sustainable travel, surveys must have a statistically accurate response rate. The travel surveys will be reflected in the actions and measures suggested and add justification to the need and success of actions. Travel Plans should include a full analysis of the surveys.
- Develop a marketing strategy to ensure all site users are aware and continuously reminded of sustainable transport options available.
- Investigate the business travel and grey fleet issues to complement the car park management strategy.
- There is mention of other organisations on the site and in the local vicinity. It would be wise to work alongside these organisations, especially with regards to liaising with local public transport operators to improve their services to the sites.
- It is acknowledged that some staff may be relocating. Relocation offers a great opportunity to influence travel behaviour as habits are yet to be formed. A plan should be put in place to assist any relocating staff on their new journeys to work when the new building usages and staff are confirmed.

Business Travel and Grey Fleet

4.55 It has been acknowledged in the documents that grey fleet and business travel is not well managed with significant costs to the NHS, estimated across SaTH at £900,000 per year. It is therefore important to investigate opportunities on how this can be reduced. If there is less need to travel during the working day and therefore less need to drive to work.

4.56 Simple measures could be put in place to ensure that staff can avoid driving during the working day. These include:

- Introduce a business travel hierarchy and process to seek to reduce business travel mileage and deliver cost savings. It will look to promote firstly alternatives to travel such as teleconferencing, followed by active transport, public transport, pool car usage and car sharing, with grey fleet being used as a last resort.
- Ensuring that teleconferencing systems are available and used effectively and all staff are trained in how to use them;
- Ensure that if no sustainable transport modes are available for business travel that staff are able to car share where applicable (conferences etc.);
- Adopt an electronic mileage claim form to monitor business and grey fleet travel; and
- Ensure all staff are aware of the newly contracted lift share scheme through running events and the dedicated car sharing bays.

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SUMMARY OF RECCOMENDATIONS

4.57 Table 4-5 provides a summary of the recommendations set out above.

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Table 4-5 Summary of Recommendations

Actions	Delivery	Date to be completed
Car Parking Recommendations		
At PRH promote better utilisation of the Ramped Staff Car Park.	NHS Trust	
At PRH ensure that enforcement warnings are given to cars parked in unallocated spaces.	NHS Trust	
At PRH investigate the use of the land that is currently available to the south of the internal access road and consider its usage as a car park as an alternative to a multi storey.	NHS Trust with the support of JMP Consultants	
At RSH investigate further the need for an extension to the main staff car park to the west of the site or a multi storey.	NHS Trust with the support of JMP Consultants	
At RSH investigate if Evolution Road requires upgrading with emphasis on the junction between Evolution Road and Mytton Oak Road in order to provide capacity for vehicles accessing new multi-storey car park.	NHS Trust with the support of JMP Consultants	
Produce and deliver a Car Park Management Strategy for both sites	JMP Consultants	
Cycle Recommendations		
Conduct site cycle audits to identify key priorities to improve infrastructure and way finding for cyclists on site.	JMP Consultants	
Ensure that existing links to residential areas can be utilised by cyclists to encourage permeability to the sites.	NHS Trust with the support of JMP Consultants	
Work with the local authority and cycling groups (such as Sustrans) to ensure that the local cycle network paths are well maintained, free of vegetation, well-lit and have natural surveillance to ensure that cyclists feel secure throughout the year.	NHS Trust, Local Authorities and Sustrans	
Blue Light Only Route (BLOR)		
Introduce measures to mitigate the impact of noise and visual pollution on local properties.	NHS Trust	
Investigate the future of vegetation and trees surrounding the potential BLOR as well as the children's play area.	NHS Trust with the support of JMP Consultants	
Investigate the use of Evolution Road as a potential alternative BLOR to cutting through the green space.	NHS Trust with the support of JMP Consultants	
Implement Red Route restrictions	NHS Trust and Local Authority	
Implement appropriate signage.	NHS Trust with the support of JMP Consultants	
Travel Plan Review Recommendations		
Produce a Travel Plan to combine the GTP and TTP to take into consideration both staff and visitor travel to the site.	NHS Trust / JMP Consultants	
Set up a Travel Plan Steering Group	NHS Trust	
Conduct a thorough staff and visitor travel survey to feed into the Travel Plan which must reach a statistically accurate response rate. This should be completed annually for monitoring purposes.	NHS Trust with the support of JMP Consultants	
Investigate ways to save time and costs on Business Travel and Grey Fleet issues.	JMP Consultants	
Produce a Car Park Management Strategy.	JMP Consultants	

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5 Summary

5.1 JMP has provided a series of future recommendations to help inform the reorganisation of the PRH and RSH sites. These centre predominantly on car parking, cycle access, the establishment of a BLOR and a review of travel plan principles.

5.2 JMP recommend that a car park management strategy is produced for both sites. At PRH focus should be on better utilisation of the ramped staff car park, combined with suitable enforcement measures for cars parked in unallocated space. At PRH, it is also recommended that for Option B, a new 437 space 3 storey car park is provided on land to the south of the internal access road, costing approximately £5.244 million. AT RSH in the case of Option C1 being realised, a new multi-storey is deemed necessary, which will provide 660 spaces over 4 storeys at a total cost of £7.5 million. For Option C2, a multi-storey comprising 486 spaces over 3 storeys is considered appropriate, costing approximately £5.6 million. At RSH, given the proposed location of any multi-storey, further investigation will be required to determine whether Evolution Road requires upgrading in order to provide capacity for additional vehicles accessing this location.

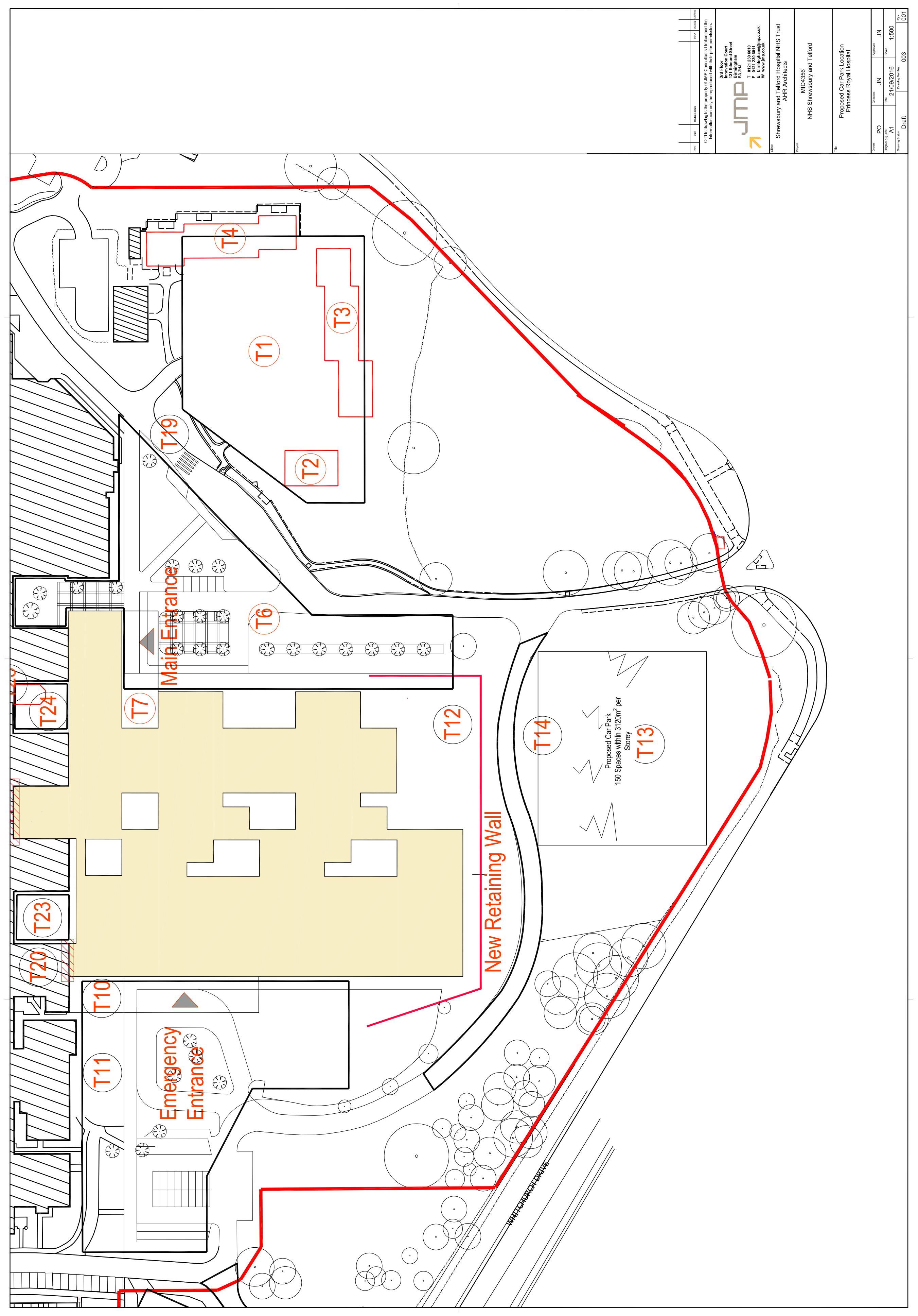
5.3 With regard to cycle infrastructure, JMP recommend that cycle audits are undertaken in order to identify key priorities to improve infrastructure and way finding for cyclists at both sites. Existing links to residential areas should also be examined further, in order to determine whether these can be utilised by cyclists, enhancing permeability of the two sites. It is also recommended that SaTH work with the local authority and cycling groups (for example Sustrans) to ensure that the local cycle network paths are adequately maintained, free of vegetation, well-lit and benefit from natural surveillance to ensure cyclists feel secure throughout the year.

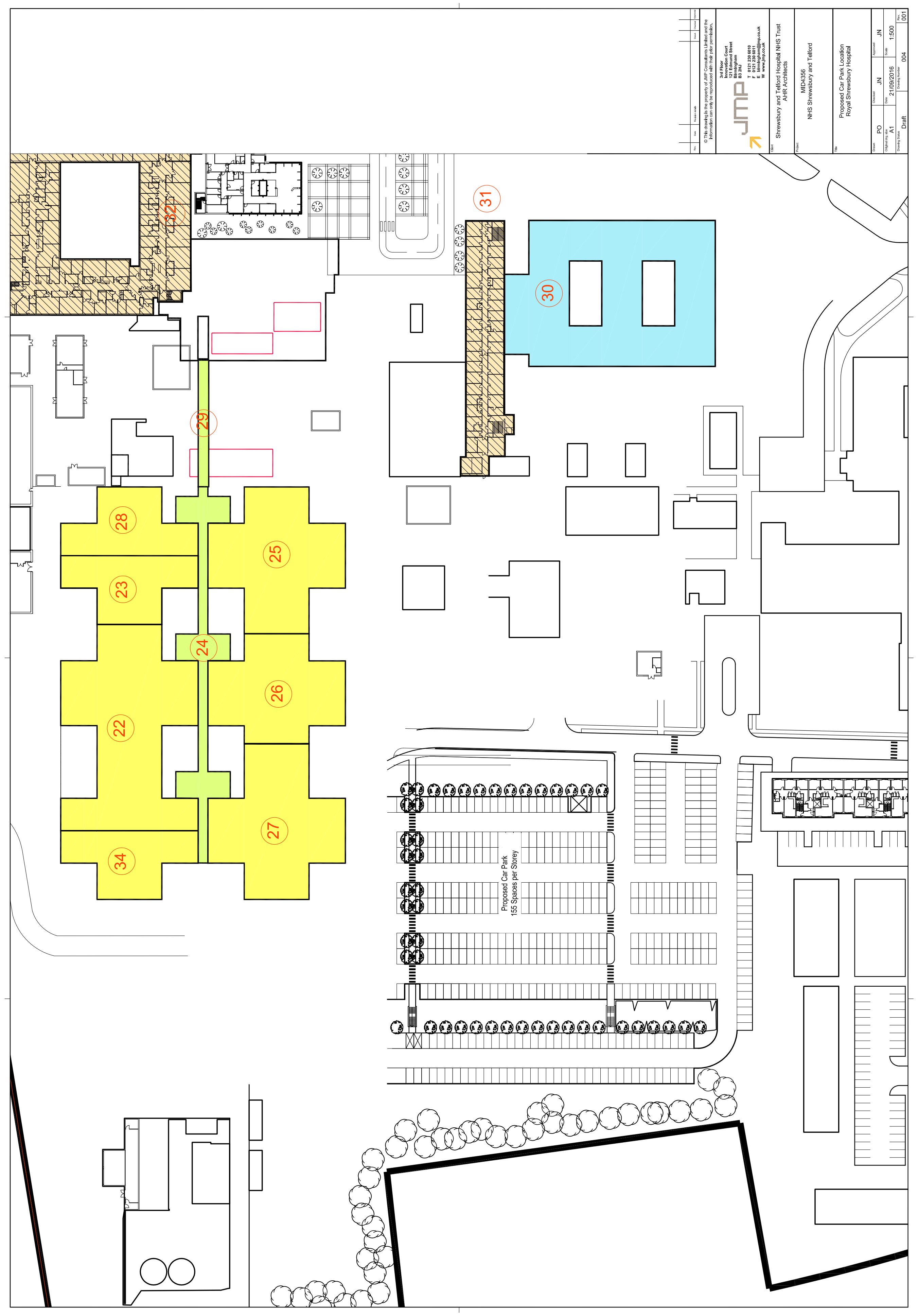
5.4 In the case of an Emergency Site being located at RSH, a new BLOR is proposed for emergency vehicles. In order to support this, JMP recommend that further investigation is undertaken to examine the future of vegetation and the existing play area which are currently situated on the green space to the northwest corner of the site. The use of the exiting section of Evolution Road to the west of Estates may also be considered as a potential alternative route. In the case of a BLOR being brought forward, JMP recommend that appropriate red routes restrictions and subsequent signage are introduced to prevent conflict with public vehicles. In the case of the BLOR being located on green space to the north of the site, JMP would also recommend appropriate screening is provided to mitigate the potential for noise pollution and visual intrusion on existing properties situated adjacent to the green space.

5.5 Finally, a number of recommendations are made surrounding a comprehensive review of the travel plans for the two sites. JMP suggest that a travel plan is produced to combine the GTP and TTP to take into consideration both staff and visitor travel to the site, and that a steering group is set up to support this. A thorough staff and visitor travel survey is also required, to feed into the travel plan. This should be completed annually for monitoring purposes. Further investigation is also recommended surrounding potential ways to save time and costs on Business Travel and Grey Fleet Issues.

Appendix A

CAR PARK LOCATIONS


T1
T2
T3
T4
T6
T7
T10
T11
T12
T13
T14
T19
T20
T23
T24
Main Entrance
Emergency Entrance
New Retaining Wall
Proposed Car Park
150 Spaces within 3120m² per Storey


22
23
24
25
26
27
28
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34
Proposed Car Park
155 Spaces per Storey

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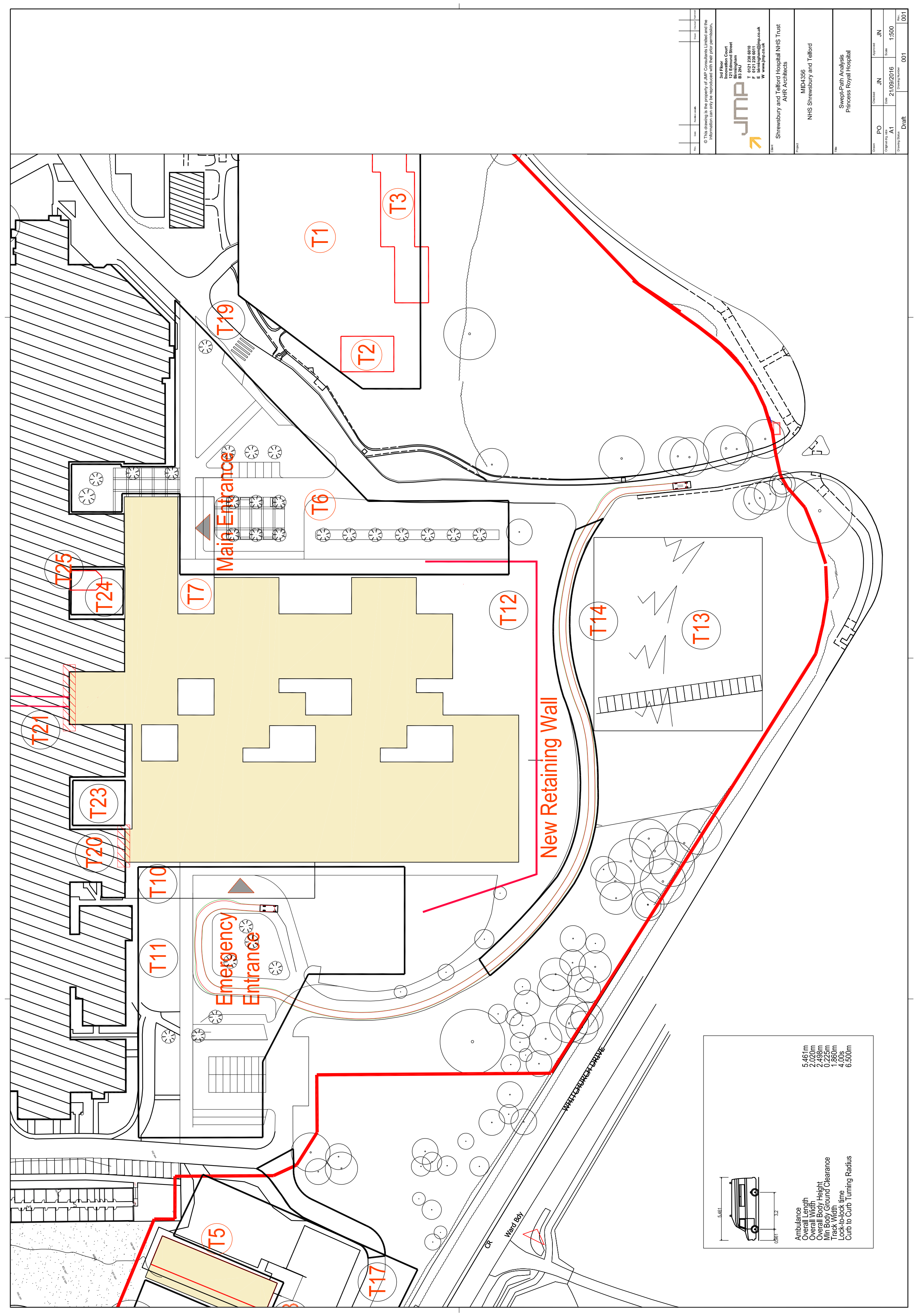
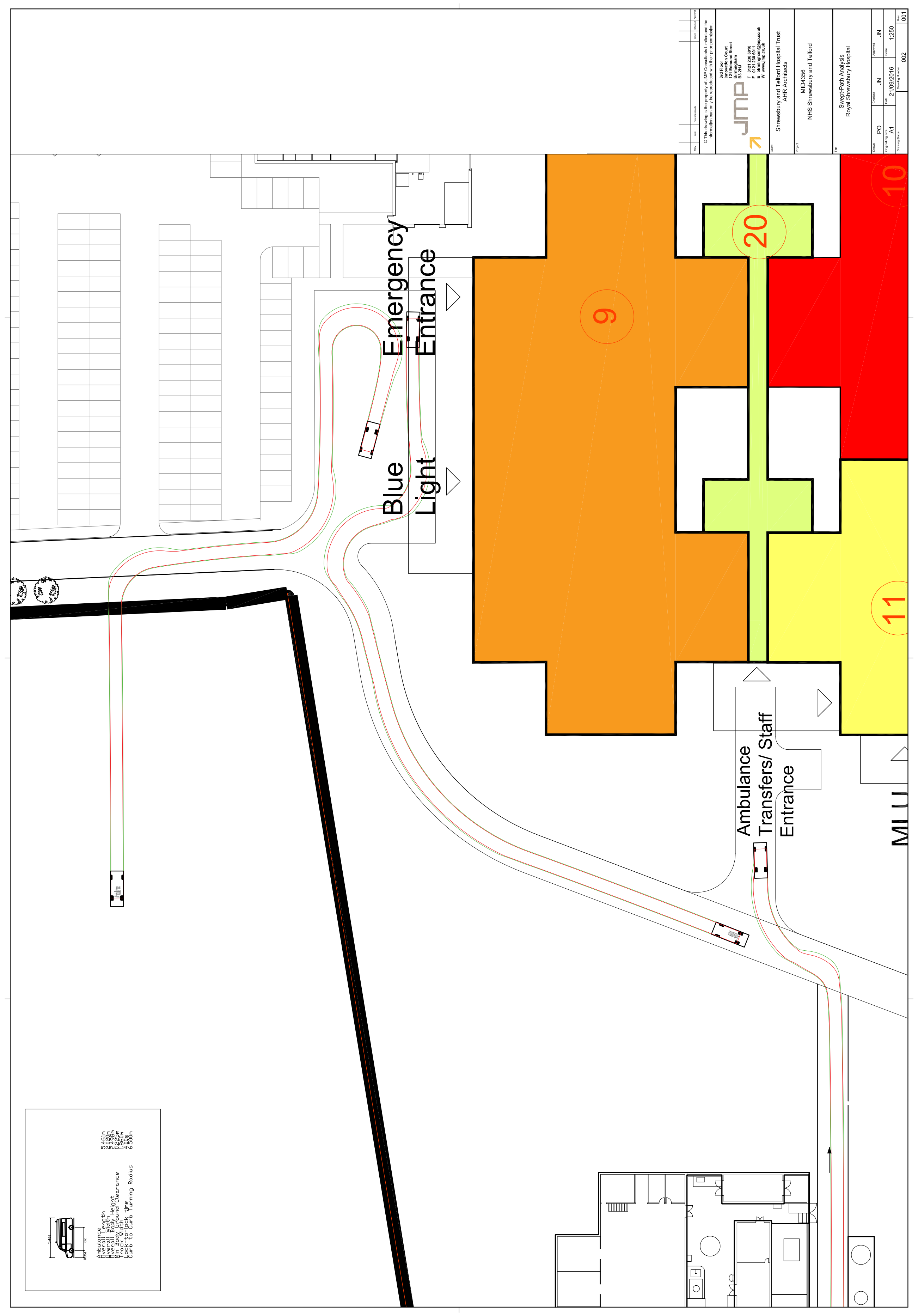
Appendix B

SWEPT-PATH ANALYSIS (INLCUDING BLOR ROUTES)





Emergency Entrance
Blue Light
9
10
20
11
Ambulance Transfers/ Staff Entrance
MLU

VOLUME 7:   HEALTH CARE PLANNING

STRATEGIC HEALTHCARE PLANNING

SCHEDULE OF ACCOMMODATION

Version 3

SaTH SSP: Outline Busness Case	
	15039

Sustainable Service Programme

Contents

Document Author
Strategic Healthcare Planning

Document Compiler
Huw Lambert

Document Owner
Huw Lambert

Main Entrance			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Entrance Functions	Entrance Foyer			100.00	1	100.00						
	Reception, 4 positions		Project	16.00	1	16.00						
	Office - Two person		Project	12.00	1	12.00						
	Interview Counselling		Project	9.00	4	36.00						
	Information Room	May be linked to PALS	Project	16.00	1	16.00						
	Auto Health Check Booth	May be linked to Info Room		2.00	1	2.00						
	Waiting Area: 25 places		Project	39.00	1	39.00						
	Parking Bay Wheelchair		Project	2.00	8	16.00						
	Baby Change		Project	5.00	1	5.00						
	Public Toilets (3) Male		Project	16.00	2	32.00						
	Public Toilets (3) Female		Project	16.00	2	32.00						
	Toilet - Changing Places	T+F Request		12.00	1	12.00						
	Baby Feed		Project	5.50	1	5.50						
	Sub Total (Net)						**323.50**					
Community & Commercial Spaces	Commercial Pharmacy	Assumed retail opportunity		100.00	0	-		20th Oct 201	AHR / SHP	Shell only space to be provided (below the line)		- 100.00
	Switchgear	Meters to support commercial unit	SHP	1.00	1	1.00		20th Oct 201	AHR / SHP	Must be linked to shell only space		1.00
	Coffee Shop and Snack Bar	Assumed Trust managed service		40.00	1	40.00						
	Café	Assumed Trust managed service		100.00	1	100.00						
	ATM			2.00	1	2.00						
	Retail Unit	Assumed retail opportunity		60.00	0	-		20th Oct 201	AHR / SHP	Shell only space to be provided (below the line)		- 180.00
	Switchgear	Meters to support commercial unit	SHP	1.00	3	3.00		20th Oct 201	AHR / SHP	Must be linked to shell only space		3.00
	Sub Total (Net)						**143.00**					

Main Entrance			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
Contemplation Suite	Office Resource Base (4 person)		Project	12.00	1	12.00						
	Break out space			12.00	1	12.00						
	Beverage Bay - with HRB		Project	6.00	1	6.00						
	Group Room	Contemplation, worship, reflection		60.00	1	60.00						
	Interview Counselling		Project	9.00	1	9.00						
	Personal module storage supplement	Allocation per faith	Project	1.00	4	4.00						
	Wudu - Male	3 place Wudu, WHB, WC cubicle		9.00	1	9.00						
	Wudu - Female	1 place Wudu, WHB, WC cubicle		6.00	1	6.00						
	Prayer - Male			16.00	1	16.00						
	Prayer - Female			8.00	1	8.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)						**146.50**					
General Office	Office Cashier			16.00	1	16.00						
	Office - General			20.00	1	20.00						
	Store - General Office			16.00	1	16.00						
	Sub Total (Net)						**52.00**					
Hospitality Lounge (Discharge Suite)	Discharge Planning & Assessment (per place - recliner)	Combine recliner & chair areas with PPE and touchdown		10.00	10	100.00		20th Oct 201	AHR / SHP	Transferred from Emergency Portal		100.00
	Discharge Planning & Assessment (per place - easy	Combine recliner & chair areas with PPE and		4.00	5	20.00		20th Oct 201	AHR / SHP	Transferred from Emergency Portal		20.00
	Touchdown Base	Combine recliner & chair areas with PPE and touchdown	HBN	2.00	1	2.00		20th Oct 201	AHR / SHP	Transferred from Emergency Portal		2.00
	WHB / PPE Station	Combine recliner & chair areas with PPE and touchdown	Project	2.00	1	2.00		20th Oct 201	AHR / SHP	Transferred from Emergency Portal		2.00

Main Entrance			Version 3					Change Control				
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	Consulting Examination - Dual sided access	Therapy Assessment (as T+F tracker)	HBN	16.00	1	16.00		20th Oct 201	AHR / SHP	Transferred from Emergency Portal		16.00
	Beverage Bay - with HRB		Project	6.00	1	6.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		6.00
	Toilet - Accessible		Project	4.50	2	9.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		9.00
	Equipment Bay	Resus	Project	2.00	2	4.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		4.00
	Store - Linen		Project	2.00	1	2.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		2.00
	Parking Bay Wheelchair - Large			40.00	1	40.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		40.00
	Sub Total (Net)						**201.00**					
Staff & Support	Locker Bay (12 small lockers)		Project	1.50	2	3.00		20th Oct 201	AHR / SHP	Support req'd to transferred facility		1.50
	Staff Rest	*See Zonal Hub*		-	0	-						
	Beverage Bay - with HRB	*See Zonal Hub*		-	0	-						
	Staff Changing	*See Zonal Hub*		-	0	-						
	Staff WC	*See Zonal Hub*		-	0	-						
	Staff - Shower	*See Zonal Hub*		-	0	-						
	Seminar room 24 place	*See Zonal Hub*		-	0	-						
	Domestic Services Room		Project	7.00	1	7.00						
	Disposal hold	*See Zonal Hub*		-	0	-						
	Information Technology Hub	*See Zonal Hub*		-	0	-						
	Switchgear		HBN	2.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 2.00

Main Entrance			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
				-	0	-						
	Sub Total (Net)						**10.00**					

Net Departmental Area		**876.00**
Planning Allowance	5%	43.80
Sub Total		**919.80**
Engineering Allowance	0%	-
Circulation Allowance	30%	275.94
Gross Departmental Area		**1,195.74**
	Total for two sites	**2,391.48**

Site Wide provision	Ambulance Service Rest Room	1 per site		24.00	2	48.00						
Retail	Commercial Pharmacy	1 per site		100.00	2	200.00		20th Oct 201	AHR / SHP	Shell only space to be provided		200.00
Retail	Commercial Retail Unit	3 per site		60.00	6	360.00		20th Oct 201	AHR / SHP	Shell only space to be provided		360.00

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
UCC: Entrance	Entrance Lobby			11.00	1	11.00						
	Reception, 4 positions	Additional workstn for PTS coordinator	SHP	16.00	1	16.00						
	Office - Single Person	Security - 'Gold Control'	Project	8.00	1	8.00						
	Office - Three Person	Security - CCTV	Project	15.00	1	15.00						
	Waiting Area: 30 places		HBN	51.00	1	51.00						
	Children's play & wait: 15 places			24.00	1	24.00						
	Toilet - Accessible		Project	4.50	2	9.00						
	Toilet - Ambulant		Project	2.00	4	8.00						
	Baby Feed		HBN	6.00	1	6.00						
	Baby Change		HBN	5.00	1	5.00						
	Drinking Water Dispenser		Project	0.50	1	0.50						
	Vending		HBN	3.00	1	3.00						
	Parking Bay Wheelchair		Project	2.00	3	6.00						
	Sub Total (Net)						**162.50**					
ED: Entrance	Store General (small)	Equipment - Ambulance	SHP	6.00	1	6.00						
	Domestic Services Room	Ambulance Cleaning	Project	7.00	1	7.00						
	Entrance Lobby			11.00	1	11.00						
	Office - open plan - Allocated	To support streaming process	Project	6.00	1	6.00						
	Store General (medium)	Equipment and Consumables (Major Incident) - Decon Tent (Inflatable)	SHP	8.00	1	8.00						
	Store General (medium)	Equipment and Consumables (Major Incident) - PPE	SHP	8.00	1	8.00						
	Store General (medium)	Equipment and Consumables (Major Incident) - Site Control Equip	SHP	8.00	1	8.00						
	Trolley Bay			16.00	1	16.00						

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Sub Total (Net)						**70.00**					
UCC: Clinical Zone	WHB / PPE Station	Entrances to clinical areas	SHP	2.00	2	4.00						
	Examination Room - Double sided access	Triage	Project	12.00	2	24.00						
	Examination Room - Double sided access	Adults Minors - (T+F increased from 6) see also isolation = 7	Project	12.00	7	84.00						
	Examination Room - Double sided access	Paeds Minors - (T+F increased from 2)	Project	12.00	4	48.00						
	Consulting /Examination - Ophthalmology			12.00	1	12.00						
	Consulting Examination - Dual sided access	Therapy Assessment: Not part of capacity calculation	HBN	16.00	1	16.00						
	Treatment Room		SHP	16.00	1	16.00		20th Oct 201	AHR / SHP	Transferred from Consult / Exam		16.00
	Staff Base (3)		HBN	16.50	2	33.00						
	Waiting Area: 5 places	Paeds sub wait	Project	9.00	1	9.00						
	Plaster Room (1 couch)			16.00	1	16.00						
	Store General (small)	Plaster Store	SHP	6.00	1	6.00						
	Store General (large)	Equipment	SHP	12.00	1	12.00						
	Equipment Bay	Resus trolley	Project	2.00	1	2.00						
	Shower/WC/WHB (accessible)		Project	7.00	1	7.00						
	Toilet - Ambulant		Project	2.00	1	2.00						
	Clean Utility with controlled drugs		Project	14.00	1	14.00						
	Dirty Utility with macerator		Project	12.00	1	12.00						
	Store - Linen		Project	2.00	1	2.00						
	Interview Counselling		Project	9.00	1	9.00						
	Sub Total (Net)						**328.00**					

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
Assessment	Discharge Planning & Assessment (per place - recliner)	Combine recliner & chair areas with PPE and touchdown		10.00	0	-		20th Oct 201	AHR / SHP	Transferred to Main Entrance Hospitality Lounge		- 100.00
	Discharge Planning & Assessment (per place - easy chair)	Combine recliner & chair areas with PPE and touchdown		4.00	0	-		20th Oct 201	AHR / SHP	Transferred to Main Entrance Hospitality Lounge		- 20.00
	Touchdown Base	Combine recliner & chair areas with PPE and touchdown	HBN	2.00	0	-		20th Oct 201	AHR / SHP	Transferred to Main Entrance Hospitality Lounge		- 2.00
	WHB / PPE Station	Combine recliner & chair areas with PPE and touchdown	Project	2.00	0	-		20th Oct 201	AHR / SHP	Transferred to Main Entrance Hospitality Lounge		- 2.00
	Consulting Examination - Dual sided access	Therapy Assessment (as T+F tracker)	HBN	16.00	0	-		20th Oct 201	AHR / SHP	Transferred to Main Entrance Hospitality Lounge		- 16.00
Consult / Exam Suite	Examination Room - Double sided access		Project	12.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 48.00
	Treatment Room		SHP	16.00	0	-		20th Oct 201	AHR / SHP	Transferred to UCC Clinical zone		- 16.00
	Staff Base (2) with Clean Supplies		SHP	13.50	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 13.50
	Shower/WC/WHB (accessible)		Project	7.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 7.00
	Toilet - Ambulant		Project	2.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 4.00
	Clean Utility with controlled drugs		Project	14.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 14.00
	Dirty Utility with macerator		Project	12.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 12.00
	Store General (small)	Consumables	SHP	6.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 6.00
	Store - Linen		Project	2.00	0	-		20th Oct 201	AHR / SHP	Shared Clinical Zone		- 2.00

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Sub Total (Net)						-					
Mental Health	Crisis Support Room	(from T+F Tracker)		12.00	2	24.00						
	Shower/WC/WHB (accessible)		Project	7.00	1	7.00						
	Interview Counselling		Project	9.00	1	9.00						
	Sub Total (Net)						40.00					
ED: Clinical Zone	Examination Room - Double sided access	Adult - Includes RAT (as T+F Tracker)	Project	12.00	26	312.00						
	Examination Room - Double sided access - Large	Combined isolation and bariatric		16.00	1	16.00						
	Lobby	Isolation		5.00	1	5.00						
	Ensuite - WC/WHB - Large	Combined isolation and bariatric		5.50	1	5.50						
	Examination Room - Double sided access	Paeds - Including RAT (as T+F Tracker)	Project	12.00	7	84.00						
	Staff Base (3) with Clean Supplies	Associated with adult cubicles	SHP	16.50	3	49.50						
	Staff Base (3) with Clean Supplies	Associated with paeds cubicles	SHP	16.50	1	16.50						
	Touchdown Base		SHP	1.50	4	6.00						
	Waiting Area: 5 places	Adult sub wait	Project	9.00	4	36.00						
	Waiting Area: 5 places	Paeds sub wait	Project	9.00	1	9.00						
	Store - Linen		Project	2.00	6	12.00						
	Near Patient Testing Room			8.50	2	17.00						
	Clean Utility with controlled drugs	1x resus, 1x adult, 1x paeds	Project	14.00	3	42.00						
	Clean Utility without controlled drugs	1x adult, 1x paeds	Project	8.00	2	16.00						
	Dirty Utility with macerator		Project	12.00	2	24.00						
	Resuscitation	8 place		26.00	8	208.00						
	Staff Base (4) with Clean Supplies	Associated with Resuscitation	SHP	19.50	1	19.50						

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Procedures Room			20.00	1	20.00						
	Change Point		SHP	1.00	2	2.00						
	Pre / Post Procedure (place)			3.50	2	7.00						
	Equipment Bay	Mobile x-ray	Project	2.00	2	4.00						
	Ultrasound room		SHP	16.00	1	16.00						
	Equipment Bay		Project	2.00	8	16.00						
	Store General (large)	Pharmacy / IV Fluids	SHP	12.00	1	12.00						
	Store General (large)	Equipment	SHP	12.00	1	12.00						
	Store General (large)	Clean Supplies	SHP	12.00	1	12.00						
	Interview Counselling	Relatives	Project	9.00	2	18.00						
	Beverage Bay - with HRB	Relatives	Project	6.00	1	6.00						
	Toilet - Accessible		Project	4.50	2	9.00						
	Sub Total (Net)						**1,012.00**					
Ambulatory Emergency Care / Clinical Decisions Unit (AEC/CDU)	Staff Base (2) with Clean Supplies		Project	13.50	3	40.50						
	Touchdown Base		SHP	1.50	6	9.00						
	Waiting Area: 5 places		HBN	8.50	2	17.00						
	Assessment Bay - Single	Generally grouped in eights		14.00	34	476.00						
	Assessment Bay - Twin	2x trolley (CDU) grouped together		26.00	4	104.00						
	Assessment Bay - Bariatric			14.00	1	14.00						
	Assessment Bay - Single	Day Case planned care grouped together		14.00	6	84.00						
	Clean Utility with controlled drugs		SHP	14.00	2	28.00						
	Dirty Utility with macerator		Project	12.00	2	24.00						
	Store - Equipment			8.00	1	8.00						
	Store - Linen		Project	2.00	1	2.00						

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Equipment Bay	Resus trolley	Project	2.00	1	2.00						
	Equipment Bay		Project	2.00	3	6.00						
	Office - Three Person	MDT / case review	Project	15.00	1	15.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Toilet- Assisted (Dual Access)	Adjacent to bariatric assessment	Project	5.50	1	5.50						
	Staff WC		Project	2.00	1	2.00						
	Sub Total (Net)						**841.50**					
Surgical Assessment Ur	See separate schedule			-	0	-						
	Sub Total (Net)						**-**					
Medical Assessment Uni	See separate schedule			-	0	-						
	Sub Total (Net)						**-**					
Paediatric Assessment U	See separate schedule			-	0	-						
	Sub Total (Net)						**-**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Beverage Room / Pantry	Snack & Sandwich type service	Project	12.00	1	12.00						
	Regeneration Kitchen	*See snack & sandwich note*	Project	26.00	0	-						
	Store General (small)	*FM equipment. See Zonal Hub*	SHP	6.00	0	-						
	Pneumatic Tube Station	Associate with Staff Base	SHP	1.00	2	2.00						
	Domestic Services Room	Dept. provision not Zonal Hub	Project	7.00	2	14.00						
	Disposal Hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**28.00**					
Staff Facilities	Staff Rest (20 place)	Dept. provision not Zonal Hub	SHP	21.00	1	21.00						
	Beverage Room / Pantry	Dept. provision not Zonal Hub	Project	12.00	1	12.00						

Emergency Site - Emergency & Urgent Care Department			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Staff Changing / uniform issue (40 Lockers)	Dept. provision not Zonal Hub	SHP	17.00	2	34.00						
	Staff WC	Dept. provision not Zonal Hub	Project	2.00	2	4.00						
	Staff - Shower	Dept. provision not Zonal Hub	Project	2.50	2	5.00						
	On call office			9.00	1	9.00		20th Oct 201	AHR / SHP	Additional facilities located off the dept		- 9.00
	Office - Single Person		Project	8.00	2	16.00						
	Office - Two Person	*See Zonal Hub*	Project	12.00	0	-						
	Office - Three Person	MDT / case review	Project	15.00	1	15.00						
	Office - Four Person	*See Zonal Hub*	Project	20.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Sub Total (Net)						**116.00**					

Net Departmental Area		**2,598.00**
Planning Allowance	5%	129.90
Sub Total		**2,727.90**
Engineering Allowance	0%	-
Circulation Allowance	33%	900.21
Gross Departmental Area		**3,628.11**

Ancillary Facilities excluded from GDA

	External Major Incident Unit	Containerised Solution		30.00	1	30.00						
				-	0	-						

Planned Care Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Entrance & Reception	Reception, 1 position			6.00	1	6.00						
	Waiting Area: 5 places		Project	9.00	1	9.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)						**19.50**					
SSS (18 bed unit)	Touchdown Base	1:2 for singles and 1:1 for multi	Project	2.00	9	18.00						
	Waiting Area: 15 places	Patients	Project	23.00	1	23.00						
	Consulting Examination - Dual sided access	Assessment	HBN	16.00	1	16.00						
	Toilet - Ambulant		Project	2.00	1	2.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Single Bedroom - Adult Acute	33% singles	Project	19.00	6	114.00						
	Ensuite - Shower/WC/WHB		Project	4.50	6	27.00						
	Multi Bedroom - Acute (Four)		Project	61.00	3	183.00						
	Ensuite - WC/WHB		Project	3.50	3	10.50						
	Assisted Bathroom / WC / WHB		Project	15.00	1	15.00						
	Clean Utility without controlled drugs	See separate medicaments and clean supplies storage	Project	8.00	1	8.00		20th Oct 201	AHR / SHP	Number reduced to reflect centralised approach		- 8.00
	Dirty Utility with macerator		Project	12.00	1	12.00		20th Oct 201	AHR / SHP	derogate from HBN given short stay		- 12.00

Planned Care Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
	Store General (medium)	Medicaments / Pharmacy (automated dispensing)	Project	8.00	1	8.00						
	Store General (medium)	Clean supplies	Project	8.00	1	8.00						
	Store - Equipment			8.00	1	8.00						
	Store - Linen		Project	2.00	1	2.00						
	Equipment Bay	Resus trolley	Project	2.00	1	2.00						
	Equipment Bay	Hoist	Project	2.00	2	4.00						
	Equipment Bay	Mobile x-ray	Project	2.00	1	2.00						
	Beverage Bay - with HRB		Project	6.00	1	6.00						
	Office - Three Person	MDT	Project	15.00	1	15.00						
	Staff WC		Project	2.00	1	2.00						
	Sub Total (Net)						**490.00**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Switchgear		HBN	2.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 2.00
	Regeneration Kitchen	*See Zonal Hub*	Project	26.00	0	-						
	Store General (small)	*FM equipment see Zonal Hub*	SHP	6.00	0	-						
	Pneumatic Tube Station	Associate with Assessment	SHP	1.00	1	1.00						
	Domestic Services Room		Project	7.00	1	7.00						
	Disposal Hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**8.00**					
Staff Support	Locker Bay (12 small lockers)		Project	1.50	2	3.00						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff Rest (5 place)	*See Zonal Hub*	Project	10.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Staff Changing (20 Lockers)	*See Zonal Hub*	Project	10.00	0	-						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff - Shower	*See Zonal Hub*	Project	2.50	0	-						
	On call office			9.00	1	9.00						

Planned Care Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Office - Single Person		Project	8.00	1	8.00						
	Office - Two Person	*See Zonal Hub*	Project	12.00	0	-						
	Office - Three Person	*See Zonal Hub*	Project	15.00	0	-						
	Office - Four Person	*See Zonal Hub*	Project	20.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Sub Total (Net)						**20.00**					

Net Departmental Area		**537.50**
Planning Allowance	5%	26.88
Sub Total		**564.38**
Engineering Allowance	0%	-
Circulation Allowance	25%	141.09
Gross Departmental Area		**705.47**

Emergency Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
Entrance & Reception	Reception, 1 position			6.00	1	6.00						
	Waiting Area: 5 places		Project	9.00	1	9.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)						**19.50**					
SSS (29 bed unit)	Touchdown Base	1:2 for singles and 1:1 for multi	Project	2.00	11	22.00						
	Waiting Area: 15 places	Patients	Project	23.00	1	23.00						
	Consulting Examination - Dual sided access	Assessment	HBN	16.00	1	16.00						
	Toilet - Ambulant		Project	2.00	1	2.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Single Bedroom - Adult Acute		Project	19.00	13	247.00						
	Ensuite - Shower/WC/WHB		Project	4.50	13	58.50						
	Multi Bedroom - Acute (Four)		Project	61.00	4	244.00						
	Ensuite - WC/WHB		Project	3.50	4	14.00						
	Single Bedroom - Short Stay, Bariatric			19.00	1	19.00						
	Shower/WC/WHB (bariatric)		Project	6.00	1	6.00						

Emergency Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
	Assisted Bathroom / WC / WHB		Project	15.00	1	15.00						
	Clean Utility without controlled drugs	See separate medicaments and clean supplies storage	Project	8.00	2	16.00		20th Oct 201	AHR / SHP	Number reduced to reflect centralised approach		- 8.00
	Dirty Utility with macerator		Project	12.00	2	24.00		20th Oct 201	AHR / SHP	derogate from HBN given short stay		- 12.00
	Store General (medium)	Medicaments / Pharmacy (automated dispensing)	Project	8.00	1	8.00						
	Store General (medium)	Clean supplies	Project	8.00	1	8.00						
	Store - Equipment			8.00	1	8.00						
	Store - Linen		Project	2.00	1	2.00						
	Equipment Bay	Resus trolley	Project	2.00	1	2.00						
	Equipment Bay	Hoist	Project	2.00	2	4.00						
	Equipment Bay	Mobile x-ray	Project	2.00	1	2.00						
	Beverage Bay - with HRB		Project	6.00	1	6.00						
	Office - Three Person	MDT	Project	15.00	1	15.00						
	Staff WC		Project	2.00	1	2.00						
	Sub Total (Net)						**768.00**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Switchgear		HBN	2.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 2.00
	Regeneration Kitchen	*See Zonal Hub*	Project	26.00	0	-						
	Store General (small)	*FM equipment see Zonal Hub*	SHP	6.00	0	-						
	Pneumatic Tube Station	Associate with Assessment	SHP	1.00	1	1.00						
	Domestic Services Room		Project	7.00	1	7.00						

Emergency Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Disposal Hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**8.00**					
Staff Support	Locker Bay (12 small lockers)		Project	1.50	2	3.00						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff Rest (5 place)	*See Zonal Hub*	Project	10.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Staff Changing (20 Lockers)	*See Zonal Hub*	Project	10.00	0	-						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff - Shower	*See Zonal Hub*	Project	2.50	0	-						
	On call office			9.00	1	9.00						
	Office - Single Person		Project	8.00	1	8.00						
	Office - Two Person	*See Zonal Hub*	Project	12.00	0	-						
	Office - Three Person	*See Zonal Hub*	Project	15.00	0	-						
	Office - Four Person	*See Zonal Hub*	Project	20.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Sub Total (Net)						**20.00**					

Net Departmental Area			**815.50**
Planning Allowance		5%	40.78

Emergency Site - Short Stay Surgical			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Sub Total						**856.28**					
	Engineering Allowance				0%		-					
	Circulation Allowance				25%		214.07					
	Gross Departmental Area						**1,070.34**					

Emergency Site - Short Stay Medicine			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
Entrance & Reception	Reception, 1 position			6.00	1	6.00						
	Waiting Area: 5 places		Project	9.00	1	9.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)						**19.50**					
Medical Short Stay (43 bed unit)	Touchdown Base	1:2 for singles and 1:1 for mult	Project	2.00	15	30.00						
	Waiting Area: 15 places	Patients	Project	23.00	1	23.00						
	Consulting Examination - Dual sided access	Assessment	HBN	16.00	1	16.00						
	Toilet - Ambulant		Project	2.00	1	2.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Single Bedroom - Adult Acute		Project	19.00	18	342.00						
	Ensuite - Shower/WC/WHB		Project	4.50	18	81.00						
	Multi Bedroom - Acute (Four)		Project	61.00	6	366.00						
	Ensuite - WC/WHB		Project	3.50	6	21.00						
	Single Bedroom - Short Stay, Bariatric			19.00	1	19.00						

Emergency Site - Short Stay Medicine			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Shower/WC/WHB (bariatric)		Project	6.00	1	6.00						
	Assisted Bathroom / WC / WHB		Project	15.00	1	15.00						
	Clean Utility without controlled drugs	See separate medicaments and clean supplies storage	Project	8.00	4	32.00						
	Dirty Utility with macerator		Project	12.00	4	48.00						
	Store General (medium)	Medicaments / Pharmacy (automated dispensing)	Project	8.00	1	8.00						
	Store General (medium)	Clean supplies	Project	8.00	1	8.00						
	Store - Equipment			8.00	1	8.00						
	Store - Linen		Project	2.00	1	2.00						
	Equipment Bay	Resus trolley	Project	2.00	1	2.00						
	Equipment Bay	Hoist	Project	2.00	2	4.00						
	Equipment Bay	Mobile x-ray	Project	2.00	1	2.00						
	Beverage Bay - with HRB		Project	6.00	1	6.00						
	Office - Three Person	MDT	Project	15.00	1	15.00						
	Staff WC		Project	2.00	1	2.00						
				-	0	-						
	Sub Total (Net)						**1,062.50**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Switchgear		HBN	2.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 2.00
	Regeneration Kitchen	*See Zonal Hub*	Project	26.00	0	-						
	Store General (small)	*See Zonal Hub*	SHP	6.00	0	-						
	Pneumatic Tube Station	Associate with Assessment	SHP	1.00	1	1.00						
	Domestic Services Room		Project	7.00	1	7.00						
	Disposal Hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**8.00**					
Staff Support	Locker Bay (12 small lockers)		Project	1.50	2	3.00						

Emergency Site - Short Stay Medicine			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff Rest (5 place)	*See Zonal Hub*	Project	10.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Staff Changing (20 Lockers)	*See Zonal Hub*	Project	10.00	0	-						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff - Shower	*See Zonal Hub*	Project	2.50	0	-						
	On call office			9.00	1	9.00						
	Office - Single Person		Project	8.00	1	8.00						
	Office - Two Person	*See Zonal Hub*	Project	12.00	0	-						
	Office - Three Person	MDT / case review	Project	15.00	0	-						
	Office - Four Person	*See Zonal Hub*	Project	20.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Sub Total (Net)						**20.00**					

Net Departmental Area		**1,110.00**
Planning Allowance	5%	55.50
Sub Total		**1,165.50**
Engineering Allowance	0%	-
Circulation Allowance	25%	291.38
Gross Departmental Area		**1,456.88**

Adult Acute Inpatients (Generic - 32 bed)			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Entrance & Reception	Reception, 1 position			6.00	1	6.00						
	Waiting Area: 5 places		Project	9.00	1	9.00						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)						**19.50**					
Bedroom & Sanitary Fac	Single Bedroom - Adult Acute		Project	19.00	15	285.00						
	Ensuite - Shower/WC/WHB		Project	4.50	15	67.50						
	Multi Bedroom - Acute (Four)		Project	61.00	4	244.00						
	Ensuite - WC/WHB		Project	3.50	4	14.00						
	Ensuite - Shower/WHB		Project	3.50	4	14.00						
	Single Bedroom - Adult Acute (Bariatric)	Combined isolation & bariatric provision		20.00	1	20.00						
	Lobby	Isolation		5.00	1	5.00						
	Shower/WC/WHB (bariatric)	Combined isolation & bariatric provision	Project	6.00	1	6.00						
	Touchdown Base	1:2 for singles and 1:1 for mult	Project	2.00	12	24.00						
	Assisted Bathroom / WC / WHB		Project	15.00	1	15.00						
	Sub Total (Net)						**694.50**					
Clinical Support	Treatment Room		Project	16.00	1	16.00						
	Interview Counselling		Project	9.00	1	9.00						
	Breakout Space (patients)		Project	6.00	4	24.00						
	Beverage Room / Pantry		HBN	8.00	1	8.00						
	Equipment Bay	resus trolley	Project	2.00	1	2.00						
	Food Trolley Bay		Project	2.00	2	4.00						
	Equipment Bay		Project	2.00	2	4.00						
	Ward Storage Allowance	per bed		0.75	32	24.00						
	Store General (medium)	Medicaments / Pharmacy (automated dispensing)	Project	8.00	1	8.00						
	Store General (medium)	Clean supplies	Project	8.00	1	8.00						

Adult Acute Inpatients (Generic - 32 bed)			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
	Dirty Utility with macerator		Project	12.00	2	24.00						
	Clean Utility without controlled drugs	See separate medicaments and clean supplies storage	Project	8.00	1	8.00						
	Sub Total (Net)						**139.00**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Switchgear	*See Zonal Hub*	HBN	2.00	0	-						
	Regeneration Kitchen	*See Zonal Hub*	Project	26.00	0	-						
	Store General (small)	*FM equipment; see FM Hub*	SHP	6.00	0	-						
	Pneumatic Tube Station		SHP	1.00	1	1.00						
	Domestic Services Room		Project	7.00	1	7.00						
	Disposal Hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**8.00**					
Staff Support	Locker Bay (12 small lockers)		Project	1.50	2	3.00						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff Rest (5 place)	*See Zonal Hub*	Project	10.00	0	-						
	Seminar room 24 place	*See Zonal Hub*	Project	32.00	0	-						
	Staff Changing (20 Lockers)	*See Zonal Hub*	Project	10.00	0	-						
	Staff WC	*See Zonal Hub*	Project	2.00	0	-						
	Staff - Shower	*See Zonal Hub*	Project	2.50	0	-						
	Sub Total (Net)						**3.00**					

Net Departmental Area		864.00
Planning Allowance	5%	43.20
Sub Total		907.20
Engineering Allowance	0%	-
Circulation Allowance	25%	226.80
Gross Departmental Area	Per ward	1,134.00

Excludes AEC, CDU, Day Case, SSS, MSS, Paeds, Obs, Gyn, NNU and CC

Total for two sites 20,482.88

* **Isolation Room Note:** Four of the Acute Care Medical isolation rooms are required to be colocated

Emergency Site - Critical Care Unit (Adult)			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Public Spaces	Reception, 2 positions		Project	9.50	1	9.50						
	Waiting Area: 30 places		Project	46.00	1	46.00						
	Interview Counselling		Project	9.00	1	9.00						
	Beverage Bay - without HRB		Project	5.00	1	5.00						
	Toilet - Accessible		Project	4.50	2	9.00						
	Sub Total (Net)						**78.50**					
Clinical Spaces	Staff Base (4) with Clean Supplies		SHP	19.50	4	78.00						
	Touchdown Base	1:1 for isolation 1:2 elsewhere	Project	2.00	18	36.00						
	Equipment Bay	4 per cluster	Project	2.00	16	32.00						
	Isolation Room	Assume suited together		26.00	6	156.00						
	Ensuite - Shower/WC/WHB	Assumes 2x rooms available for HDU isolation	HBN	5.00	2	10.00						
	Gowning Lobby			6.00	6	36.00						
	Bed Bay - single	Cluster policy based on multi bay 8's (as T+F Tracker). Support allocation based on 3x clusters of 8's plus 1x isolation suite		26.00	24	624.00						
	Store General (small)		Project	6.00	4	24.00						
	Assisted Shower / WC / WHB		Project	8.00	4	32.00						
	Sub Total (Net)						**1,028.00**					
Clinical Support Spaces	Clean Utility with controlled drugs		Project	14.00	4	56.00						
	Ice Making Machine Bay			1.50	1	1.50						
	Near Patient Testing Room		Project	8.00	1	8.00						
	Dirty Utility with macerator		Project	12.00	4	48.00						
	Beverage Room / Pantry		Project	12.00	1	12.00						
	Store	Satellite Pharmacy / automated dispensing		32.00	1	32.00						
	Store	IV Fluids		32.00	1	32.00						
	Store	Sterile Packs / Supplies		32.00	1	32.00						
	Store	Bulk		32.00	1	32.00						
	Store	Clinical equipment		12.00	4	48.00						
	Decontamination Room - clinical equipment			16.00	1	16.00						
	Technician (EBME)			12.00	1	12.00						
	Pneumatic Tube Station		Project	1.00	1	1.00						
	Blood Refrigerator Bay			2.00	1	2.00						
	Equipment Bay	Imaging equipment	Project	2.00	1	2.00						
	Equipment Bay	Resus trolley	Project	2.00	4	8.00						
	Transfer Trolley	Including consumables, charging, etc		6.00	1	6.00						
	RO Unit	*Size TBC*		18.00	0	-		20th Oct 201	AHR / SHP	Included within MEP allowance		- 18.00
	RO Unit Store	*Size TBC*		6.00	0	-		20th Oct 201	AHR / SHP	Included within MEP allowance		- 6.00
	Domestic Services Room	Dept. provision not Zonal Hub	Project	7.00	2	14.00						
	Disposal hold	*See Zonal Hub*	Project	12.00	0	-						
	Sub Total (Net)						**362.50**					

Emergency Site - Critical Care Unit (Adult)			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Visitor Support Spaces	Relatives Overnight Stay			17.00	4	68.00						
	Ensuite - Shower/WC/WHB		Project	4.50	4	18.00						
	Sitting Room (7 places)			12.00	1	12.00						
	Sub Total (Net)						**98.00**					
Staff Spaces	Office - Two person	ICNARC / Admin	Project	12.00	1	12.00						
	Office - Single person	Ward Manager - Dept. provisi	Project	8.00	1	8.00						
	Office - Single person	Intensivist - Dept. provision no	Project	8.00	1	8.00						
	Office - Single person	Outreach - Dept. provision not	Project	8.00	1	8.00						
	Seminar room 24 place	Dedicated dept. provision, not part of Zonal Hub	Project	32.00	1	32.00						
	Staff Rest (20 place)	Dedicated dept. provision, not part of Zonal Hub	Project	21.00	1	21.00						
	Staff Changing / uniform issue (100 Lockers)	Dept. provision not Zonal Hub	Project	36.50	2	73.00						
	Staff - Shower	Dept. provision not Zonal Hub	Project	2.50	2	5.00						
	Staff WC	Dept. provision not Zonal Hub	Project	2.00	4	8.00						
	Sub Total (Net)						**175.00**					
Support	Information Technology Hub	*See Zonal Hub*	SHP	13.00	0	-						
	Switchgear	*See Zonal Hub*	HBN	2.00	0	-						
	Data Hub	Dedicated local CCU server & workstation		9.00	1	9.00						
	Sub Total (Net)						**9.00**					

Net Departmental Area		**1,751.00**
Planning Allowance	5%	87.55
Sub Total		**1,838.55**
Engineering Allowance	0%	-
Circulation Allowance	30%	551.57
Gross Departmental Area		**2,390.12**

Zonal Hub - Staff Welfare (Generic - 32 bed)			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
		Male										
Zonal Staff Changing and Rest	Staff Changing / uniform issue (40 Lockers)	Male	Project	17.00	0	-						
	Staff Changing / uniform issue (60 Lockers)		Project	23.00	0	-						
	Staff Change	Twice number of staff on shift plus 10% for Nurses (rounded up)		40.00	1	40.00						
	Changing - Supplemental	Allowance for additional privacy		2.00	1	2.00						
	Staff WC		Project	2.00	2	4.00						
	Staff - Shower		Project	2.50	2	5.00		20th Oct 201	AHR / SHP	Gender segregation		2.50
	Changing Cubicle (1) - ambulant		Project	2.50	1	2.50						
	Changing Cubicle (1) - accessible		Project	3.50	1	3.50						
	Staff Rest with mini kitchen allowance	Includes beverage bay. 3 out of 8 staff at any one time		1.80	12	21.60						
	Sub Total (Net)					**20**	**1,572.00**					
Zonal Admin & Training	Reception, 2 positions		Project	9.50	0	-						
	Lounge/Dining Area			35.00	0	-						
	Kitchen/Servery			15.00	0	-						
	Office - Single person	See centralised policy	Project	8.00	0	-						
	Office - Four Person	See centralised policy	Project	20.00	0	-						
	Office - open plan - Allocated	Assume x2 combi for 64 beds	Project	6.00	8	48.00						
	Personal module storage supplement	Assume x2 combi for 64 beds	Project	1.00	2	2.00						
	Private study/ Quiet room	Assume x2 combi for 64 beds	Project	6.00	0.5	3.00						
	Library Supplement	Assume x2 combi for 64 beds	Project	4.00	0.5	2.00						
	Reprographics	Assume x2 combi for 64 beds	Project	6.00	0.5	3.00						
	Store General (small)	Assume x2 combi for 64 beds	Project	6.00	0.5	3.00						
	Seminar room 24 place	Assume x2 combi for 64 beds	Project	32.00	0.5	16.00						
	Seminar room 16 place	See centralised policy	Project	30.00	0	-						
	Seminar room 10 place	See centralised policy	Project	20.00	0	-						
	Toilet - Ambulant		Project	2.00	0	-						
	Toilet - Accessible		Project	4.50	1	4.50						
	Sub Total (Net)					**20**	**1,630.00**					

Net Departmental Area		**3,202.00**
Planning Allowance	5%	160.10
Sub Total		**3,362.10**
Engineering Allowance	0%	-
Circulation Allowance	20%	672.42
Gross Departmental Area		**4,034.52**
	20	**201.73**
	40	**100.86**

Zonal Hub - Facilities Management (Generic - 32 bed)			Version 3					Change Control				
Strategic Content	Proposed Function	Comments	Area Derived From	Proposed Unit Area (sqm)	Quantum	Total Area (sqm)	Sub Totals (sqm)	Date	Raised By	Description/ Reason for Change	Approved By	Effect of Change on Area from previous version
Zonal Non-Clinical Supp	Disposal hold			3.00	4	12.00						
	Domestic Services Room	Assume x2 combi for 64 beds	Project	7.00	0.5	3.50						
	Store General (large)	Domestic	Project	12.00	1	12.00						
	Store General (large)	Furniture	Project	12.00	1	12.00						
	Store General (medium)	Linen	Project	8.00	1	8.00						
	Regeneration Kitchen	Assume x2 combi for 64 beds	Project	24.00	0.5	12.00						
	Sub Total (Net)					**20**	**1,190.00**					
Hard FM	Information Technology Hub		Project	13.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 13.00
	Store General (small)	FM equipment	Project	6.00	1	6.00						
	Switchgear - Entertainment Hub		Project	1.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		
	Switchgear		Project	1.00	0	-		20th Oct 20	AHR / SHP	Adopt HPCG		- 2.00
	Sub Total (Net)					**20**	**120.00**					

Net Departmental Area			**1,310.00**
Planning Allowance	5%		65.50
Sub Total			**1,375.50**
Engineering Allowance	0%		-
Circulation Allowance	20%		275.10
Gross Departmental Area			**1,650.60**
		20.00	**82.53**
		40.00	41.27

Both Sites - Equipment Library (Generic)			Version 3					Change Control				
Strategic Content	**Proposed Function**	**Comments**	**Area Derived From**	**Proposed Unit Area (sqm)**	**Quantum**	**Total Area (sqm)**	**Sub Totals (sqm)**	**Date**	**Raised By**	**Description/ Reason for Change**	**Approved By**	**Effect of Change on Area from previous version**
	Goods in / Holding (Dirty)	Includes touchdown wkstn		20.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 20.00
	WHB / PPE Station		Project	2.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 2.00
	Decontamination Area	Includes bed wash		20.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 20.00
	Workshop			50.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 50.00
	Equipment Library			40.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 40.00
	Store - Beds (Clean)	Combine with Goods out / Holding (Clean)		60.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 60.00
	Store - Clean Supplies	Emergency backfill stock		40.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 40.00
	Store - Clean Linen	Emergency backfill stock		20.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 20.00
	Store - Therapy Equipment	Therapy Team bulk store		20.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 20.00
	Staff WC		Project	2.00	0	-		20th Oct 201	AHR / SHP	To be delivered via alternative strategies		- 2.00
	Sub Total (Net)						-					

	-
5%	-
	-
0%	-
33%	-
	-
x2 sites	-

VOLUME 8:   COST ESTIMATES

SaTH Sustainable Services Programme: Option B (Emergency Site at PRH, Planned Site at RSH)

riderhunt

OPTIMISM BIAS: CONTRIBUTORY FACTORS AND MITIGATION

Contibutory Factor to Upper Bound	% Factor Contributes	Stage	Mitigation Factor	% After Mitigation
Progress with Planning Approval	4%	SOC	Opened discussion with planning authority, some engagement	3%
		OBC	Outline consent in place, with any Planning Conditions and requirements for Section 106 or similar agreements established, including any specific requirements of e.g. Environmental Agency	
		FBC	Full Consent in place. Judicial Review period passed	
Other Regulatory	4%	SOC	Degree of sign off from Fire Authority, HSE, transport authority, local government etc	4%
		OBC		
		FBC		
Depth of surveying of site/ground information	3%	SOC	Desktop study undertaken of own site	1%
		OBC	Investigations undertaken, historical records examined	
		FBC	Full survey of conditions, site services and topographics	
Detail of design	4%	SOC	Concept/masterplan/DCP	3%
		OBC	1:500s agreed and selected 1:200s	
		FBC	All 1:200s in place, key 1:50s (depends on procurement route)	
Innovative project/design	3%	SOC		
		OBC	Yes/No	0%
		FBC		
Design complexity	4%	SOC	This might include complex M&E solutions (requires futher development)	2%
		OBC		
		FBC		
Likely variations from Standard Contract	2%	SOC	No contract chosen	2%
		OBC	Yes/No with measurement of scale variations	
		FBC		
Design Team capabilities	3%	SOC	Previous relevant experience of individuals involved. Capacity	0%
		OBC		
		FBC		
Contractor's capabilities	2%	SOC	Previous relevant experience of individuals involved. Capacity. Track record of delivery	1%
		OBC		
		FBC		
Contractor involvement	2%	SOC	Buildability. Opportunity to influence design	1%
		OBC		
		FBC		
Client capability and capacity	6%	SOC	Degree of team in place with relevant experience	2%
		OBC	Full team in place for procurement	
		FBC	Robust implementation plan in place	
Robustness of Output Specification	25%	SOC	Definition of scope and extent of services. Degree of outstanding decisions	15%
		OBC		
		FBC		

Involvement of Stakeholders, including Public and Patient Involvement	5%	SOC	Scope of stakeholders to be involved. Plan in place to engage	3%
		OBC	Implementation of Plan	
		FBC	Involvement demostrated	
Agreement to Output Specification by stakeholders	5%	SOC	Letters of support from clinicians, Trade Unions, staff groups, patient representatives/groups	3%
		OBC		
		FBC		
New service or traditional	3%	SOC	Assessment of how innovative/new service model is at national/regional/local level. Has this ever been tried before?	1%
		OBC		
		FBC		
Local community consent	3%	SOC	Consideration of traffic noise/existence of protestors or pressure groups	3%
		OBC		
		FBC		
Stable policy environment	20%	SOC	Degree to which new policy/standards are applicable depending upon which stage is reached	8%
		OBC		
		FBC		
Likely competition in the market for the project	2%	SOC	Degree project has been marketed	0%
		OBC	Evidence of market interest	
		FBC	Mitigated	
TOTAL	**100%**			**52%**

Note: Across all contributory factors, mitigation would be expected to be greater the greater the extent of risk quantification and risk management (including the extent to which it is captured in contingencies)

SaTH Sustainable Services Programme: Option B (Emergency Site at PRH, Planned Site at RSH)

OPTIMISM BIAS - UPPER BOUND CALCULATION

Lowest & Upper Bound	13%
Mid %	40%
Upper %	76%
Actual % Upper Bound for this project	33%

Build complexity			
Choose 1 category			
Length of Build	< 2 years	0.50%	
	2 to 4 years	1.00%	1.00%
	Over 4 years	4.00%	
Choose 1 category			
Number of phases	1 or 2 phases	0.50%	
	3 or 4 phases	2.00%	2.00%
	More than 4 Phases	5.00%	
Choose 1 category			
Number of sites involved	Single site	2.00%	
(i.e. before and after	2 sites	2.00%	2.00%
change	More than 2 sites	5.00%	
Location			
Green field	New build	3%	
Brown field	New build	8%	
Existing site	New build	5%	
	or		
	Less than 15% refurb	6%	
	15% - 50% refurb	10%	10.00%
	Over 50% refurb	15%	
Scope of scheme			
Choose 1 category			
Facilities Management	Hard FM only	0.00%	0.00%
	TUPE whole service	2.00%	
	RoE whole service	2.00%	
Choose 1 category			
Equipment	Group 1&2 only	0.50%	0.50%
	Major medical equipment	1.50%	
	All equipment included	5.00%	
Choose 1 category			
IT	No IT implications	0.00%	
	Infrastructure	1.50%	1.50%
	Infrastructure & systems	5.00%	

Choose more than 1 category if applicable			
External stakeholders	Local NHS economy (e.g. DGH)	1.00%	1.00%
	Wider NHS economy (e.g. teaching DGH)	2.00%	
	NHS/Universities/Private/Vol sector	5.00%	
Service changes			
Stable environment, i.e. no change to service		5%	
Identified changes not quantified		10%	10%
Longer time frame service changes		20%	
Gateway			
Choose 1 category			
RPA Score	Low	0%	
	Medium	5%	5%
	High	10%	
		TOTAL	**33.000%**

CONTRIBUTION FACTORS AND MITIGATION	52%
UPPER BOUND CALCULATION	33%

TOTAL FACTOR TO APPLY TO ESTIMATE	17%

SaTH Sustainable Services Programme: Option C1 (Emergency Site at RSH, Planned Site at PRH)

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OPTIMISM BIAS: CONTRIBUTORY FACTORS AND MITIGATION

Contibutory Factor to Upper Bound	% Factor Contributes	Stage	Mitigation Factor	% After Mitigation
Progress with Planning Approval	4%	SOC	Opened discussion with planning authority, some engagement	
		OBC	Outline consent in place, with any Planning Conditions and requirements for Section 106 or similar agreements established, including any specific requirements of e.g. Environmental Agency	3%
		FBC	Full Consent in place. Judicial Review period passed	
Other Regulatory	4%	SOC	Degree of sign off from Fire Authority, HSE, transport authority, local government etc	4%
		OBC		
		FBC		
Depth of surveying of site/ground information	3%	SOC	Desktop study undertaken of own site	1%
		OBC	Investigations undertaken, historical records examined	
		FBC	Full survey of conditions, site services and topographics	
Detail of design	4%	SOC	Concept/masterplan/DCP	3%
		OBC	1:500s agreed and selected 1:200s	
		FBC	All 1:200s in place, key 1:50s (depends on procurement route)	
Innovative project/design	3%	SOC		
		OBC	Yes/No	0%
		FBC		
Design complexity	4%	SOC	This might include complex M&E solutions (requires futher development)	2%
		OBC		
		FBC		
Likely variations from Standard Contract	2%	SOC	No contract chosen	2%
		OBC	Yes/No with measurement of scale variations	
		FBC		
Design Team capabilities	3%	SOC	Previous relevant experience of individuals involved. Capacity	0%
		OBC		
		FBC		
Contractor's capabilities	2%	SOC	Previous relevant experience of individuals involved. Capacity. Track record of delivery	1%
		OBC		
		FBC		
Contractor involvement	2%	SOC	Buildability. Opportunity to influence design	1%
		OBC		
		FBC		
Client capability and capacity	6%	SOC	Degree of team in place with relevant experience	2%
		OBC	Full team in place for procurement	
		FBC	Robust implementation plan in place	
Robustness of Output Specification	25%	SOC	Definition of scope and extent of services. Degree of outstanding decisions	15%
		OBC		
		FBC		

Involvement of Stakeholders, including Public and Patient Involvement	5%	SOC	Scope of stakeholders to be involved. Plan in place to engage	3%
		OBC	Implementation of Plan	
		FBC	Involvement demostrated	
Agreement to Output Specification by stakeholders	5%	SOC	Letters of support from clinicians, Trade Unions, staff groups, patient representatives/groups	3%
		OBC		
		FBC		
New service or traditional	3%	SOC	Assessment of how innovative/new service model is at national/regional/local level. Has this ever been tried before?	1%
		OBC		
		FBC		
Local community consent	3%	SOC	Consideration of traffic noise/existence of protestors or pressure groups	2%
		OBC		
		FBC		
Stable policy environment	20%	SOC	Degree to which new policy/standards are applicable depending upon which stage is reached	8%
		OBC		
		FBC		
Likely competition in the market for the project	2%	SOC	Degree project has been marketed	0%
		OBC	Evidence of market interest	
		FBC	Mitigated	
TOTAL	**100%**			**51%**

Note: Across all contributory factors, mitigation would be expected to be greater the greater the extent of risk quantification and risk management (including the extent to which it is captured in contingencies)

SaTH Sustainable Services Programme: Option C1 (Emergency Site at RSH, Planned Site at PRH)

OPTIMISM BIAS - UPPER BOUND CALCULATION

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Lowest & Upper Bound	13%
Mid %	40%
Upper %	76%
Actual % Upper Bound for this project	36%

Build complexity			
Choose 1 category			
Length of Build	< 2 years	0.50%	
	2 to 4 years	1.00%	
	Over 4 years	4.00%	4.00%
Choose 1 category			
Number of phases	1 or 2 phases	0.50%	
	3 or 4 phases	2.00%	2.00%
	More than 4 Phases	5.00%	
Choose 1 category			
Number of sites involved (i.e. before and after change	Single site	2.00%	
	2 sites	2.00%	2.00%
	More than 2 sites	5.00%	
Location			
Green field	New build	3%	
Brown field	New build	8%	
Existing site	New build	5%	
	or		
	Less than 15% refurb	6%	
	15% - 50% refurb	10%	10.00%
	Over 50% refurb	15%	
Scope of scheme			
Choose 1 category			
Facilities Management	Hard FM only	0.00%	0.00%
	TUPE whole service	2.00%	
	RoE whole service	2.00%	
Choose 1 category			
Equipment	Group 1&2 only	0.50%	0.50%
	Major medical equipment	1.50%	
	All equipment included	5.00%	
Choose 1 category			
IT	No IT implications	0.00%	
	Infrastructure	1.50%	1.50%
	Infrastructure & systems	5.00%	

Choose more than 1 category if applicable			
External stakeholders	Local NHS economy (e.g. DGH)	1.00%	1.00%
	Wider NHS economy (e.g. teaching DGH)	2.00%	
	NHS/Universities/Private/Vol sector	5.00%	
Service changes			
Stable environment, i.e. no change to service		5%	
Identified changes not quantified		10%	10%
Longer time frame service changes		20%	
Gateway			
Choose 1 category			
RPA Score	Low	0%	
	Medium	5%	5%
	High	10%	
		TOTAL	**36.000%**

CONTRIBUTION FACTORS AND MITIGATION	51%
UPPER BOUND CALCULATION	36%

TOTAL FACTOR TO APPLY TO ESTIMATE	18%

SaTH Sustainable Services Programme: Option C2 (Emergency Site at RSH, Planned Site at PRH)

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OPTIMISM BIAS: CONTRIBUTORY FACTORS AND MITIGATION

Contibutory Factor to Upper Bound	% Factor Contributes	Stage	Mitigation Factor	% After Mitigation
Progress with Planning Approval	4%	SOC	Opened discussion with planning authority, some engagement	
		OBC	Outline consent in place, with any Planning Conditions and requirements for Section 106 or similar agreements established, including any specific requirements of e.g. Environmental Agency	3%
		FBC	Full Consent in place. Judicial Review period passed	
Other Regulatory	4%	SOC	Degree of sign off from Fire Authority, HSE, transport authority, local government etc	4%
		OBC		
		FBC		
Depth of surveying of site/ground information	3%	SOC	Desktop study undertaken of own site	1%
		OBC	Investigations undertaken, historical records examined	
		FBC	Full survey of conditions, site services and topographics	
Detail of design	4%	SOC	Concept/masterplan/DCP	3%
		OBC	1:500s agreed and selected 1:200s	
		FBC	All 1:200s in place, key 1:50s (depends on procurement route)	
Innovative project/design	3%	SOC	Yes/No	0%
		OBC		
		FBC		
Design complexity	4%	SOC	This might include complex M&E solutions (requires futher development)	2%
		OBC		
		FBC		
Likely variations from Standard Contract	2%	SOC	No contract chosen	2%
		OBC	Yes/No with measurement of scale variations	
		FBC		
Design Team capabilities	3%	SOC	Previous relevant experience of individuals involved. Capacity	0%
		OBC		
		FBC		
Contractor's capabilities	2%	SOC	Previous relevant experience of individuals involved. Capacity. Track record of delivery	1%
		OBC		
		FBC		
Contractor involvement	2%	SOC	Buildability. Opportunity to influence design	1%
		OBC		
		FBC		
Client capability and capacity	6%	SOC	Degree of team in place with relevant experience	2%
		OBC	Full team in place for procurement	
		FBC	Robust implementation plan in place	
Robustness of Output Specification	25%	SOC	Definition of scope and extent of services. Degree of outstanding decisions	15%
		OBC		
		FBC		

Involvement of Stakeholders, including Public and Patient Involvement	5%	SOC	Scope of stakeholders to be involved. Plan in place to engage	3%
		OBC	Implementation of Plan	
		FBC	Involvement demostrated	
Agreement to Output Specification by stakeholders	5%	SOC	Letters of support from clinicians, Trade Unions, staff groups, patient representatives/groups	3%
		OBC		
		FBC		
New service or traditional	3%	SOC	Assessment of how innovative/new service model is at national/regional/local level. Has this ever been tried before?	1%
		OBC		
		FBC		
Local community consent	3%	SOC	Consideration of traffic noise/existence of protestors or pressure groups	2%
		OBC		
		FBC		
Stable policy environment	20%	SOC	Degree to which new policy/standards are applicable depending upon which stage is reached	8%
		OBC		
		FBC		
Likely competition in the market for the project	2%	SOC	Degree project has been marketed	0%
		OBC	Evidence of market interest	
		FBC	Mitigated	
TOTAL	**100%**			**51%**

Note: Across all contributory factors, mitigation would be expected to be greater the greater the extent of risk quantification and risk management (including the extent to which it is captured in contingencies)

SaTH Sustainable Services Programme: Option C2 (Emergency Site at RSH, Planned Site at PRH)

OPTIMISM BIAS - UPPER BOUND CALCULATION

riderhunt

Lowest & Upper Bound	13%
Mid %	40%
Upper %	76%
Actual % Upper Bound for this project	36%

Build complexity			
Choose 1 category			
Length of Build	< 2 years	0.50%	
	2 to 4 years	1.00%	
	Over 4 years	4.00%	4.00%
Choose 1 category			
Number of phases	1 or 2 phases	0.50%	
	3 or 4 phases	2.00%	2.00%
	More than 4 Phases	5.00%	
Choose 1 category			
Number of sites involved	Single site	2.00%	
(i.e. before and after	2 sites	2.00%	2.00%
change	More than 2 sites	5.00%	
Location			
Green field	New build	3%	
Brown field	New build	8%	
Existing site	New build	5%	
	or		
	Less than 15% refurb	6%	
	15% - 50% refurb	10%	10.00%
	Over 50% refurb	15%	
Scope of scheme			
Choose 1 category			
Facilities Management	Hard FM only	0.00%	0.00%
	TUPE whole service	2.00%	
	RoE whole service	2.00%	
Choose 1 category			
Equipment	Group 1&2 only	0.50%	0.50%
	Major medical equipment	1.50%	
	All equipment included	5.00%	
Choose 1 category			
IT	No IT implications	0.00%	
	Infrastructure	1.50%	1.50%
	Infrastructure & systems	5.00%	

Choose more than 1 category if applicable

External stakeholders	Local NHS economy (e.g. DGH)	1.00%	1.00%
	Wider NHS economy (e.g. teaching DGH)	2.00%	
	NHS/Universities/Private/Vol sector	5.00%	

Service changes

Stable environment, i.e. no change to service	5%	
Identified changes not quantified	10%	10%
Longer time frame service changes	20%	

Gateway

Choose 1 category

RPA Score	Low	0%	
	Medium	5%	5%
	High	10%	
		TOTAL	**36.000%**

CONTRIBUTION FACTORS AND MITIGATION	51%
UPPER BOUND CALCULATION	36%

TOTAL FACTOR TO APPLY TO ESTIMATE	18%

COST FORM OB1

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option B: PRH as the Emergency Site and RSH as the Planned Site

CAPITAL COSTS: Summary

		Cost £	V.A.T. (with recovery) £	Cost incl V.A.T £
1	Department Costs (from Form OB2)	107,228,016	20,040,003	127,268,019
2	On Costs (a) (from Form OB3)	18,847,020	3,769,404	22,616,424
3	Work Cost Total (1+2) at PUBSEC 195	126,075,036	23,809,407	149,884,443
4	Provisional location adjustment Shropshire	-2,767,185	-553,437	-3,320,622
5	Sub-Total (3+4)	123,307,851	23,255,970	146,563,821
6	Fees (c) (from Form OB4)	17,627,000	(d) xxxxxxxxxxxxx	17,627,000
7	Non-Works Costs (e)	0 400,000	0 80,000	0 480,000
8	Equipment Cost (from OB2)	14,121,100	2,824,220	16,945,320
9A	Planning contingencies 10%	13,559,200	2,711,840	16,271,040
9B	Optimism Bias 17%	30,820,895	6,164,179	36,985,075
10	TOTAL (for approval purposes)(5+6+7+8+9a+9b)	199,836,046	35,036,209	234,872,255
11	Inflation Adjustments PUBSEC 195 to PUBSEC 214	12,284,234	2,456,847	14,741,081
12	FORECAST OUTTURN BUSINESS CASE	212,120,280	37,493,056	249,613,336

Cash Flow

YEAR	EFL	SOURCE OTHER GOVERNMENT	PRIVATE	£ TOTAL
Total	0	0		0

This form completed by: RIDER HUNT
Telephone No: 0161 834 8922
Address: 12 Tenterden Street, Bury, BL0 0EG
Date: 25.10.16

COST FORM OB2

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option B: PRH as the Emergency Site and RSH as the Planned Site

CAPITAL COSTS: Departmental

FUNCTIONAL CONTENT	FUNCTION UNIT/SPACE REQUIREMENTS	COST /M2 £	COST ALLOWANCE	EQUIPMENT COST
			£	£
Works at PRH				
SSP New Build			44,721,521	
SSP Refurbishment			1,402,500	
Estates Implications New Build			0	
Estates Implications Refurbishment			2,286,500	
Backlog New Build			0	
Backlog Refurbishment			6,121,500	
Works at RSH				
SSP New Build			758,302	
SSP Refurbishment			5,370,000	
Estates Implications New Build			0	
Estates Implications Refurbishment			2,064,500	
Backlog New Build			26,606,693	
Backlog Refurbishment			17,896,500	
All at PUBSEC 195				
Less abatement for transferred equipment if applicable (0.%) (4)				
Departmental Costs and Equipment Costs to Summary (Form OB1)		£	107,228,016	14,121,100

COST FORM OB3

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option B: PRH as the Emergency Site and RSH as the Planned Site

CAPITAL COSTS: On-Costs

	£	Estimated Cost (exc. VAT)	Percentage of Departmental Cost
1. Demolitions			
Demolitions at PRH	10,000		
Demolitions at RSH	250,000		
		260,000	0.24%
2. Abnormals			
Abnormals at PRH	9,317,220		
Abnormals at RSH	9,269,800		
		18,587,020	17.33%
All at PUBSEC 195			
Total On-Costs to Summary OB1		18,847,020	

This form completed by: RIDER HUNT
12 Tenterden Street, Bury, BL9 0NT
Telephone: 0161 834 8922
Date: 25.10.16

COST FORM OB4

TRUST — The Shrewsbury and Telford Hospital NHS Trust

SCHEME — Sustainable Services Programme
Option B: PRH as the Emergency Site and RSH as the Planned Site

CAPITAL COSTS: — Fees and Non-works costs

		£	Percentage of Works Cost %
1.	Fees (including "in-house" resource costs)		
a.	Architects		}
b.	Structural Engineers		}
c.	Mechanical Engineers		}
d.	Electrical Engineers		}
e.	Quantity Surveyors		}
f.	Project Management		}
g.	Project Sponsorship		}
h.	Legal Fees		}
i.	Site Supervision		}
j.	Others (specify)		}
	Design fees at 13%	17,627,000	
	Total Fees to Summary (OB1) £	17,627,000	16.4%

		£
2.	Non-Works Costs	
a.	Land purchase costs and associated legal fees	
b.	Land receipts	
c.	Statutory and Local Authority charges	
d.	Building Regulations and Planning Fees	400,000
e.	Other (specify) e.g. decanting costs	
	Non-Works Costs to Summary (OB1) £	400,000

Notes:

** Delete as appropriate*

This form completed by: RIDER HUNT
12 Tenterden Street, Bury, BL0 0EG

Telephone No. 0161 834 8922

Date 25.10.16

COST FORM OB1

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C1: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: Summary

		Cost £	V.A.T. (with recovery) £	Cost incl V.A.T £
1	Department Costs (from Form OB2)	134,514,633	25,328,427	159,843,060
2	On Costs (a) (from Form OB3)	22,461,400	4,492,280	26,953,680
3	Work Cost Total (1+2) at PUBSEC 195	156,976,033	29,820,707	186,796,740
4	Provisional location adjustment Shropshire	-3,445,423	-689,085	-4,134,507
5	Sub-Total (3+4)	153,530,610	29,131,622	182,662,232
6	Fees (c) (from Form OB4)	21,947,300	(d) xxxxxxxxxxxxx	21,947,300
7	Non-Works Costs (e)	0 400,000	0 80,000	0 480,000
8	Equipment Cost (from OB2)	16,238,400	3,247,680	19,486,080
9A	Planning contingencies 10%	16,882,600	3,376,520	20,259,120
9B	Optimism Bias 18%	40,372,922	8,074,584	48,447,506
10	TOTAL (for approval purposes)(5+6+7+8+9a+9b)	249,371,832	43,910,406	293,282,239
11	Inflation Adjustments PUBSEC 195 to PUBSEC 214	15,295,101	3,059,020	18,354,121
12	FORECAST OUTTURN BUSINESS CASE	264,666,933	46,969,427	311,636,360

Cash Flow

YEAR	EFL	SOURCE OTHER GOVERNMENT	PRIVATE	£ TOTAL
Total	0	0		0

This form completed by: RIDER HUNT
Telephone No: 0161 834 8922
Address: 12 Tenterden Street, Bury, BL0 0EG
Date: 25.10.16

COST FORM OB2

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C1: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: Departmental

FUNCTIONAL CONTENT	FUNCTION UNIT/SPACE REQUIREMENTS	COST /M2 £	COST ALLOWANCE	EQUIPMENT COST
			£	£
Works at RSH				
SSP New Build			62,271,285	
SSP Refurbishment			4,047,000	
Estates Implications New Build			2,781,173	
Estates Implications Refurbishment			0	
Backlog New Build			25,929,355	
Backlog Refurbishment			22,418,300	
Works at PRH				
SSP New Build			4,170,520	
SSP Refurbishment			5,787,000	
Estates Implications New Build			0	
Estates Implications Refurbishment			400,500	
Backlog New Build			0	
Backlog Refurbishment			6,709,500	
All at PUBSEC 195				
Less abatement for transferred equipment if applicable (0.%) (4)				
Departmental Costs and Equipment Costs to Summary (Form OB1)		£	134,514,633	16,238,400

COST FORM OB3

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C1: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: On-Costs

		Estimated Cost (exc. VAT)	Percentage of Departmental Cost
	£		
1. Demolitions			
Demolitions at RSH	560,000		
Demolitions at PRH	20,000		
		580,000	0.43%
2. Abnormals			
Abnormals at RSH	16,317,725		
Abnormals at PRH	5,563,675		
		21,881,400	16.27%
All at PUBSEC 195			
Total On-Costs to Summary OB1		22,461,400	

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12 Tenterden Street, Bury, BL9 0NT

Telephone: 0161 834 8922

Date: 25.10.16

COST FORM OB4

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C1: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: Fees and Non-works costs

		£	Percentage of Works Cost %
1.	Fees (including "in-house" resource costs)		
a.	Architects		}
b.	Structural Engineers		}
c.	Mechanical Engineers		}
d.	Electrical Engineers		}
e.	Quantity Surveyors		}
f.	Project Management		}
g.	Project Sponsorship		}
h.	Legal Fees		}
i.	Site Supervision		}
j.	Others (specify)		}
	Design fees at 13%	21,947,300	
	Total Fees to Summary (OB1) £	21,947,300	16.3%

		£
2.	Non-Works Costs	
a.	Land purchase costs and associated legal fees	
b.	Land receipts	
c.	Statutory and Local Authority charges	
d.	Building Regulations and Planning Fees	400,000
e.	Other (specify) e.g. decanting costs	
	Non-Works Costs to Summary (OB1) £	400,000

Notes:
** Delete as appropriate*

This form completed by: RIDER HUNT
12 Tenterden Street, Bury, BL0 0EG
Telephone No. 0161 834 8922
Date 25.10.16

COST FORM OB1

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C2: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: Summary

		Cost £	V.A.T. (with recovery) £	Cost incl V.A.T £
1	Department Costs (from Form OB2)	126,013,689	23,732,838	149,746,527
2	On Costs (a) (from Form OB3)	22,404,445	4,480,889	26,885,334
3	Work Cost Total (1+2) at PUBSEC 195	148,418,134	28,213,727	176,631,861
4	Provisional location adjustment Shropshire	-3,257,588	-651,518	-3,909,105
5	Sub-Total (3+4)	145,160,546	27,562,209	172,722,755
6	Fees (c) (from Form OB4)	20,750,800	(d) xxxxxxxxxxxxx	20,750,800
7	Non-Works Costs (e)	0 400,000	0 80,000	0 480,000
8	Equipment Cost (from OB2)	15,212,100	3,042,420	18,254,520
9A	Planning contingencies 10%	15,962,200	3,192,440	19,154,640
9B	Optimism Bias 18%	38,150,442	7,630,088	45,780,530
10	TOTAL (for approval purposes)(5+6+7+8+9a+9b)	235,636,088	41,507,158	277,143,246
11	Inflation Adjustments PUBSEC 195 to PUBSEC 214	14,461,254	2,892,251	17,353,505
12	FORECAST OUTTURN BUSINESS CASE	250,097,342	44,399,408	294,496,751

Cash Flow

YEAR	EFL	SOURCE OTHER GOVERNMENT	PRIVATE	£ TOTAL
Total	0	0		0

This form completed by: RIDER HUNT
Telephone No: 0161 834 8922
Address: 12 Tenterden Street, Bury, BL0 0EG
Date: 25.10.16

COST FORM OB2

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C2: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: Departmental

FUNCTIONAL CONTENT	FUNCTION UNIT/SPACE REQUIREMENTS	COST /M2 £	COST ALLOWANCE	EQUIPMENT COST
			£	£
Works at RSH				
SSP New Build			41,573,157	
SSP Refurbishment			3,715,500	
Estates Implications New Build			2,781,173	
Estates Implications Refurbishment			0	
Backlog New Build			27,330,875	
Backlog Refurbishment			22,822,000	
Works at PRH				
SSP New Build			17,579,984	
SSP Refurbishment			4,860,000	
Estates Implications New Build			0	
Estates Implications Refurbishment			596,000	
Backlog New Build			0	
Backlog Refurbishment			4,755,000	
All at PUBSEC 195				
Less abatement for transferred equipment if applicable (0.%) (4)				
Departmental Costs and Equipment Costs to Summary (Form OB1)		£	126,013,689	15,212,100

COST FORM OB3

TRUST: The Shrewsbury and Telford Hospital NHS Trust

SCHEME: Sustainable Services Programme
Option C2: RSH as the Emergency Site and PRH as the Planned Site

CAPITAL COSTS: On-Costs

		Estimated Cost (exc. VAT)	Percentage of Departmental Cost
	£		
1. Demolitions			
Demolitions at RSH	560,000		
Demolitions at PRH	0		
		560,000	0.44%
2. Abnormals			
Abnormals at RSH	15,621,375		
Abnormals at PRH	6,223,070		
		21,844,445	17.33%
All at PUBSEC 195			
Total On-Costs to Summary OB1		22,404,445	

This form completed by: RIDER HUNT
12 Tenterden Street, Bury, BL9 0NT

Telephone: 0161 834 8922

Date: 25.10.16

COST FORM OB4

TRUST	The Shrewsbury and Telford Hospital NHS Trust
SCHEME	Sustainable Services Programme Option C2: RSH as the Emergency Site and PRH as the Planned Site
CAPITAL COSTS:	Fees and Non-works costs

			£	Percentage of Works Cost %
1.	Fees (including "in-house" resource costs)			
	a.	Architects		}
	b.	Structural Engineers		}
	c.	Mechanical Engineers		}
	d.	Electrical Engineers		}
	e.	Quantity Surveyors		}
	f.	Project Management		}
	g.	Project Sponsorship		}
	h.	Legal Fees		}
	i.	Site Supervision		}
	j.	Others (specify)		}
		Design fees at 13%	20,750,800	
	Total Fees to Summary (OB1)	£	20,750,800	16.5%

				£
2.	Non-Works Costs			
	a.	Land purchase costs and associated legal fees		
	b.	Land receipts		
	c.	Statutory and Local Authority charges		
	d.	Building Regulations and Planning Fees		400,000
	e.	Other (specify) e.g. decanting costs		
	Non-Works Costs to Summary (OB1)		£	400,000

Notes:

** Delete as appropriate*

This form completed by:	RIDER HUNT 12 Tenterden Street, Bury, BL0 0EG
Telephone No.	0161 834 8922
Date	25.10.16

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The Shrewsbury and Telford Hospital NHS Trust

Sustainable Services Programme

PRH Emergency Site /RSH Planned Site

High Level Cost Estimate

Option B OBC Issue

October 2016

Rider Hunt Construction Consultants LLP
12 Tenterden Street
Bury
BL9 0EG

The Shrewsbury and Telford Hospital NHS Trust
Sustainable Services Programme

Option B PRH Emergency Site/RSH Planned Site

Summary of Total Project Estimate for Potential Solution

Capital cost of Works at PRH	£126,790,000
Capital cost of works at RSH	£122,823,000
Total Capital Cost of Potential Solution	**£249,613,000**

The Shrewsbury and Telford Hospital NHS Trust

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Sustainable Services Programme
High Level Cost Estimate

NOTES AND CLARIFICATIONS

The estimated costs have been based on the AHR Architects Schedules of Areas with current revisions for all options, and the site wide implication drawings.

The new build areas scheduled include an allowance for circulation and engineering within the departments, communication is shown separately and Rider Hunt have added an allowance for main plant rooms based on guidance from DSSR.

The rates per m2 are calculated mainly from DoH HPCGs and adjusted accordingly for storey height, location factor and inflation to current prices

For refurbishment projects, a proportion of the new build rate has been taken based on the type of refurbishment indicated on the schedules, with reference to the refurbishment level matrix.

The estimates exclude the costs of multi-storey and surface level car parks at both sites as it has been assumed that these will be outsourced to a private firm, or be subject to a separate business case.

The capital cost of boilers, boiler houses, energy centres and the like has been excluded from the estimates, as the assumption for OBC is that the new energy centres will be outsourced to a private firm under an "energy supply agreement", similar to the current arrangements the Trust has in place.

The capital cost for the Chemotherapy Day Case Centre at PRH in all options is excluded from the estimate as this is anticipated to be funded through other Public Sector or Charitable organisations.

The capital cost for the Midwifery-led Unit (MLU) and any other associated legacy Women and Children's accommodation at RSH in all options has been excluded from this estimate as this is funded from the Public Dividend Capital (PDC) obtained from the previous Future Configuration of Hospital Services (FCHS) scheme.

It is assumed that the buildings are able to be constructed and areas can be refurbished as shown on the plans, but may be subject to further verification.

External works and drainage have been priced using areas from AHR's schedules and rates from similar projects. Cut and fill, retaining walls and ground improvement have been based on the Capita (Civil and Structural Engineers) report and priced using rates from similar projects

Demolitions have been calculated on a volumetric basis using a typical demolition rate from previous similar projects.

Vertical circulation amounts are for the lifts and escalators only and the space requirement is included in the communication space in the schedules.

The estimates include applicable upgrades associated with the SSP scheme (eg boilers, distribution, medical gases, sub-stations, back up generators etc.), as advised by DSSR, M&E Engineers.

The costs assume that sufficient space is available to construct the new buildings/ carry out the refurbishments, suitable and sufficient access is available for construction activity, and there are no unusual or difficult working conditions or restrictions

Allowances for on-costs, abnormals and site specific costs services costs are estimated based on DSSR schedules using rates from similar recent projects.

The costs have been adjusted to current levels (PUBSEC 214) but **NO ALLOWANCE** is included for inflation up to start on site or during the construction period.

An allowance of 13% for fees has been allowed for the project as discussed with the Trust, based on similar projects.

An allowance of 12% for equipment costs has been included, based on discussions with the Trust around recent projects.

The works costs have been adjusted by the location factor for 'Shropshire' as published by BCIS

An allowance has been made for Optimism Bias, based on the attached calculations totalling 17%.

Recovery on VAT has been assumed based on fees and refurbishment works as similar schemes. It is suggested the Trust seek specialist advice in order to pursue further recovery.

We have excluded any costs for:

- Hire of temporary buildings, works associated with temporary accommodation, or temporary diagnostics
- Costs for decanting, moves, moving equipment, and items moved off site (eg medical records)
- Contaminated land and remediation (Refer to SI for details of likely issues)
- Asbestos surveys and removal
- Land purchase/Site acquisition (none deemed to be required)
- Exceptionally poor ground conditions (general allowance only for poor ground conditions)
- Legal fees
- Trust internal costs and fees
- Costs associated with establishing a procurement vehicle
- Medical equipment and diagnostic equipment (CT, MRI, Ultrasound etc.) Equipment allowance on HPCG guidance only.
- Energy costs and bringing into use
- Additional or replacement offices (unless specifically identified)
- Unusual or difficult access or working conditions
- Prolongation or lengthened construction programme above a typical duration
- Unusual or restrictive planning conditions

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option B PRH as the Emergency Site

WORKS COSTS (1 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£44,721,521
1	Main Entrance and Retail	1,760 m2 @	£2,142 / m2	3,769,249	
2	ED, UCC, AEC / CDU, Discharge Lounge	4,901 m2 @	£2,412 / m2	11,821,892	
3	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
4	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
5	Communication	74 m2 @	£1,691 / m2	125,285	
6	Communication	192 m2 @	£1,691 / m2	325,301	
11	Loading Bay	676 m2 @	£1,691 / m2	1,142,948	
12	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
13	Communication	618 m2 @	£1,691 / m2	1,044,039	
14	Critical Care	2,977 m2 @	£3,201 / m2	9,529,842	
22	Transitional Care	650 m2 @	£2,784 / m2	1,809,668	
23	Education Extension	910 m2 @	£2,254 / m2	2,051,445	
	Add for single storey construction	1,220 m2 @	£158 / m2	192,520	
	Refurbishment works				£1,402,500
20	Education Centre	600 m2 @	£1,700 / m2	1,020,000	
21	Mortuary	225 m2 @	£1,700 / m2	382,500	
	Estates Implications				
	New building works				£0
	No new build works				
	Refurbishment works				£2,286,500
7	Imaging	115 m2 @	£1,700 / m2	195,500	
11a	Ward	1,230 m2 @	£1,700 / m2	2,091,000	
	Backlog				
	New building works				£0
	No new build works				
	Refurbishment works				£6,121,500
8	Day Surgery	120 m2 @	£1,900 / m2	228,000	
9	Inpatient Ward	765 m2 @	£900 / m2	688,500	
10	Loading Bay	1,100 m2 @	£1,500 / m2	1,650,000	
15	Ward	500 m2 @	£300 / m2	150,000	
16	Inpatient Ward	500 m2 @	£900 / m2	450,000	
17	Inpatient Ward	1,000 m2 @	£900 / m2	900,000	
18	Theatres	750 m2 @	£1,900 / m2	1,425,000	
19	Admin / Offices	700 m2 @	£900 / m2	630,000	
	Other works				
	Demolitions				£10,000
	Abnormals				£9,317,220
	Building Drainage			260,500	
	External Drainage			42,910	
	Attenuation			224,000	
	Drainage Diversions			250,000	
	Abnormal Ground (mass fill)			130,250	
	Abnormal Ground (Cut and fill and disposal)			1,358,000	
	Vertical Circulation Cores			720,000	
T1	Multi-storey Car Park			excluded	
T6	Feature Landscaping			129,735	
T7	Entrance Canopy			126,000	
S2	Service Yard Canopy			99,000	
T8	Bridge Link			67,500	
T10	Entrance Canopy			372,000	
T12	Retaining Wall			405,600	
T18	Car Parking			excluded	
T20	Breakthroughs			100,000	

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option B PRH as the Emergency Site

T23	Courtyard Landscaping	6,820	
T24	Courtyard Landscaping	6,855	
T26	Multi-storey Car Park	excluded	
T27	Structural Adaptations to existing Transitional Care	100,000	
	Buildings for Services Infrastructure	671,500	
	Abnormal Plant and Equipment	1,760,000	
	Services within Ducts / Trenches	627,500	
	Builderswork for Services Diversions	120,250	
	Services Diversions	166,800	
	Incoming Services	622,000	
	Fire Alarms	25,000	
	Photovoltaic Panels	275,000	
	New Generators	650,000	
			£63,859,241
	Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)		£6,222,182
			£70,081,423
	Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016		-£1,401,628
	TOTAL WORKS COST EXCLUDING VAT		£68,679,795

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	8,928,400	
Non-works costs, including planning fees (allowance based on "typical" building)	200,000	
Equipment (say 12% of departmental costs) as discussed with Trust	7,181,400	
Planning Contingencies (10% of Works Cost)	6,868,000	£23,177,800
TOTAL CAPITAL COST EXCLUDING VAT		**£91,857,595**
Add Optimism Bias - 17% of Capital Cost - see attached form		£15,615,791
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT		**£107,473,386**
VALUE ADDED TAX - 20%		£21,494,700
		£128,968,086
Potential VAT Recovery		
Less: Fees (100% recovery assumed)	1,785,700	
Extensions (no recovery assumed)	0	
Refurbishment (20% recovery assumed)	392,400	**-£2,178,100**
PRH EMERGENCY TOTAL PROJECT ESTIMATE	**£**	**£126,789,986**

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary

WORKS COST (EXCL VAT)	£	68,680,000
TOTAL CAPITAL (EXCL VAT)	£	91,858,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	107,473,000
TOTAL CAPITAL (INCL VAT)	£	128,968,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	126,790,000

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

Option B RSH as the Planned Site

WORKS COSTS (2 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£758,302
3a	MLU - EXCLUDED FROM SSP	1,690 m2 @	£0 / m2	0	
3b	Communications	449 m2 @	£1,691 / m2	758,302	
	Refurbishment works				£5,370,000
5	Main Entrance / Retail	1,300 m2 @	£1,900 / m2	2,470,000	
6	UCC	1,450 m2 @	£2,000 / m2	2,900,000	
	Estates Implications				
	New building works				£0
	No new build works				
	Refurbishment works				£2,064,500
2	Stores	980 m2 @	£1,900 / m2	1,862,000	
11	Communication	135 m2 @	£1,500 / m2	202,500	
	Backlog				
	New building works				£26,606,693
14	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
15	Communication	426 m2 @	£1,691 / m2	720,936	
16	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
22	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
23	Communication	426 m2 @	£1,691 / m2	720,936	
24	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
26	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
27	Communication	426 m2 @	£1,691 / m2	720,936	
28	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
	Deduct for multi-storey construction	8,712 m2 @	-£158 / m2	-1,374,784	
	Refurbishment works				£17,896,500
1	Path lab	1,220 m2 @	£1,000 / m2	1,220,000	
3	Outpatients' Clinic	920 m2 @	£900 / m2	828,000	
4	Outpatients' Clinic	1,220 m2 @	£900 / m2	1,098,000	
7	Path Lab	950 m2 @	£1,000 / m2	950,000	
8	Fracture Clinic	670 m2 @	£1,700 / m2	1,139,000	
9	Fertility	720 m2 @	£1,700 / m2	1,224,000	
10	Admin / Offices	1,825 m2 @	£900 / m2	1,642,500	
13	Outpatients' Clinic	615 m2 @	£1,800 / m2	1,107,000	
17	Day Case	500 m2 @	£1,900 / m2	950,000	
18	Theatres	1,193 m2 @	£2,100 / m2	2,505,300	
19	Admin / Offices	1,288 m2 @	£900 / m2	1,159,200	
25	Ward	3,780 m2 @	£900 / m2	3,402,000	
35	Admin / Offices	395 m2 @	£1,700 / m2	671,500	
	Other works				
	Demolitions				£250,000
	Abnormals				9,269,800
	Building Drainage			277,300	
	External Drainage			69,500	
	Attenuation			52,500	
	Abnormal Ground (mass fill)			277,300	
	Abnormal Ground (Cut and fill and disposal)			100,000	
	Vertical Circulation Cores			400,000	
S2	Service Yard Canopy			52,500	
S3	Service Yard			82,500	
S7	Entrance Canopy			63,000	
S11	New road re-alignment of junction			56,250	
S13	General Landscaping			44,850	
S13a	General Landscaping			40,250	
S14	Entrance Canopy			183,750	
S15	Feature Landscapimg			162,500	
	Sub-terranean Service Duct			1,080,000	
	Breakthroughs to Existing Buildings			100,000	
	Buildings for Services Infrastructure			1,004,700	
	Abnormal Plant and Equipment			2,773,000	

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

Option B RSH as the Planned Site

Services within Ducts / Trenches	620,500	
Builderswork for Services Diversions	80,000	
Services Diversions	164,400	
Incoming Services	225,000	
Fire Alarms	25,000	
Photovoltaic Panels	275,000	
New Generators	1,060,000	
		£62,215,795
Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)		£6,062,052
		£68,277,847
Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016		-£1,365,557
TOTAL WORKS COST EXCLUDING VAT		£66,912,290

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	8,698,600	
Non-works costs, including planning fees (allowance based on "typical" building)	200,000	
Equipment (say 12% of departmental costs) as discussed with Trust	6,939,700	
Planning Contingencies (10% of Works Cost)	6,691,200	£22,529,500
TOTAL CAPITAL COST EXCLUDING VAT		**£89,441,790**
Add Optimism Bias - 17% of Capital Cost - see attached form		£15,205,104
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT		**£104,646,894**
VALUE ADDED TAX - 20%		£20,929,400
		£125,576,294
Potential VAT Recovery		
Less: Fees (100% recovery assumed)	1,739,700	
Extensions (no recovery assumed)	0	
Refurbishment (20% recovery assumed)	1,013,200	**-£2,752,900**
RSH PLANNED TOTAL PROJECT ESTIMATE	**£**	**£122,823,394**

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary

WORKS COST (EXCL VAT)	£	66,912,000
TOTAL CAPITAL (EXCL VAT)	£	89,442,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	104,647,000
TOTAL CAPITAL (INCL VAT)	£	125,576,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	122,823,000

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The Shrewsbury and Telford Hospital NHS Trust

Sustainable Services Programme

RSH Emergency Site/PRH Planned Site

High Level Cost Estimate

Option C1 OBC Issue

October 2016

Rider Hunt Construction Consultants LLP
12 Tenterden Street
Bury
BL9 0EG

The Shrewsbury and Telford Hospital NHS Trust
Sustainable Services Programme

Option C1 RSH Emergency Site/PRH Planned Site

Summary of Total Project Estimate for Potential Solution

Capital cost of Works at RSH	£267,156,000
Capital cost of works at PRH	£44,481,000
Total Capital Cost of Potential Solution	**£311,637,000**

The Shrewsbury and Telford Hospital NHS Trust

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Sustainable Services Programme
High Level Cost Estimate

NOTES AND CLARIFICATIONS

The estimated costs have been based on the AHR Architects Schedules of Areas with current revisions for all options, and the site wide implication drawings.

The new build areas scheduled include an allowance for circulation and engineering within the departments, communication is shown separately and Rider Hunt have added an allowance for main plant rooms based on guidance from DSSR.

The rates per m2 are calculated mainly from DoH HPCGs and adjusted accordingly for storey height, location factor and inflation to current prices

For refurbishment projects, a proportion of the new build rate has been taken based on the type of refurbishment indicated on the schedules, with reference to the refurbishment level matrix.

The estimates exclude the costs of multi-storey and surface level car parks at both sites as it has been assumed that these will be outsourced to a private firm, or be subject to a separate business case.

The capital cost of boilers, boiler houses, energy centres and the like has been excluded from the estimates, as the assumption for OBC is that the new energy centres will be outsourced to a private firm under an “energy supply agreement”, similar to the current arrangements the Trust has in place.

The capital cost for the Chemotherapy Day Case Centre at PRH in all options is excluded from the estimate as this is anticipated to be funded through other Public Sector or Charitable organisations.

The capital cost for the Midwifery-led Unit (MLU) and any other associated legacy Women and Children’s accommodation at RSH in all options has been excluded from this estimate as this is funded from the Public Dividend Capital (PDC) obtained from the previous Future Configuration of Hospital Services (FCHS) scheme.

It is assumed that the buildings are able to be constructed and areas can be refurbished as shown on the plans, but may be subject to further verification.

External works and drainage have been priced using areas from AHR's schedules and rates from similar projects. Cut and fill, retaining walls and ground improvement have been based on the Capita (Civil and Structural Engineers) report and priced using rates from similar projects

Demolitions have been calculated on a volumetric basis using a typical demolition rate from previous similar projects.

Vertical circulation amounts are for the lifts and escalators only and the space requirement is included in the communication space in the schedules.

The estimates include applicable upgrades associated with the SSP scheme (eg boilers, distribution, medical gases, sub-stations, back up generators etc.), as advised by DSSR, M&E Engineers.

The costs assume that sufficient space is available to construct the new buildings/ carry out the refurbishments, suitable and sufficient access is available for construction activity, and there are no unusual or difficult working conditions or restrictions

Allowances for on-costs, abnormals and site specific costs services costs are estimated based on DSSR schedules using rates from similar recent projects.

The costs have been adjusted to current levels (PUBSEC 214) but **NO ALLOWANCE** is included for inflation up to start on site or during the construction period.

An allowance of 13% for fees has been allowed for the project as discussed with the Trust, based on similar projects.

An allowance of 11% for equipment costs has been included, based on discussions with the Trust around recent projects.

The works costs have been adjusted by the location factor for 'Shropshire' as published by BCIS

An allowance has been made for Optimism Bias, based on the attached calculations totalling 18%.

Recovery on VAT has been assumed based on fees and refurbishment works as similar schemes. It is suggested the Trust seek specialist advice in order to pursue further recovery.

We have excluded any costs for:

- Hire of temporary buildings, works associated with temporary accommodation, or temporary diagnostics
- Costs for decanting, moves, moving equipment, and items moved off site (eg medical records)
- Contaminated land and remediation (Refer to SI for details of likely issues)
- Asbestos surveys and removal
- Land purchase/Site acquisition (none deemed to be required)
- Exceptionally poor ground conditions (general allowance only for poor ground conditions)
- Legal fees
- Trust internal costs and fees
- Costs associated with establishing a procurement vehicle
- Medical equipment and diagnostic equipment (CT, MRI, Ultrasound etc.) Equipment allowance on HPCG guidance only.
- Energy costs and bringing into use
- Additional or replacement offices (unless specifically identified)
- Unusual or difficult access or working conditions
- Prolongation or lengthened construction programme above a typical duration
- Unusual or restrictive planning conditions

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

Option C1 RSH as the Emergency Site

WORKS COSTS (1 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£62,271,285
2	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
3	Ward	1,674 m2 @	£2,570 / m2	4,303,111	
8	Communication	839 m2 @	£1,691 / m2	1,417,695	
9	ED / UCC / AEC / Discharge	3,601 m2 @	£2,412 / m2	8,686,112	
10	Critical Care Unit	2,977 m2 @	£3,201 / m2	9,529,842	
11	MLU - EXCLUDED FROM SSP	1,495 m2 @	£0 / m3	0	
16	Main Entrance and Retail	1,817 m2 @	£2,254 / m2	4,096,127	
20	Communication	852 m2 @	£1,691 / m2	1,439,675	
22	Paediatrics Inpatients and Oncology	2,340 m2 @	£3,021 / m2	7,068,694	
23	POPD	620 m2 @	£2,299 / m2	1,425,872	
24	Communication	893 m2 @	£1,691 / m2	1,510,010	
25	Delivery / Theatres	1,690 m2 @	£2,784 / m2	4,705,136	
26	Neonatal	1,529 m2 @	£2,784 / m2	4,256,338	
27	Antenatal / Postnatal	2,214 m2 @	£2,784 / m2	6,163,728	
28	Transitional Care	650 m2 @	£2,784 / m2	1,809,668	
29	Communication	169 m2 @	£1,691 / m2	285,737	
34	CAU	553 m2 @	£2,299 / m2	1,270,431	
	Refurbishment works				£4,047,000
4	Pharmacy Expansion	390 m2 @	£2,000 / m2	780,000	
12	Inpatient Ward	1,065 m2 @	£1,800 / m2	1,917,000	
18	Gynae, EPAS & GATU	1,000 m2 @	£900 / m2	900,000	
19	W&C Support and Training	500 m2 @	£900 / m2	450,000	
	Estates Implications				
	New building works				£2,781,173
1	Stores	1,898 m2 @	£1,127 / m2	2,139,364	
20a	Communications	172 m2 @	£1,691 / m2	290,133	
20b	Communications	208 m2 @	£1,691 / m2	351,676	
	Refurbishment works				£0
	No refurbishment work				
	Backlog				
	New building works				£25,929,355
35	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
35a	Communication	848 m2 @	£1,691 / m2	1,433,081	
36	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
37	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
38	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
39	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
40	Inpatient Ward	1,674 m2 @	£2,570 / m2	4,303,111	
	Deduction for Multi-storey Construction	8,380 m2 @	-£158 / m2	-1,322,393	
	Refurbishment works				£22,418,300
5	Staff Welfare / Offices	920 m2 @	£900 / m2	828,000	
6	Admin / Offices	1,220 m2 @	£900 / m2	1,098,000	
7	Pathology Lab	1,220 m2 @	£1,000 / m2	1,220,000	
13	Pathology Lab	950 m2 @	£1,000 / m2	950,000	
14a	Outpatients	630 m2 @	£900 / m2	567,000	
14b	Fracture Clinic	430 m2 @	£900 / m2	387,000	
14c	Outpatients	600 m2 @	£1,300 / m2	780,000	
15	Outpatients	1,825 m2 @	£900 / m2	1,642,500	
17	Ward	990 m2 @	£900 / m2	891,000	
21	Theatres	1,193 m2 @	£2,100 / m2	2,505,300	
32	Ward	2,365 m2 @	£900 / m2	2,128,500	
41	Admin / Offices	475 m2 @	£1,700 / m2	807,500	
47	Admin / Offices	515 m2 @	£1,700 / m2	875,500	
48	Admin / Offices	525 m2 @	£1,700 / m2	892,500	
49	Ward	290 m2 @	£900 / m2	261,000	
50	Ward	220 m2 @	£900 / m2	198,000	
51	Ward	415 m2 @	£900 / m2	373,500	

52	Admin / Offices	105 m2 @	£900 / m2	94,500	
53	Admin / Offices	540 m2 @	£900 / m2	486,000	
54	Admin / Offices	495 m2 @	£1,700 / m2	841,500	
55	Admin / Offices	140 m2 @	£900 / m2	126,000	
56	Admin / Offices	65 m2 @	£900 / m2	58,500	
57	Admin / Offices	535 m2 @	£900 / m2	481,500	
58	Admin / Offices	490 m2 @	£1,700 / m2	833,000	
59	Admin / Offices	130 m2 @	£900 / m2	117,000	
60	Admin / Offices	60 m2 @	£900 / m2	54,000	
61	Admin / Offices	545 m2 @	£900 / m2	490,500	
62	Admin / Offices	625 m2 @	£1,700 / m2	1,062,500	
63	Fertility	720 m2 @	£1,900 / m2	1,368,000	

Other works

	Demolitions		£560,000
	Abnormals		£16,317,725
	Building Drainage	604,600	
	External Drainage	115,000	
	Attenuation	238,000	
	Abnormal Ground (mass fill)	969,160	
	Abnormal Ground (Cut and fill and disposal)	1,459,450	
	Vertical Circulation Cores	1,420,000	
S1	General Landscaping	40,500	
S2	Service Yard Canopy	99,000	
S3	Service Yard	171,000	
S4	Road Realignment	14,400	
S6	Multi-storey Car Park	excluded	
	Petrol Interceptor	excluded	
S7	Road Realignment	10,000	
S8	General Landscaping	93,000	
	Car Parking	excluded	
S9	Entrance Canopy	56,000	
S10	Entrance Canopy	105,000	
S11	Entrance Canopy	252,000	
S12	General Landscaping	31,500	
S13	Road Realignment	180,000	
S14	Sub-terranean Service Duct	1,080,000	
S15	Blue Light Access and Roundabout Modifications	500,000	
S18	Feature Landscaping	162,500	
S20	Entrance Canopy	199,500	
S23	Childrens Sky Garden Play Area	50,000	
S24	General Landscaping	46,500	
S25	Retaining Wall	736,050	
S26	New Helipad	100,000	
S27	Breakthrough to Existing Building	100,000	
S28	General Landscaping	46,500	
	Buildings for Services Infrastructure	1,309,765	
	Abnormal Plant and Equipment	3,247,100	
	Services within Ducts / Trenches	631,000	
	Builderswork for Services Diversions	100,000	
	Services Diversions	265,200	
	Incoming Services	525,000	
	Fire Alarms	25,000	
	Photovoltaic Panels	275,000	
	New Generators	1,060,000	
			£134,324,838
	Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)		£13,088,061
			£147,412,899
	Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016		-£2,948,258
	TOTAL WORKS COST EXCLUDING VAT		£144,464,641

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C1 RSH as the Emergency Site

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	18,780,400		
Non-works costs, including planning fees (allowance based on "typical" building)	200,000		
Equipment (say 11% of departmental costs) as discussed with Trust	14,178,000		
Planning Contingencies (10% of Works Cost)	14,446,500		£47,604,900
TOTAL CAPITAL COST EXCLUDING VAT			**£192,069,541**
Add Optimism Bias - 18% of Capital Cost - see attached form			£34,572,517
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT			**£226,642,059**
VALUE ADDED TAX - 20%			£45,328,400
			£271,970,459
Potential VAT Recovery			
Less: Fees (100% recovery assumed)	3,756,100		
Extensions (no recovery assumed)	0		
Refurbishment (20% recovery assumed)	1,058,600		**-£4,814,700**
RSH EMERGENCY TOTAL PROJECT ESTIMATE		**£**	**£267,155,759**

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary

WORKS COST (EXCL VAT)	£	144,465,000
TOTAL CAPITAL (EXCL VAT)	£	192,070,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	226,642,000
TOTAL CAPITAL (INCL VAT)	£	271,970,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	267,156,000

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C1 PRH as the Planned Site

WORKS COSTS (2 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£4,170,520
1	Main Entrance and Retail	1,850 m2 @	£2,254 / m2	4,170,520	
2	Chemotherapy Day Case Centre - EXCLUDED FROM SSP	1,430 m2 @	£0 / m2	0	
9	Chemotherapy Day Case Centre - EXCLUDED FROM SSP	1,430 m2 @	£0 / m2	0	
	Refurbishment works				£5,787,000
4	UCC	1,200 m2 @	£1,800 / m2	2,160,000	
6	Breastcare	730 m2 @	£900 / m2	657,000	
13	Inpatient Ward	530 m2 @	£900 / m2	477,000	
14	Oscopy Suite	900 m2 @	£900 / m2	810,000	
15	Daycase and Daycase Theatres	1,530 m2 @	£1,100 / m2	1,683,000	
	Estates Implications				
	New building works				£0
	No new building work			0	
	Refurbishment works				£400,500
8	Admin / Offices	445 m2 @	£900 / m2	400,500	
	Backlog				
	New building works				£0
	No new building work				
	Refurbishment works				£6,709,500
5	Daycase	120 m2 @	£1,800 / m2	216,000	
7	Inpatient Ward	765 m2 @	£900 / m2	688,500	
10	Inpatient Ward	500 m2 @	£1,800 / m2	900,000	
11	Inpatient Ward	500 m2 @	£1,800 / m2	900,000	
12	Inpatient Ward	1,000 m2 @	£1,800 / m2	1,800,000	
16	Theatres	750 m2 @	£2,100 / m2	1,575,000	
17	Admin / Offices	700 m2 @	£900 / m2	630,000	
	Other works				
	Demolitions				£20,000
	Abnormals				5,563,675
	Building Drainage			85,000	
	External Drainage			19,200	
	Attenuation			26,250	
	Drainage Diversions			250,000	
	Abnormal Ground (mass fill)			42,500	
	Abnormal Ground (Cut and fill and disposal)			343,000	
	Vertical Circulation Cores			160,000	
T1	Entrance Canopy			184,000	
T2	Feature Landscaping			86,400	
T3	Retaining Wall			106,600	
	Retaining Wall			74,750	
T4	Entrance Canopy			367,500	
T5	General Landscaping around UCC			17,500	
	Breakthrough to Existing Building			10,000	
	Buildings for Services Infrastructure			331,075	
	Abnormal Plant and Equipment			1,634,000	
	Services within Ducts / Trenches			639,000	
	Builderswork for Services Diversions			72,400	
	Services Diversions			115,500	
	Incoming Services			49,000	
	Fire Alarms			25,000	
	Photovoltaic Panels			275,000	
	New Generators			650,000	
					£22,651,195

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C1 PRH as the Planned Site

Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)			£2,207,040
			£24,858,235
Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016			-£497,165
	TOTAL WORKS COST EXCLUDING VAT		£24,361,070

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	3,166,900		
Non-works costs, including planning fees (allowance based on "typical" building)	200,000		
Equipment (say 11% of departmental costs) as discussed with Trust	2,060,400		
Planning Contingencies (10% of Works Cost)	2,436,100		£7,863,400
TOTAL CAPITAL COST EXCLUDING VAT			**£32,224,470**
Add Optimism Bias - 18% of Capital Cost - see attached form			£5,800,405
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT			**£38,024,874**
VALUE ADDED TAX - 20%			£7,605,000
			£45,629,874
Potential VAT Recovery			
Less: Fees (100% recovery assumed)	633,400		
Extensions (no recovery assumed)	0		
Refurbishment (20% recovery assumed)	515,900		**-£1,149,300**
PRH PLANNED TOTAL PROJECT ESTIMATE		**£**	**£44,480,574**

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary

WORKS COST (EXCL VAT)	£	24,361,000
TOTAL CAPITAL (EXCL VAT)	£	32,224,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	38,025,000
TOTAL CAPITAL (INCL VAT)	£	45,630,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	44,481,000

The Shrewsbury and Telford Hospital NHS Trust

Sustainable Services Programme

RSH Emergency/PRH Planned

High Level Cost Estimate

Option C2 OBC Issue

October 2016

Rider Hunt Construction Consultants LLP
12 Tenterden Street
Bury
BL9 0EG

The Shrewsbury and Telford Hospital NHS Trust
Sustainable Services Programme

Option C2 RSH Emergency Site/PRH Planned Site

Summary of Total Project Estimate for Potential Solution

Capital cost of Works at RSH	£227,109,000
Capital cost of works at PRH	£67,388,000
Total Capital Cost of Potential Solution	**£294,497,000**

The Shrewsbury and Telford Hospital NHS Trust

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Sustainable Services Programme
High Level Cost Estimate

NOTES AND CLARIFICATIONS

The estimated costs have been based on the AHR Architects Schedules of Areas with current revisions for all options, and the site wide implication drawings.

The new build areas scheduled include an allowance for circulation and engineering within the departments, communication is shown separately and Rider Hunt have added an allowance for main plant rooms based on guidance from DSSR.

The rates per m2 are calculated mainly from DoH HPCGs and adjusted accordingly for storey height, location factor and inflation to current prices

For refurbishment projects, a proportion of the new build rate has been taken based on the type of refurbishment indicated on the schedules, with reference to the refurbishment level matrix.

The estimates exclude the costs of multi-storey and surface level car parks at both sites as it has been assumed that these will be outsourced to a private firm, or be subject to a separate business case.

The capital cost of boilers, boiler houses, energy centres and the like has been excluded from the estimates, as the assumption for OBC is that the new energy centres will be outsourced to a private firm under an "energy supply agreement", similar to the current arrangements the Trust has in place.

The capital cost for the Chemotherapy Day Case Centre at PRH in all options is excluded from the estimate as this is anticipated to be funded through other Public Sector or Charitable organisations.

The capital cost for the Midwifery-led Unit (MLU) and any other associated legacy Women and Children's accommodation at RSH in all options has been excluded from this estimate as this is funded from the Public Dividend Capital (PDC) obtained from the previous Future Configuration of Hospital Services (FCHS) scheme.

It is assumed that the buildings are able to be constructed and areas can be refurbished as shown on the plans, but may be subject to further verification.

External works and drainage have been priced using areas from AHR's schedules and rates from similar projects. Cut and fill, retaining walls and ground improvement have been based on the Capita (Civil and Structural Engineers) report and priced using rates from similar projects

Demolitions have been calculated on a volumetric basis using a typical demolition rate from previous similar projects.

Vertical circulation amounts are for the lifts and escalators only and the space requirement is included in the communication space in the schedules.

The estimates include applicable upgrades associated with the SSP scheme (eg boilers, distribution, medical gases, sub-stations, back up generators etc.), as advised by DSSR, M&E Engineers.

The costs assume that sufficient space is available to construct the new buildings/ carry out the refurbishments, suitable and sufficient access is available for construction activity, and there are no unusual or difficult working conditions or restrictions

Allowances for on-costs, abnormals and site specific costs services costs are estimated based on DSSR schedules using rates from similar recent projects.

The costs have been adjusted to current levels (PUBSEC 214) but **NO ALLOWANCE** is included for inflation up to start on site or during the construction period.

An allowance of 13% for fees has been allowed for the project as discussed with the Trust, based on similar projects.

An allowance of 11% for equipment costs has been included, based on discussions with the Trust around recent projects.

The works costs have been adjusted by the location factor for 'Shropshire' as published by BCIS

An allowance has been made for Optimism Bias, based on the attached calculations totalling 18%.

Recovery on VAT has been assumed based on fees and refurbishment works as similar schemes. It is suggested the Trust seek specialist advice in order to pursue further recovery.

We have excluded any costs for:

- Hire of temporary buildings, works associated with temporary accommodation, or temporary diagnostics
- Costs for decanting, moves, moving equipment, and items moved off site (eg medical records)
- Contaminated land and remediation (Refer to SI for details of likely issues)
- Asbestos surveys and removal
- Land purchase/Site acquisition (none deemed to be required)
- Exceptionally poor ground conditions (general allowance only for poor ground conditions)
- Legal fees
- Trust internal costs and fees
- Costs associated with establishing a procurement vehicle
- Medical equipment and diagnostic equipment (CT, MRI, Ultrasound etc.) Equipment allowance on HPCG guidance only.
- Energy costs and bringing into use
- Additional or replacement offices (unless specifically identified)
- Unusual or difficult access or working conditions
- Prolongation or lengthened construction programme above a typical duration
- Unusual or restrictive planning conditions

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C2 RSH as the Emergency Site

WORKS COSTS (1 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£41,573,157
2	Ward - Short Stay	1,674 m2 @	£2,570 / m2	4,303,111	
3	Ward - Short Stay	1,674 m2 @	£2,570 / m2	4,303,111	
8	Communication	839 m2 @	£1,691 / m2	1,417,695	
9	ED / UCC / AEC / Discharge Lounge	4,901 m2 @	£2,412 / m2	11,821,892	
10	Critical Care Unit	2,977 m2 @	£3,201 / m2	9,529,842	
11	Inpatient Ward	1,674 m2 @	£2,784 / m3	4,661,704	
16	Main Entrance and Retail	1,817 m2 @	£2,254 / m2	4,096,127	
20	Communication	852 m2 @	£1,691 / m2	1,439,675	
	Refurbishment works				£3,715,500
4	Pharmacy Expansion	390 m2 @	£2,000 / m2	780,000	
12	Inpatient Ward	1,065 m2 @	£1,700 / m2	1,810,500	
18	Admin, Welfare and Catering	1,250 m2 @	£900 / m2	1,125,000	
19	Paediatrics Inpatient Ward - EXCLUDED FROM SSP	560 m2 @	£0 / m2	0	
19a	CAU - EXCLUDED FROM SSP	500 m2 @	£0 / m2	0	
21a	MLU - EXCLUDED FROM SSP	1,150 m2 @	£0 / m2	0	
	Estates Implications				
	New building works				£2,781,173
1	Stores	1,898 m2 @	£1,127 / m2	2,139,364	
20a	Communication	172 m2 @	£1,691 / m2	290,133	
20b	Communication	208 m2 @	£1,691 / m2	351,676	
	Refurbishment works				£0
	No refurbishment work				
	Backlog				
	New building works				£27,330,875
22	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
23	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
24	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
25	Communications	894 m2 @	£1,691 / m2	1,512,208	
26	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
27	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
28	Inpatients Ward	1,674 m2 @	£2,570 / m2	4,303,111	
	Refurbishment works				£22,822,000
5	Staff Welfare / Offices	920 m2 @	£900 / m2	828,000	
6	Admin / Offices	1,220 m2 @	£900 / m2	1,098,000	
7	Pathology Lab	1,220 m2 @	£1,000 / m2	1,220,000	
13	Pathology Lab	950 m2 @	£1,000 / m2	950,000	
14a	Outpatients	630 m2 @	£900 / m2	567,000	
14b	Fracture Clinic	430 m2 @	£900 / m2	387,000	
14c	Outpatients	600 m2 @	£900 / m2	540,000	
15	Outpatients	1,825 m2 @	£900 / m2	1,642,500	
17	Ward	1,288 m2 @	£900 / m2	1,159,200	
21	Theatres	1,193 m2 @	£2,100 / m2	2,505,300	
32	Ward	3,050 m2 @	£900 / m2	2,745,000	
40	Admin / Offices	1,800 m2 @	£1,700 / m2	3,060,000	
41	Admin / Offices	1,800 m2 @	£1,700 / m2	3,060,000	
42	Admin / Offices	1,800 m2 @	£1,700 / m2	3,060,000	
	Other works				
	Demolitions				£560,000
	Abnormals				£15,621,375
	Building Drainage			448,000	
	External Drainage			79,300	
	Attenuation			238,000	
	Abnormal Ground (mass fill)			969,160	

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C2 RSH as the Emergency Site

	Abnormal Ground (Cut and fill and disposal)	1,459,450	
	Vertical Circulation Cores	980,000	
S1	General Landscaping	36,450	
S2	Service Yard Canopy	99,000	
S3	Service Yard	171,000	
S4	Road Realignment	14,400	
S6	Multi-storey Car Park	excluded	
	Petrol Interceptor	excluded	
S7	Road Realignment	10,000	
S8	General Landscaping	93,000	
	Car Parking	excluded	
S9	Entrance Canopy	56,000	
S10	Entrance Canopy	105,000	
S11	Entrance Canopy	252,000	
S12	General Landscaping	31,500	
S13	Road Realignment	180,000	
S14	Sub-terranean Service Duct	1,080,000	
S15	Blue Light Access and Roundabout Modifications	500,000	
S18	Feature Landscaping	162,500	
S20	Entrance Canopy	199,500	
S23	Childrens Play Area	20,000	
S23a	Childrens Play Area	20,000	
S24	General Landscaping	46,500	
S25	Retaining Wall	736,050	
S26	New Helipad	100,000	
S27	Breakthrough to Existing Building	50,000	
S28	General Landscaping	46,500	
	Buildings for Services Infrastructure	1,309,765	
	Abnormal Plant and Equipment	3,247,100	
	Services within Ducts / Trenches	631,000	
	Builderswork for Services Diversions	100,000	
	Services Diversions	265,200	
	Incoming Services	525,000	
	Fire Alarms	25,000	
	Photovoltaic Panels	275,000	
	New Generators	1,060,000	
			£114,404,080
	Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)		£11,147,064
			£125,551,144
	Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016		-£2,511,023
	TOTAL WORKS COST EXCLUDING VAT		£123,040,121

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	15,995,200	
Non-works costs, including planning fees (allowance based on "typical" building)	200,000	
Equipment (say 11% of departmental costs) as discussed with Trust	11,857,200	
Planning Contingencies (10% of Works Cost)	12,304,000	£40,356,400
TOTAL CAPITAL COST EXCLUDING VAT		**£163,396,521**
Add Optimism Bias - 18% of Capital Cost - see attached form		£29,411,374
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT		**£192,807,895**
VALUE ADDED TAX - 20%		£38,561,600
		£231,369,495
Potential VAT Recovery		
Less: Fees (100% recovery assumed)	3,199,000	
Extensions (no recovery assumed)	0	
Refurbishment (20% recovery assumed)	1,061,500	**-£4,260,500**
RSH EMERGENCY TOTAL PROJECT ESTIMATE	£	**£227,108,995**

RIDER HUNT CONSTRUCTION CONSULTANTS LLP

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

Option C2 RSH as the Emergency Site

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary		
WORKS COST (EXCL VAT)	£	123,040,000
TOTAL CAPITAL (EXCL VAT)	£	163,397,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	192,808,000
TOTAL CAPITAL (INCL VAT)	£	231,369,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	227,109,000

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C2 PRH as the Planned Site

WORKS COSTS (2 of 2)

		Area (inc. plant)	Rate (HPCGs)	£	£
	SSP Baseline				
	New building works				£17,579,984
1	Main Entrance and Retail	1,850 m2 @	£2,254 / m2	4,170,520	
2	Chemotherapy Day Case Centre - EXCLUDED FROM SSP	1,430 m2 @	£0 / m2	0	
3	Treatment Centre (including Breast and Oscopy Suite)	1,899 m2 @	£2,784 / m2	5,287,849	
5	Communication	202 m2 @	£1,691 / m2	340,686	
6	Communication	195 m2 @	£1,691 / m2	329,697	
12	Inpatient Ward	1,762 m2 @	£2,480 / m2	4,368,113	
13	Communication	494 m2 @	£1,691 / m2	835,231	
14	Chemotherapy Day Case Centre - EXCLUDED FROM SSP	1,430 m2 @	£0 / m2	0	
20	Transitional Care	650 m2 @	£2,784 / m2	1,809,668	
	Add for single storey construction	2,777 m2 @	£158 / m2	438,220	
	Refurbishment works				£4,860,000
9a	UCC	1,200 m2 @	£1,800 / m2	2,160,000	
15	Inpatient Ward	500 m2 @	£1,800 / m2	900,000	
16	Communication	500 m2 @	£1,800 / m2	900,000	
16a	Day Case Ward	500 m2 @	£1,800 / m2	900,000	
	Estates Implications				
	New building works				£0
	No new building work			0	
	Refurbishment works				£596,000
4	Admin / Offices	445 m2 @	£900 / m2	400,500	
7	Imaging	115 m2 @	£1,700 / m2	195,500	
	Backlog				
	New building works				£0
	No new building work				
	Refurbishment works				£4,755,000
7a	Inpatient Ward	765 m2 @	£1,800 / m2	1,377,000	
8	Day Surgery	120 m2 @	£1,900 / m2	228,000	
17	Inpatient Ward	500 m2 @	£900 / m2	450,000	
18	Theatres	750 m2 @	£1,900 / m2	1,425,000	
19	Admin / Offices	750 m2 @	£1,700 / m2	1,275,000	
	Other works				
	Demolitions				£0
	Abnormals				£6,223,070
	Building Drainage			85,000	
	External Drainage			19,200	
	Attenuation			26,250	
	Drainage Diversions			250,000	
	Abnormal Ground (mass fill)			42,500	
	Abnormal Ground (Cut and fill and disposal)			343,000	
	Vertical Circulation Cores			480,000	
T1	Multi-storey Car Park			excluded	
T7	Entrance Canopy			184,000	
T8	Bridge Link			202,500	
T6	Feature Landscaping			86,400	
T3	Retaining Wall			106,600	
	Retaining Wall			74,750	
T10	Entrance Canopy			183,750	
T11	General Landscaping			133,145	
T18	Car Parking			excluded	
T19	New Pedestrian Crossing			5,000	
T20	Breakthrough to Existing Building			100,000	
T26	Multi-storey Car Park			excluded	
T27	Transitional Care Roof Alterations			100,000	

The Shrewsbury and Telford Hospital NHS Trust - Sustainable Services Programme

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Option C2 PRH as the Planned Site

Breakthrough to Existing Building	10,000	
Buildings for Services Infrastructure	331,075	
Abnormal Plant and Equipment	1,634,000	
Services within Ducts / Trenches	639,000	
Builderswork for Services Diversions	72,400	
Services Diversions	115,500	
Incoming Services	49,000	
Fire Alarms	25,000	
Photovoltaic Panels	275,000	
New Generators	650,000	
		£34,014,054
Adjust for inflation from PUBSEC 195 to PUBSEC 214 (4Q2016)		£3,314,190
		£37,328,244
Adjust for location factor 0.98 Shropshire as BCIS 02/09/2016		-£746,565
TOTAL WORKS COST EXCLUDING VAT		£36,581,679

TRUST COSTS

Fees at 13% of Works Cost (from Trust)	4,755,600	
Non-works costs, including planning fees (allowance based on "typical" building)	200,000	
Equipment (say 11% of departmental costs) as discussed with Trust	3,354,900	
Planning Contingencies (10% of Works Cost)	3,658,200	£11,968,700
TOTAL CAPITAL COST EXCLUDING VAT		**£48,550,379**
Add Optimism Bias - 18% of Capital Cost - see attached form		£8,739,068
TOTAL CAPITAL COST INCL OPTIMISM BIAS/EXCL VAT		**£57,289,447**
VALUE ADDED TAX - 20%		£11,457,900
		£68,747,347
Potential VAT Recovery		
Less: Fees (100% recovery assumed)	951,100	
Extensions (no recovery assumed)	0	
Refurbishment (20% recovery assumed)	408,400	**-£1,359,500**
PRH PLANNED TOTAL PROJECT ESTIMATE	**£**	**£67,387,847**

For full set of notes, clarifications, and basis of costs refer to attached Notes Sheet

Summary

WORKS COST (EXCL VAT)	£	36,582,000
TOTAL CAPITAL (EXCL VAT)	£	48,550,000
TOTAL CAPITAL (INCL OPTIMISM BIAS AND EXCL VAT)	£	57,289,000
TOTAL CAPITAL (INCL VAT)	£	68,747,000
TOTAL CAPITAL (INCL VAT AND POTENTIAL RECOVERY)	£	67,388,000

VOLUME 9: CDM

COMMUNICATING RISK VISUALLY:

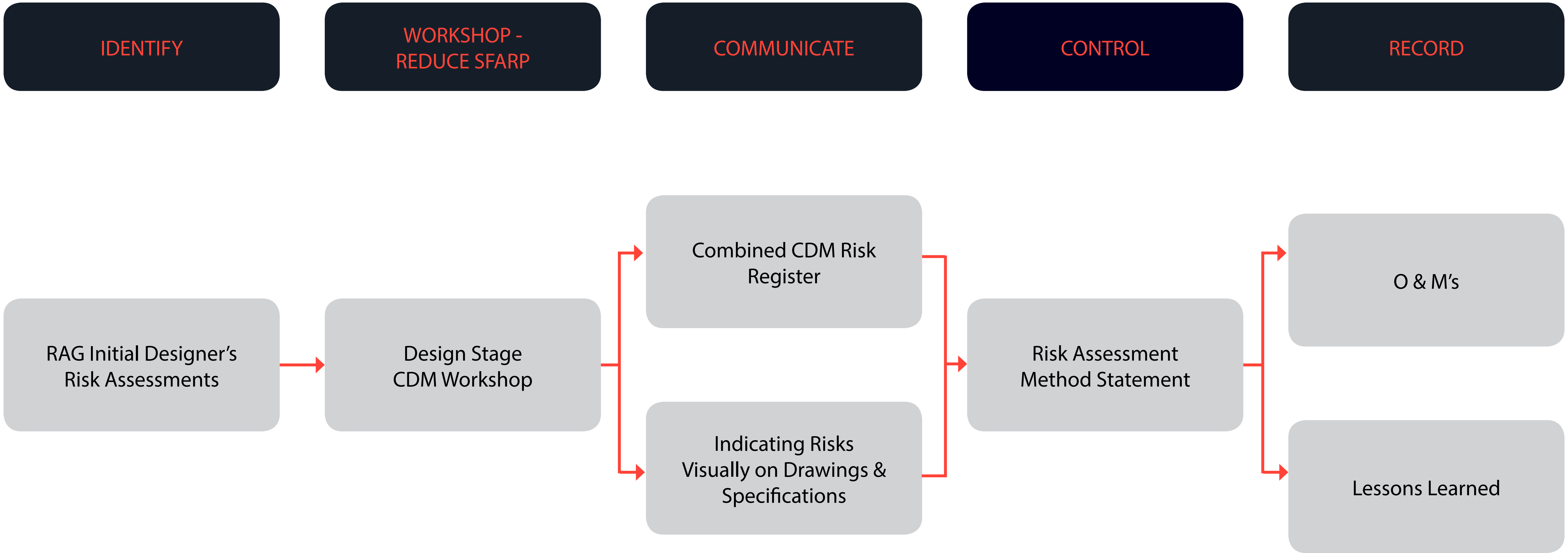
a collaborative approach to project safety

- Use of Safety Visually*

- Identify risk in a visual way
- Communicate risk in a clear, graphical way to all Stakeholders
- Capture good practice and feedback into the process

- Avoid information overload
- Encourage a collaborative and ongoing approach to project safety

* a methodology developed by Scott Brownrigg's Technical Consulting Team in 2013

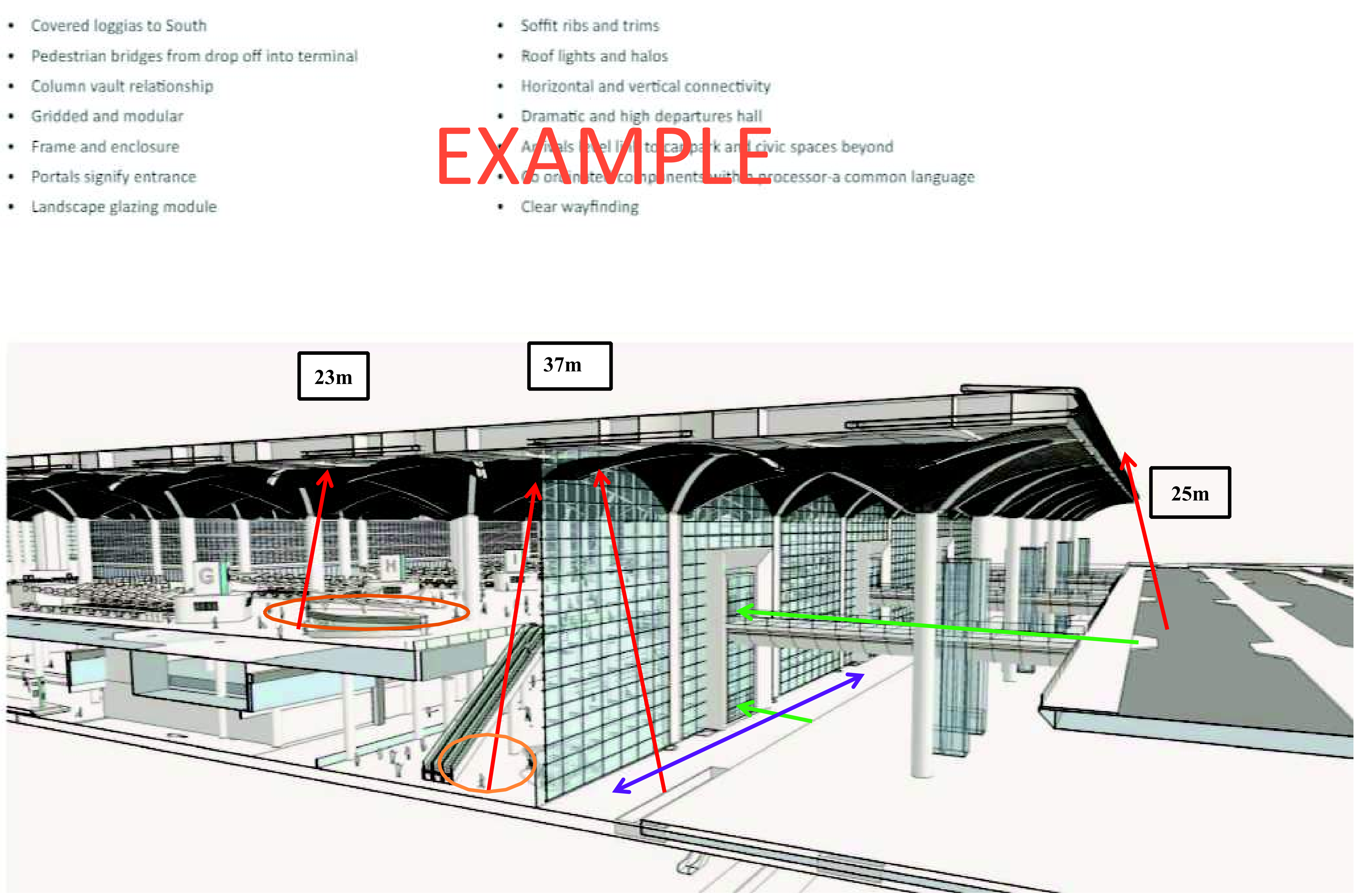


- Materials
- Activities
- Events
- Outcomes

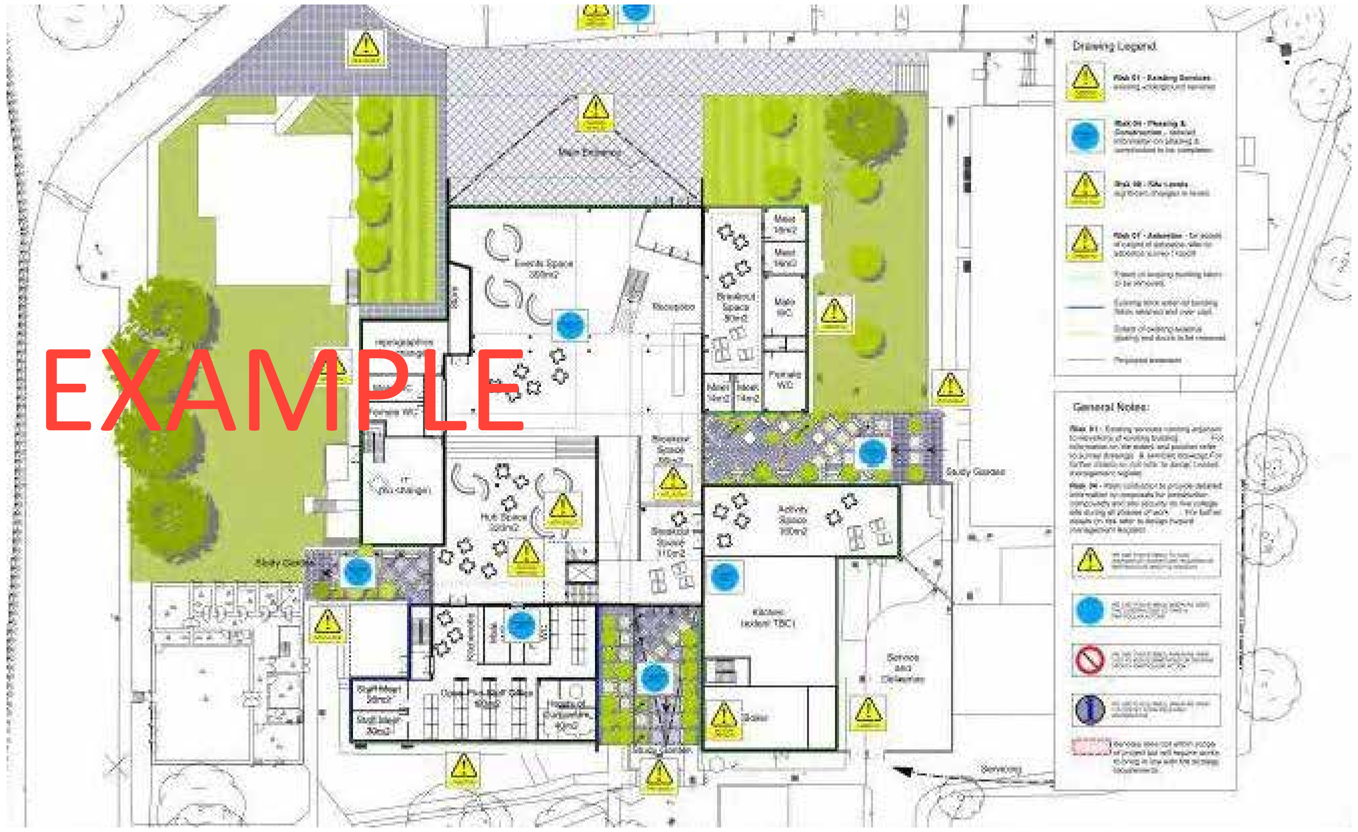
- Historic Case Studies

- Open discussions with Contractor, Supply Chain and FM teams

Maintenance Access Analysis Matrix - Identification and Significant Risk Management						
Project & No:-	**A New Airport**	**16526**	Work Stage :-	Revision & Date:	**5th**	
AREA , ELEMENT or SIGNIFICANT RISK ISSUE	**BUILDING FORM, MATERIAL, ACTIVITY, LOCATION HAZARDS and SIGNIFICANT RISKS (Identified)**	**ELIMINATE or AVOID risks** (During early design stages) **SFARP**	**REDUCE or MINIMIZE risks ALARP by :-** (During all design stages) Safe systems of work & protection **>**	**INFORMATION** To be provided with the design eg **Specialist Design & client input**	**Actions required** **STAGE - DESIGN CONTROL METHODS action, dates, comments, guidance, etc**	**Agreed Action** **Agreed in principle** **Not agreed**
	Design Risk Management Process - Visual Risk Pathways					

The Processor Building		**Cleaning and Maintenance to High Glazed Elevations & Ceiling Lights** 30 – 38m.	In principle in earlier reports
		Internal access . Suitability of floor slabs to resist loads and deflections without finishes cracking. 10 ton capacity available.	Struct. Engineers and flooring specialists
		External Access Can apron and roads be used to access the elevations without undue disruption to traffic and aircraft, and airside traffic?	Yes,Agreed by manage-ment control
		Review plans Is access possible to all locations given location of internal elements such as escalators, cabins, travelators, water features, above hotel,etc.	To be further explored on detailed plans
		MEWP Access Can 40m high MEWPS access the building at appropriate levels? Ie. large doors, bridges and circulation route requirements without the need for temporary protection.	Yes, To be further explored in detailed design but principles agreed

Team Sign -off status	Client		Architect		Struct. Eng		Services Eng		P. Contractor	
Others	P.M		P.Designer		Landscape		Cost Consultant		Façade Cont.	
	Int,Des		Fire Eng		Acoustic		Lighting Des.		other	



KEY TO SYMBOLS

	Use to avoid or refrain from a particular action
	Use to indicate a required particular action by the contractor
	Use to convey some relevant information
	Use to Warn of significant Hazzards or information which is unusual

- Identify only significant risk on drawings

- Hyperlink to supporting information- avoid information overload

- Integrate health and safety into the design from the outset
- Address risk in a design-based proportionate and practicable way
- Facilitate open discussion of design-risk resolution options
- Reduce unnecessary paperwork
- Communicate to all Stakeholders and workforce in a clear comprehensible format






Project Delivery System
Hazard identification register

Covering significant design-related Safety, Health and Environmental hazards

Click here for link to guidance :

Project no :	**Latest revision ref :**	**Brief project overview :**
2015.00839.000	**01**	The Scheme comprises the construction of a new build ED, CCU, and Inpatient accommodation, together with Clinical and non-clinical support, together with an extensive refurbishment of the existing estate; The programme covers works at both the RSH and PRH sites and includes significant enabling works in the form of service and road diversions, retaining walls and the construction of a mSCP
Project description :	**Latest revision date :**	
SATH- Sustainable Services Programme	**21 Oct 2016**	
Original prepared by :	**Date prepared :**	
Alison Evans	**12 Aug 2016**	

Item Ref	**Date added or amended**	**Foreseeable potential hazards identified** (Those with the potential to cause significant harm to people, other living species or the environment, or which AHR is able to positively influence)	**Affected party / Sensitive receptor**	**Comments or specific sensitivities** (eg. specific party, named watercourse, species etc)	**Period(s) when may apply**	**Is AHR able to influence risk reduction?**	**If 'Yes' to influence, enter current status**	**Risk ownership** (Party best placed to take responsibility for further investigation and/or actions)	**Specify how AHR can influence risk reduction, or provide relevant information to those with ownership of the risk (ERIC)** (Provide link / reference below to documents containing such, or add as text on the 'Item' tab)
1	12.08.16	Asbestos removal or disturbance	Workers	Existing Buildings and service ducts are known to contain asbestos	Construction	No		SATH	Full Demolition and refurb asbestos Surveys to be undertaken prior to commencing any works on site.
2	12.08.16	Disruption e.g. traffic, parking issues etc. (specify type)	Occupier / end-user	Enabling Works and construction works will compound existing lack of parking on both sites	Site Enabling	Yes	Open	SATH/ JMP/ AHR	AHR and JMP to work closely with Trust team in the development of Interim Travel Plans for Enabling and Construction Works, and a comprehensive Travel Plan for the completed scheme
3	12.08.16	Disruption e.g. traffic, parking issues etc. (specify type)	Public	Additional Construction Traffic on the Wider Road Network	Construction	No		JMP	Full Transport assessment to be undertaken as part of FBC
4	12.08.16	Disruption e.g. traffic, parking issues etc. (specify type)	Other (specify in comments)	Potential disruption to Blue Light traffic during Construction	Construction	No		Contractor/ SATH	All parties Site Logistics Workshops to be undertaken to agree traffic management Strategy during Construction
5	12.08.16	Disruption e.g. traffic, parking issues etc. (specify type)	Other (specify in comments)	Restriction on helicopter landing access during construction when cranes and equipment are on site	Construction	No		Aviation Adviser/ Air Ambulance Service, Contractor	Aviation Adviser to be appointed to the team at FBC
6	12.08.16	Disturbance or endangerment of any living species (plant or animal)	Landscape	Potential disturbance of wildlife and landscape on both sites	Site Enabling	No		SATH/ Crestwood	Environmental Consultants have been appointed to undertake surveys of existing wildlife and landscape and to assess the requirement for an EIA
7	12.08.16	Dust or grit emissions	Occupier / end-user	Risk to patients with existing health challenges	Construction	Yes	Open	Design Team/ Contractor	Design team to consider method of reducing activities which will generate dust and grit during construction
8	12.08.16	Excavation collapse	Workers	Considerable earth works, retaining walls and subterranean ducts form part of the design at the RSH site	Construction	Yes	Open	AHR/ Capita/ DSSR	Workshop to review the location and scale of retaining Structures to be developed at FBC; Methods of providing access to services linking the Energy Centre with the main hospital building at RSH to be reviewed in detail at FBC
9	12.08.16	Fall from height	Workers	The greater the requirement for working at height, the greater the risk	Construction	Yes	Open	AHR/ DSSR/ Capita/ Contractor	Consider elements of the design where working at height can be reduced- eg pre-cast stairs installed early in the programme to avoid the need for temporary access; Consider specifying Cladding systems which can be installed from within the building etc
10	12.08.16	Fall from height	Maintenance personnel	Scheme may involve plant, rooflights or photovoltaic cells at roof level which may require access	Maintenance	Yes	Open	AHR/ DSSR	Consider means of achieving safe access during FBC
11	12.08.16	Falling objects	Various (specify in comments)	Workers, Staff and Visitors may be in close proximity to construction activities	Construction	No		Contractor/ SATH	Contractor to liaise with SATH to develop alternative pedestrian routes around the site
12	12.08.16	Fume, gas or odour emissions (created by construction or in use activities)	Occupier / end-user	Workers, Staff, Visitors & Patients	Construction	Yes	Open	AHR	AHR to specificy low emissivity products and low VOC products wherever possible
13	12.08.16	Interface with public and pedestrians	Occupier / end-user	Workers, Staff and Visitors may be in close proximity to construction activities	Construction	No		Contractor/ SATH	Contractor to schedule deliveries to off-peak times; Contractor to liaise with SATH to develop alternative pedestrian routes around the site
14	12.08.16	Noise (during construction or in use activities)	Workers	Workers, Staff and Visitors may be in close proximity to construction activities	Construction	Yes		AHR/ SATH/ DSSR/ Contractor	Phasing and decants to be scheduled to minimise disruption
15	21.10.16	Working in proximity to moving vehicles or plant	Workers	Workers	Construction	No		Contractor	Contractor to develop site logistics Plan and segregate vehicle and pedestrian movement
16	21.10.16	Structural collapse	Workers	Workers, Staff, Visitors & Patients	Construction	No		Capita/ Contractor/ Specilist demolition contractor	All temporary Works, and sequencing to be fully detailed and followed
17	21.10.16	Work with or near live services	Workers	Existing Building Services; Buried Services on Site- Poor existing records and high volumes of redundant services still in situ;	Construction	No		DSSR/ Contractor	Commission Sub-Tronic Surveys, Review existing services information; undertake full services surveys, utilise safe digging techniques
18	21.10.16	Land pollution/contamination (already present on site)	Workers	Workers, Visitors, Neighbours	Construction	No		SATH, Capita,	Site investigation report commissioned
19	21.10.16	Working in confined spaces	Workers	Existing Confined Spaces	Construction	No		DSSR, Contractor	Existing subterraneon ducts to be replaced with an approach which enables access without the requirement for workers to enter enclosed spaces wherever possible; this will be explored further during OBC
20	21.10.16	Other (specify in comments)	Occupier / end-user	Aspergillosisrisk to patients during demolition	Demolition	No		Contractor/ SATH	Method Statements to be developed to consider how to manage this risk

Project: SaTH SSP

Date : Sept 2016

Building Services CDM Register

Reference: M4556-DSSR-X-X-SC-MEP-90004

status	Work in Progress
Purpose:	Issue for Comment

This version

Authored by:

name:	D. Carpenter	R. Monks	M. Atherton
role:	Mechanical Engineer	Electrical Engineer	Public Health Engineer
signed:			
date:	09/09/2016	09/09/2016	09/09/2016

Reviewed by:

name:	S. Greatrex
role:	Executive Engineer
signed:	
date:	09/09/2016

Authorised for issue by:

name:	J. Hatton
role:	Regional Partner
signed:	
date:	09/09/2016

The original signed copy of this page is to be retained by the originating team.

Revision Status & Approval Log

Date	Status for Purpose	Version	Overview of Changes
Sep-16	First Issue	A	

M&E DESIGNERS RISK ASSESSMENTS

SECTION 1: EXISTING BUILDINGS

DSSR

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design M	E	P	C	L	Anticipated Action to Reduce Risk	Persons at Risk Const	User	Public	Maint	Visitor	Decomm	Initial Risk Assessment S	L	A	Design Risk Mitigation (Hierarchy of Risk Control) Principle of Avoidance / Reduction / Protection and Control	Residual Risk Assessment S	L	A	Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
1.1	Any construction/demolition works in existing buildings	Asbestos present in existing building materials	✓	✓	✓	✓		Check Hospital's asbestos register. Any areas not been surveyed for asbestos, where works are due to take place, should be surveyed and cleared of asbestos prior to any works taking place.	✓			✓		✓	3	3	9	Relevant asbestos surveys and removal will be carried out prior to any works or intrusive surveys	3	1	3	Ensure certificates from asbestos surveys are provided to anyone working/surveying in the relevant area	Client	
1.2	Check for existing management Health and Safety File and/or existing record/as fitted drawings.	Inheriting pre-existing hazards due to lack of information and knowledge on existing services.	✓	✓	✓	✓		Discuss with Client and determine if any documentation exists. If existing records exist, check same. If records do not exist, carry out survey (or organise for specialist surveys). Incorporate all relevant information within current design. Highlight known hazards and design in improvements where possible, e.g. better access for maintenance, replace hazardous materials etc.	✓			✓		✓	1	3	3	Hospital has plans to survey all existing services and infrastructure. Timescale of this is currently unknown.	1	2	2	Ensure any relevant information is provided to all members of Design Team and Contractors.	N/A	
1.3	Check use/previous use of site or building.	Inheriting potentially dangerous buildings, systems, components or materials.	✓	✓	✓	✓		Check with Client/other Design Team Members to determine whether any current/previous use of the building/site or parts of the building/site could have an affect on the Health and Safety of construction personnel and/or eventual occupants.	✓			✓		✓	3	1	3	Client to check and verify that area is safe for work/occupation.	1	1	1	Ensure any relevant information is provided to all members of Design Team and Contractors.	Client	
1.4	Check design loading of existing building fabric.	Lack of information leading to overloading of plant weights.	✓	✓	✓	✓		Check with the Client/other Design Team Members regarding condition of existing building i.e. structural weakness, timber decay, asbestos panels/tiles, etc which could have and adverse affect on the Health and Safety of construction personnel. Incorporate all relevant information within design and highlight any known hazards.	✓	✓	✓	✓	✓	✓	3	1	3	Review of new plant locations in existing buildings yet to be held. Structural engineer will need to verify construction is suitable for plant weights.	3	1	3	Verification of plant loading	Structural Engineer	
1.5	Check condition of existing building fabric	Defective structures or deleterious materials existing and having the potential to cause harm.	✓	✓	✓			Check with the Client/other Design Team Members to determine if the design loading of the existing structure will have an affect on the services design or vice versa i.e. weight of plant items etc. Request specific structural engineering / specialist input if in doubt. Incorporate all relevant information within design and highlight any known hazards.	✓	✓	✓	✓	✓	✓	3	1	3	Review of new plant locations in existing buildings yet to be held.	3	1	3	Ensure contractor provides method statement detailing any works in said areas, and adopts safe working practices.	Structural Engineer	
1.6	Forming holes etc. in the existing structure for new services distribution/access.	Causing weakening/instability of existing structure.	✓	✓	✓	✓		Discuss with Architect/other Design Team members the requirements for forming holes in the existing building structure and any other associated builders work in connection with the engineering services. Agree maximum hole sizes and location limitations. Check also fire rating of structure being penetrated and ensure services fire stopping to a similar level. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	1	2	2	To be reviewed within the design team as part of the design process.	1	2	2	Contractor to provide Method Statement for forming large openings in existing (especially load bearing) structures.	Structural Engineer	
1.7	Check location and condition of existing services within building/site (including buried services in areas of new work)	Re-use of defective/life expired/illegal/inappropriate materials or components (e.g. lead piping or defunct cabling).	✓	✓	✓	✓		Check with Client if records exist detailing the location and condition/age of existing services i.e. where are they and are there any known defects. Carry out survey of existing services where possible (e.g. Sonar/CAT scan). Where any doubts remain arrange for the Tender package to include for the Contractor to carry out a survey of the existing services prior to commencing any other works. Include drawing in Tender package showing approximate locations of all known buried site services and suggested trial hand dig locations if deemed necessary.	✓			✓		✓	3	3	9	Services that are known to be old/defective will be replaced.	1	2	2	Any services where condition is not known and are to re-used will be included in the design as a risk and these should be agreed with the Client. Complete risk actions as identified by specialists.	Client	

KEY:

M = Mechanical
E = Electrical
P = Public Health
C = Controls
L = Lifts

Note: Add Design / Construction Team initials on a project specific basis

Risk Assessment Scoring (Product of Severity x Likelihood)

S = Severity of Hazard	**3 = High:** Fatality, Major Injury or Illness
	2 = Medium: Injury or Illness causing Short-term disability
	1 = Low: Other Injury or Illness
L = Likelihood (Probability)	**3 = High:** Certain or Near Certain to Occur
	2 = Medium: Reasonably likely to occur
	1 = Low: Very Seldom or Never Occurs
A = Assessed Risk Score	**9 = High:** Avoid / Eliminate by Design
	6 = Mitigate by Design
	4 = Mitigate where possible, minimise and control where not
	3 = Mitigate where possible, minimise and control where not
	2 = Mitigate where possible, minimise and control where not
	1 = Assumed to be within the Capabilities of a Competent Contractor - No reporting or mitigation measures required.

Notes:

1 All residual risk scores higher than 1 should be reported to Planning Supervisor and Installing Contractors.

2 All hazards to which maintenance, visitors and decommissioning personnel are exposed should be included in the O&M / Handover Documentation (Residual risk scores higher than 1)

3 Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

M&E DESIGNERS RISK ASSESSMENTS

SECTION 2: SITE ACCESS & CLEARANCE

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design					Anticipated Action to Reduce Risk	Persons at Risk						Initial Risk Assessment			Design Risk Mitigation (Hierarchy of Risk Control)	Residual Risk Assessment			Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
			M	E	P	C	L		Const	User	Public	Maint	Visitor	Decomm	S	L	A	Principle of Avoidance / Reduction / Protection and Control	S	L	A			
2.1	Delivery of materials to/movement of Plant and Materials about site (by mechanical means).	Harm caused due to access limitations or uncontrolled movement of people and traffic. Collision, dropping of materials, operators being run over or unsuitable crane bases/access.	✓	✓		✓		Discuss with Client and/or other Design Team Members to determine if there are any special restrictions regarding access to the works which will limit delivery and/or movement of plant and materials to/about the site e.g. one way traffic system, designated crane/lift zones, out of hours deliveries and lifts, footpath routes for operators/public. Check hard standing load restrictions for craneage. Specify plant with adequate lifting lugs and request info on weight/centre of gravity etc. Design and specify plant delivery sizes/times to suit restrictions, e.g. flat pack, out of hours deliveries etc.	✓	✓	✓	✓	✓		3	2	6	Review plant requirements in design team meetings and agree delivery methods	3	2	6	Ensure Contractor provides Method Statement detailing their proposals for such work.	Main Contractor	
2.2	Access limitations to existing plant and ancillaries.	Harm caused due to access limitations. Spatial limitations creating confined space working or head height restrictions/working at height.	✓	✓	✓	✓		Check with Client and/or other Design Team Members to determine if any known problems exist regarding access to existing plant and ancillaries (subterranean service ducts are currently inaccessible at RSH due to a combination of flooding, asbestos and structural scaffolding holding them up). Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	1	3	3	Allowance made in strategy for replacement of all external service ducts (ie. all ducts not under existing buildings). Solution still to be decided for service ducts running underneath existing building.	1	2	2	Ensure correct risk assessments are undertaken before any work is done in existing service ducts and contractor provides method statement detailing their proposals for such work.	Main Contractor	
2.3	Access limitations to existing services being retained.	Danger caused by location/configuration of services.	✓	✓	✓	✓		Discuss with Client and/or other Design Team Members to determine if existing means of access to existing services require to be enhanced i.e. for future maintenance (eg. Boxed in ductwork with no access for cleaning out, or high level lamp replacement). Indicate any of the above requirements i.e. new access doors and the like on existing ductwork, access gantries etc. Do not accept the standard of existing services being retainined (in terms of CDM)	✓			✓		✓	2	3	6	Allowance made in strategy for replacement of all external service ducts. Solution still to be decided for service ducts running underneath existing building.	2	1	2	Ensure Contractor provides Method Statement detailing their proposals for such work.	Main Contractor	
2.4	Excavating adjacent to live underground services.	Damage to Service. Electrocution and Scalding of Operatives	✓	✓	✓			Ensure Drawings indicate all known routes of live services on site. Consult existing records. Specify progressive scrape and hand dig only in close proximity to live services. Specify trial trenches (hand dug / progressive scrape) to correctly locate live services when in doubt over location. Avoid use of mechanical digger adjacent to live underground services. If services are unknown, conduct a sub ground survey (eg. sonar, CAT scan)	✓	✓	✓	✓	✓	✓	3	2	6	All drawings of existing services to be supplied by Client. Any services where routes are not known for sure, to be surveyed.	3	1	3	Contractors Method Statement for working adjacent to live services and adoption of safe working practices should reduce risk to low.	Main Contractor	

Key:

KEY:	Risk Assessment Scoring (Product of Severity x Likelihood)	
M = Mechanical	**S = Severity of Hazard**	**3 = High:** Fatality, Major Injury or Illness
E = Electrical		**2 = Medium:** Injury or Illness causing Short-term disability
P = Public Health		**1 = Low:** Other Injury or Illness
C = Controls	**L = Likelihood (Probability)**	**3 = High:** Certain or Near Certain to Occur
L = Lifts		**2 = Medium:** Reasonably likely to occur
		1 = Low: Very Seldom or Never Occurs
	A = Assessed Risk Score	**9 = High:** Avoid / Eliminate by Design
Note: Add Design / Construction Team initials on a project specific basis		**6** = Mitigate by Design
		4 = Mitigate where possible, minimise and control where not
		3 = Mitigate where possible, minimise and control where not
		2 = Mitigate where possible, minimise and control where not
		1 = Assumed to be within the Capabilities of a Competent Contractor - No reporting or mitigation measures required.

Notes:

1 All residual risk scores higher than 1 should be reported to Planning Supervisor and Installing Contractors.

2 All hazards to which maintenance, visitors and decommissioning personnel are exposed should be included in the O&M / Handover Documentation (Residual risk scores higher than 1)

3 Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

M&E DESIGNERS RISK ASSESSMENTS

SECTION 3: DEMOLITION, STRIPPING OUR & ALTERATIONS TO EXISTING

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design					Anticipated Action to Reduce Risk	Persons at Risk						Initial Risk Assessment			Design Risk Mitigation (Hierarchy of Risk Control)	Residual Risk Assessment			Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
			M	E	P	C	L		Const	User	Public	Maint	Visitor	Decomm	S	L	A	Principle of Avoidance / Reduction / Protection and Control	S	L	A			
3.1	Electrical Systems (links)	Linking with existing Fire Alarm system (also security, nurse call, BMS & IT)		✓		✓		Identify main loops & links at concept. Then follow on with detailed survey of all devices in linking areas, involving the Trust/Specialist operator.	✓	✓	✓	✓	✓	✓	1	3	3	Engineering strategy will be produced to advise and agree scope of works. Client investigation should be undertaken to advise connection points/arrangements.	1	1	1	Ensure the works are carried out by suitably trained operatives. Ensure Contractor provides Method Statement detailing any works in and adopts safe working practices.	Main Contractor	
3.2	M, E & PH Infrastructure	Isolating & connecting to existing site M&E infrastructure (steam, power, medical gases/oxygen, etc)	✓	✓		✓		Identify main infrastructure runs & links at concept. Then follow on with detailed survey of precise routes, isolation points (& condition, where relevant), involving the Trust/Specialist operator where required.	✓	✓		✓		✓	1	2	2	Engineering strategy will be produced to advise and agree scope of works. Client investigation should be undertaken to advise connection points/arrangements.	1	1	1	Provide Contractor with details of any requirements within the Specification and/or the Drawings. Ensure Contractor provides Method Statement detailing these works, and adopts safe working practices.	Main Contractor	
3.3	Stripping out existing services.	Harm caused by live, hot, or non-isolated/purged existing services systems.	✓	✓	✓	✓		No work to be carried out on live electrical services. Test to prove "isolation" before work commences. Allow any hot piped services to cool down and purge all gas systems before work commences. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	3	1	3	Contractor to ensure all relevant safety procedures are followed.	1	1	1	Ensure Contractor provides Method Statement detailing these works, and adopts safe working practices.	Main Contractor	
3.4	Coming into contact with existing hazardous materials, especially asbestos.	Harm caused during handling of existing materials.	✓	✓	✓	✓	✓	Check with Client/other Design Team Members if records exist detailing known hazardous materials on site. Check for Asbestos Register and/or record of other hazardous materials. For any areas where records do not exist, arrange for Specialist Contractor to carry out analysis of samples. Hazardous materials should only be stripped out by Specialist Contractors. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	3	2	6	Client to check records and instigate necessary surveys to verify site is safe and clear from hazardous materials prior to commencing design surveys.	3	1	3	Client to advise when area is considered safe.	Client	
3.5	Connecting/breaking into/alterations to and/or continuity of existing services.	Harm caused to operatives and damage/danger due to discontinuous services, e.g. Virus Lab Fridges and Extraction Systems.	✓	✓	✓	✓		Discuss with Client the requirements for breaking into existing services and the impact this may have on their operations/activities. Plan shutdowns for off-peak/unoccupied hours and ensure services are isolated before work commences. Adequate survey to be undertaken. Full implications of shut-downs should be known. Discuss with Client which services require to be maintained in operation during the duration of the works. This may involve temporary diversions or standby power/heat etc. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	1	2	2	Engineering strategy will be produced to advise and agree scope of works. Client investigation should be undertaken to advise connection points/arrangements.	1	1	1	Provide Contractor with details of any requirements within the Specification and/or the Drawings. Ensure Contractor provides Method Statement detailing these works, and adopts safe working practices.	Client	
3.6	Stripping out existing asbestos thermal insulation.	Harm caused to operatives through inhalation or skin contact.	✓	✓	✓	✓	✓	Review Clients/Users Asbestos Register for notification of the presence of Asbestos on site. Disposal and protective/isolation works must only be carried out by a Specialist Contractor. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	3	3	9	Client to check records and instigate necessary surveys to verify site is safe and clear from hazardous materials prior to commencing design surveys.	1	1	1	Specialist contractor to undertake asbetos removal works.	Main Contractor	
3.7	Removal of existing smoke detectors with radio active elements.	Harm caused to operatives through direct contact.		✓				Check if existing fire alarm detectors contain radio active elements. Consult specialist if necessary. Arrange for work to be carried out by Specialist Contractor and ensure redundant materials are properly disposed of. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	3	1	3	Client to check records and instigate necessary surveys to verify site is safe and clear from hazardous materials prior to commencing design surveys.	1	1	1	Specialist contractor to undertake removal works of smoke detectors containing radioactive material.	Main Contractor	

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Note: Add Design / Construction Team initials on a project specific basis	**A = Assessed Risk Score**	**9 = High:** Avoid / Eliminate by Design **6** = Mitigate by Design **4** = Mitigate where possible, minimise and control where not **3** = Mitigate where possible, minimise and control where not **2** = Mitigate where possible, minimise and control where not **1** = Assumed to be within the Capabilities of a Competent Contractor - No reporting or mitigation measures required.

Notes:

1. All residual risk scores higher than 1 should be reported to Planning Supervisor and Installing Contractors.
2. All hazards to which maintenance, visitors and decommissioning personnel are exposed should be included in the O&M / Handover Documentation (Residual risk scores higher than 1)
3. Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

M&E DESIGNERS RISK ASSESSMENTS

SECTION 4: DESIGN STANDARDS, PARAMETERS & SPECIFICATION

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design					Anticipated Action to Reduce Risk	Persons at Risk						Initial Risk Assessment			Design Risk Mitigation (Hierarchy of Risk Control)	Residual Risk Assessment			Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
			M	E	P	C	L		Const	User	Public	Maint	Visitor	Decomm	S	L	A	Principle of Avoidance / Reduction / Protection and Control	S	L	A			
4.1	Electrical cabling (smoke)	Smoke generated from burning sheaths in the case of a fire		✓				Adopt Low Smoke and Halogen fume cable sheaths (LSF) throughout (LSF commutes this risk from "medium" to "Low").	✓	✓	✓	✓	✓	✓	2	1	2	Review provision with Client during design stage meetings and include appropriate design specifications	1	1	1	Ensure contractor follows contract specification requirements	Main Contractor	
4.2	Stripping out existing or installing new fibrous thermal insulation.	Skin irritation or inhalation of airborne fibrous materials.	✓					Consider alternative materials for new projects. Incorporate all relevant information within current design and highlight known hazards.	✓			✓		✓	1	2	2	Review provision with Client in terms of insulation materials to be utilised.	1	2	2	Ensure the works are carried out by suitably trained operatives. Ensure Contractor provides Method Statement detailing any works in said areas, and adopts safe working practices for disposal/handling activities.	Main Contractor	
4.3	Materials and Equipment specified within the Design.	Exposure to harmful/sub-standard products and systems.	✓	✓	✓	✓		Where possible specify equipment that has the "CE" mark. By specifying Materials that carry the "CE" mark all responsibility is taken away from the Designer in terms of the material standard and its suitability for use. Otherwise, specify the highest possible alternative standard (BSI). Do not specify suspect standard equipment.	✓			✓		✓	2	2	4	Review equipment specifications with design team as part of design process and ensure design details appropriate specs.	1	1	1	Ensure contractor follows contract specification requirements.	N/A	
4.4	Safe water temperatures. (40°C and above)	Scalding.	✓					Design to HSE ACoP L8. Design in fail safe temperature devices and equipment, especially where elderly and children are involved. Ensure warning labels are on display if there is any doubt about the temperature at terminal fittings.	✓	✓	✓	✓	✓	✓	1	2	2	Architects sanitaryware package should include taps with integral thermostatic / failsafe elements. Scheme will be reviewed to ensure all appropriate items are protected. Applications not fitted with TMVs to be appropriately labelled.	1	1	1	Architect to review	Client	
4.5	M&E Distribution risers	Access to electrical services by mechanical operatives. Risk of water from wet services onto electrical equipment (safety and fire risk).	✓	✓				Design in separate Electrical and Mechanical risers. Avoid wet services being vertically above electrical areas.	✓			✓			2	2	4		2	1	2	Ensure the works are carried out by suitably trained operatives. Ensure Contractor provides Method Statement detailing any works in said areas, and adopts safe working practices for disposal/handling activities.	Main Contractor	
4.6	M&E Service ducts	Flooding of ducts	✓	✓	✓	✓		Review with Trust, current strategy for removal of flood water.	✓			✓			2	3	6	Ensure that ducts are fitted with floor gullies in the vicinity of services or alternatively sump pits with pumps.	2	1	2	Trust to ensure whatever method is used is sufficient to keep flood water away from services	Client	
4.7	Mechanical Plant heat	Heat transfer to adjacent areas	✓					Pipework, boilers and plate heat exchangers to be insulated. Ventilation strategy for ducts and plantrooms to be reviewed.	✓			✓	✓	✓	2	1	2	Insulate rooms to high standard and supply sufiicient ventilation to dissipate the heat.	1	1	1	Ensure contractor applies thermal insulation to plant and pipeowkr to ensure risk in minimised.	Main Contractor	
4.8	Plate Heat Exchangers/boilers	Hot surfaces and discharges causing burns and personal injury.	✓					Design in/specify correct and adequate safety devices, pressure relief valves automatic shut off devices.	✓			✓		✓	2	1	2	Design Standard	1	1	1	Ensure only qualified staff operate equipment.	N/A	
4.9	Handling, storage and use of substances hazardous to health, e.g. refrigerants, chlorine etc.	Possible toxic poisoning and/or general environmental pollution.	✓					Contractor to provide list of all substances proposed for use on project which fall within the jurisdiction of the COSHH Regs. End User to ensure all materials are stored, handled and installed strictly in accordance with the manufacturers written instructions and that only operatives trained in their use handle them. Where appropriate, suitable protective equipment must be provided.	✓			✓		✓	2	2	4	End User to provide list of all substances proposed for use on project which fall within the jurisdiction of the COSHH Regs. End User to ensure all materials are stored, handled and installed strictly in accordance with the manufacturers written instructions and that only operatives trained in their use handle them. Where appropriate, suitable protective equipment must be provided.	2	1	2		Client	
4.10	Electrical Systems. (generally)	Fire.	✓	✓	✓	✓	✓	Ensure that no systems become overloaded and that equipment in operation is suitable for its environment. Design to BS 7671. Where possible utilise self extinguishing materials.	✓	✓	✓	✓	✓	✓	3	1	3	Engineering strategy document will be produced to indicate design philospohy. Design requirements to be specifically reviewed with Client and Client to verify / provide suitable supply connection. Design specifications will include appropriate materials.	1	1	1	Ensure contractor follows contract specification requirements	N/A	
4.11	Battery Charger; chemical emissions.	Toxic, corrosive and possibly explosive.		✓				Consider locating externally to building. Provide high and/or low level exhaust ventilation. Discuss with the Architect re provision of louvred doors. Specify "spark proof" electrical/lighting systems in same room.	✓			✓			2	1	2		1	1	1		N/A	
4.12	The control of Legionella in domestic water and air conditioning systems.	Contracting Legionnaires disease.	✓		✓			Design to HSE ACOP L8 Guidance and any other current published anti-legionella Standards. Ensure disinfection of systems takes place. List out all system design mitigation measures from anti-legionella checklist. Position water tanks away from heat sources and solar gain. Insulate correctly and provide temperature warning system / alarms.	✓	✓	✓	✓	✓	✓	3	2	6	Scheme to include monitoring and control system linked to site BMS. Cold water service installed to promote good turnover by terminating at a high use fitting, such as regularly used WC or dirty utility macerator.	3	1	3	Ensure contractor follows contract specification requirements	N/A	
4.13	Selection/Installation of luminaires.	Luminaire falling from ceiling or diffusers burning, causing injury.		✓				The use of TP (b) Class 3 diffusers should not be considered. Ensure correct Specification of materials. Specify fall arrest or independent supports for light fittings. Do not rely on ceiling tile T-Bar as main/only support. Support independently of ceiling system/tile grid. Specify safe diffusers/louvres (not thermoplastic).	✓	✓	✓	✓	✓	✓	2	1	2	Light fitting design to be developed closely with Client. Design specifications to ensure appropriate installation methods.	1	1	1	Ensure contractor follows contract specification requirements	N/A	
4.14	Re-using existing incoming water supply	Poor quality of supply, inadequate water treatment plant	✓					Survey of existing installations should be completed by specialist for client consideration.		✓					3	2	6	Trust specialist to compete detailed survey of existing supplies and installations and provide report on findings	3	1	3	Complete actions as recommended by Trust specialist	Client	
4.15	Inadequacy of existing medical gas provision on 'Planned Care' site	Inadequate capacity from existing medical gas services	✓					Specialist to carry out survey of existing site installation to advise suitable remedial works to facilitate demands imposed on existing infrastructure.		✓					2	1	2	Trust specialist to be employed to complete a review of existing infrastructure and advise suitability for proposed new builds/refurbished areas.	1	1	1		N/A	
4.16	Inadequacy of heating availability from existing boiler plant on 'Planned Care' site	Inadequate capacity from existing boilers and plate heat exchangers serving existing hospital	✓					Survey should be undertaken to establish capacity of existing plant and confirm is there is spare capapcity for new builds/refurbished areas.	✓	✓					2	2	4	If necessary new plant may need to be installed to serve increased demand	1	1	1		N/A	

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3. Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

M&E DESIGNERS RISK ASSESSMENTS

SECTION 5: CONSTRUCTION ACTIVITIES (WORK ON SITE AND IN OCCUPIED BUILDING)

Project Title: SaTH SSP

Project No: M4556 **Date:** ____

Ref.	Activity / Works Element	Description of Hazard	Element of Design					Anticipated Action to Reduce Risk	Persons at Risk						Initial Risk Assessment			Design Risk Mitigation (Hierarchy of Risk Control)	Residual Risk Assessment			Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
			M	E	P	C	L		Const	User	Public	Maint	Visitor	Decomm	S	L	A	Principle of Avoidance / Reduction / Protection and Control	S	L	A			
5.1	M&E Services - fire stopping	Inadequate fire stopping of penetrations through floors & fire compartments, around risers/plantrooms, etc.	✓	✓	✓	✓		Agree an effective proprietary system relative to the particular M&E service pipe/duct/cable method & suitable means of installation.	✓	✓	✓	✓	✓	✓	3	1	3	Issue raised in engineering strategy document and design reviews. Contract specifications to include appropriate requirements.	1	1	1	Ensure contractor follows contract specification requirements.	N/A	
5.2	Aspergillis	Hospital's sensitive areas (particularly immune suppressed patients) could be subject to infective/viral spores from demolition in the vicinity.	✓	✓	✓	✓		Identify historic risk with the Trust & the susceptive areas (that do not already have mechanical, filtered ventilation). Build a barrier around air intakes on new build, as well as existing buildings in the vicinity. Where these patients cannot be decanted then consider providing temporary filtered ventilation systems to mitigate the risk (possibly an element of cooling also required). Liaise with the Trust as to solutions.	✓	✓	✓	✓	✓		3	2	6	Client should liaise with infection control and establish internal operational policy.	3	1	3	Client to review.	Client	
5.3	Working limitations within an occupied building (including overhead working)	Harm to occupants directly linked to work activity.	✓	✓	✓	✓		Where a building or part of a building is to remain occupied during the works, discuss with the Client/other Design Team Members the effect the proposed works will have on the Client's staff and visitors to the building, including means of access/emergency exits for users, staff and visitors to the site. Provide Contractor with details within the Specification and/or on the Drawings. Overhead working in an occupied area of a building should not be permitted unless conditions dictate otherwise, and only then after full discussions with the Client have taken place to determine all aspects of the proposed works. Incorporate all relevant information within current design and highlight known hazards. Arrange for most disruptive/dangerous elements to be undertaken in cordoned off areas or out of hours if possible. Consider decanting.	✓	✓	✓	✓	✓	✓	2	2	4	Design drawings will indicate areas of work outside of contract area.	2	1	2	Ensure Contractor provides Method Statement detailing any works in said areas, and adopts safe working practices.	Main Contractor	
5.4	Working within existing ceiling voids.	Disturbance of and exposure to deposits of dirt and dust giving rise to inhalation and airborne pollution.	✓	✓	✓	✓		Consider the removal of the minimum number of ceiling tiles etc. to provide safe working access. Consider having the works carried out outside normal working hours to limit the number of people exposed to the potential hazard. Incorporate all relevant information within current design and highlight known hazards.	✓	✓	✓	✓	✓	✓	2	1	2	Areas outside of contract area, where works will need to be undertaken in ceiling void, will be indicated and reviewed on site. Design specifications to include relevant information.	1	1	1	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	Main Contractor	
5.5	Vermin	A build up of droppings etc. could pose serious health hazards through inhalation or infection of open wounds.	✓	✓	✓	✓		Discuss with Client if known infestation of vermin applies to building. Incorporate all relevant information within current design and highlight known hazards.	✓						2	1	2	Work areas to be reviewed with client.	1	1	1	Ensure Contractor provides Method Statement detailing the works when working in any high risk area.	Main Contractor	
5.6	Dust	Inhalation of airborne particles causing lung damage and/or breathing difficulties	✓	✓	✓	✓		Ensure that the works are carried out in accordance with HSE Environmental Hygiene Sheet 1S EH40. Carry out dust producing activities externally and out of normal working hours where possible.	✓	✓	✓	✓	✓		2	1	2	Contractor to be advised of risks associated with dust in relation to the site.	1	1	1	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	Main Contractor	
5.7	Heavy Lifting: Manual	Damage to operatives back and limbs due to lifting of awkward or inappropriate weights / materials.	✓	✓		✓		Discuss with other Design Team members any requirements in this respect. E.g. Lintols, floor loads, maintenance requirements etc. Consider size and weight of components. Consider specifying flat pack plant and equipment. Consider off site prefabrication and mechanically lifting into position. Consider installing lifting beams.	✓	✓	✓	✓	✓	✓	2	2	4	Solutions to be agreed as part of design stage.	2	1	2	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	Main Contractor	
5.8	Heavy Lifting: Use of mobile crane	Inappropriate crane base or access requirements, or uneven loads.	✓	✓	✓	✓		Consider access/parking restrictions and axle loads / ground bearing limitations / crane reach. No persons or materials to be on crane when it is moved. Cone off working area of crane and ensure others do not enter coned off area.	✓	✓	✓	✓	✓	✓	3	1	3	To be reviewed with design team and methodology to be included in preliminaries	3	1	3	Contractors Method Statement for Crane Safety in Use and adoption of safe working practices.	Main Contractor	
5.9	Working at height	Injury caused by fall	✓	✓	✓	✓		Only correct scaffolding, handrails, temporary and permanent access gantries etc. can be used. Locate services as low as possible. Minimise frequency of work by maximising off site prefabrication and minimising maintainable components and frequency of visits. Consider fall arrest systems. Concentrate high level services distribution to single areas. Specify retractable components where possible. Ensure Work at Height Regs 2005 are adhered to. Harnessing to be last resort activity.	✓			✓		✓	3	2	6	Services distribution principals to be reviewed with design team.	2	1	2	Contractor is responsible for adopting safe working practices. Method Statement Required.	Main Contractor	
5.10	Working on roofs	Injury caused by fall over edge or through roof.	✓	✓	✓	✓		Discuss with Design Team Members access to roof and if any weight restrictions apply. Ensure adequate source of power and lighting available. Discuss with Architect any requirements for "Built in" safety features to facilitate future maintenance of services.	✓			✓		✓	3	2	6	To be discussed with Client. Access strategies to relevant areas to be agreed	3	1	3	Contractor is responsible for adopting safe working practices. Method Statement Required.	Main Contractor	
5.11	Working in confined spaces and underground services ducts	Entrapment/Collision with hard/sharp objects. Persons falling in.	✓	✓		✓		Ensure 2 persons are in close contact/proximity to avoid entrapment/allow assistance to be sought. Contractor to ensure adequate ventilation is provided. Cordon off access to manholes/duct entrances.	✓						3	1	3	Strategy to be agreed for working in these areas, especially subterranean service ducts at RSH.	1	1	1	Contractor is responsible for adopting safe working practices. Method statement required.	Main Contractor	
5.12	Working on/near live electrical installations.	Electrocution and loss	✓	✓	✓	✓		Only allow work on the service when isolated. Ensure switching of system is only carried out by Authorised Personnel. Introduce permit to work system. Use physical segregation when working near live electrical systems.	✓						3	1	3	Extent of works to be developed in conjunction with the client and details indicated on drawings.	2	1	2	Operation of a permit to work system and normal safe working practices by the contractor. Method Statement required.	Main Contractor	This would only apply when systems were live.
5.13	Working near unguarded moving parts.	Personal injury.	✓	✓	✓	✓		Ensure all equipment containing moving parts are fitted with adequate protective safeguards. Ensure equipment is isolated from power source whilst working is taking place on it. Introduce permit to work system.	✓			✓		✓	3	1	3	Contract specifications to detail safe working parts and appropriate isolation facilities.	2	1	2	Operation of a permit to work system and normal safe working practices by the contractor. Method Statement required.	Main Contractor	
5.14	Hot work	Fire Hazard and Personal Injury	✓		✓			Consider alternative methods of working to avoid requirement for hot work. If this is not possible, impose strict permit to work scheme. Contractor to provide and maintain fire fighting equipment, hot works early warning system and PPE. Contractor to provide temporary extract ventilation systems if required.	✓	✓	✓	✓	✓		3	2	6	Contract specifications to detail alternatives to hot works where appropriate such as press-fit (not thin wall pipes unless agreed by client). Hot works will be required on medical gases.	3	1	3	Operation of a permit to work system and normal safe working practices by the contractor. Method Statement required.	Main Contractor	
5.15	Solvent Jointing	Inhalation of Vapours.		✓				Avoid where possible by specifying alternative joining methods or materials. If unavoidable, ensure that Contractor:- A. Handles, stores and uses solvent in accordance with manufacturers and COSHH Regulations B. Provide temporary Mechanical Extract Ventilation System if required C. Provide Employees with PPE.	✓			✓		✓	2	2	4	Agrrement with Client if solvent jointing is a requirement. Contract specifications to detail requirement for safe working practices.	2	1	2	Operation of a permit to work system and normal safe working practices by the contractor. Method Statement required.	Main Contractor	
5.16	Working in deep trenches	Trench collapse and persons falling in causing harm to operatives / public. Floooding: below water table or inadequate pumping.			✓			Reduce amount of trenching required insofar as is possible by routing of same and/or multiple occupancy of services within trenches etc. Ensure specification included planking and strutting (where possible). Mimimise depth of trench by avoiding mult-layered services widen trench to compensate if necessary. Specify suitably cordoned off areas of dig. Restrict Access. Ensure specification includes for adequate mechanical pumping of surface water run-off. Check water table level.	✓		✓		✓		2	2	4		2	1	2	Contractors Method Statement for Cordoning Off and Public Access Restrictions and adoption of safe working practices.	Main Contractor	

Status: For Comment
Section:
Version No:
Dated: September 2016

M&E DESIGNERS RISK ASSESSMENTS

SECTION 5: CONSTRUCTION ACTIVITIES (WORK ON SITE AND IN OCCUPIED BUILDING)

Project Title: SaTH SSP

Project No: M4556 **Date:**

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5.17	Working in vertical ducts/risers.	Fall from height or dropping of tools etc. causing harm to persons below.	✓	✓	✓	✓		Ensure access to duct riser is cordoned off to prevent persons falling down. Ensure protective barriers/temporary flooring are installed at each level of shaft/duct to provide safe working platform and to prevent falling objects causing harm. Contractor to ensure adequate ventilation as required.	✓						2	2	4		2	1	2	Contractor is responsible for adopting safe working practices. Method Statement Required.	Main Contractor	
5.18	Access provisions.	Injury from overstretching, working at height or in tight/restricted access locations.	✓	✓	✓	✓		Discuss with other Designers method of access. Ensure Rodding Access/Valving/Balancing etc is possible and practical. Ensure design locates access points in optimum accessible positions.	✓			✓		✓	3	2	6	Requirements discussed with design team. Maintenance items such as heater batteries will not be installed in ceiling voids (unless unavoidable and agreed with client). Certain items such as volume control dampers and fire dampers will be ceiling void mounted.	2	1	2	Operation of a permit to work system and normal safe working practices by the contractor. Method Statement required. Final locations to be clearly indicated on as installed drawings.	Main Contractor	
5.19	Failure of component or pipework due to thermal shock or pressure testing.	Scalding from steam/hot water systems.	✓					Would only apply when system is operational. For steam systems, ensure correct design of drainage condensate particularly in vertical rises above valves. Install a trap set where rise occurs. Ensure permit to work scheme is introduced when system is Live. Specify suitable materials/fittings for expected working/pressures.	✓	✓	✓	✓	✓	✓	2	2	4	Specifications to detail approriate testing regimes during installation works, such as pressure testing.	2	1	2	Ensure permit to work scheme is introduced when system is Live.	Main Contractor	

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M&E DESIGNERS RISK ASSESSMENTS

SECTION 6: MAINTENANCE OF PLANT & EQUIPMENT

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design: M	E	P	C	L	Anticipated Action to Reduce Risk	Persons at Risk: Const	User	Public	Maint	Visitor	Decomm	Initial Risk Assessment: S	L	A	Design Risk Mitigation (Hierarchy of Risk Control): Principle of Avoidance / Reduction / Protection and Control	Residual Risk Assessment: S	L	A	Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
6.1	M & E Services Generally	General Maintenance access to risers on floors & plant (generally in plantrooms or on roofs).	✓	✓	✓	✓		Adequate space/access to HSE guidance to be provided to all control/access points requiring routine maintenance /adjustment, i.e 600mm min. in front of equipment/sides(s) requiring access. If not full walk in access, then access off the corridor to be safely cordoned off from main routes. Access via riser doors/access panels in rooms around risers, where necessary.	✓			✓		✓	2	2	4	To be reviewed in design team meetings. In areas to be refurbished, if adequate space is not available within existing plantrooms, new plant will be be located externally or new plant space created.	2	1	2	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	N/A	
6.2	Mechanical & Public Health Services (air ducts & pipework)	Maintenance access to ceilings around risers: smoke/fire/VCD dampers & pipework isolation valves (potentially) around risers.	✓	✓	✓	✓		Need for infrequent reasonable access to remove ceiling tiles locally. Preferably access valves directly from risers from floor level.	✓	✓	✓	✓	✓	✓	2	2	4	Maintenance items to be kept to a minimum within ceiling voids. For items on a wall in ceiling void (ie. smoke/fire dampers) access to be from within less critical area.	2	1	2	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	N/A	
6.3	Electrical Services (smoke detectors)	Maintenance access to smoke detectors in ceiling voids (if required): particularly in corridors		✓				Need for Smoke detectors (where voids are greater than 800mm) to be considered relative to fire risk assessment of services in ceilings in corridors (risk assessment to design out the need for). Very difficult to access and maintain due to being above layers of services.	✓	✓	✓	✓	✓	✓	2	2	4	Provision and requirement for ceiling void detectors to be reviewed with Client.	2	2	4		N/A	
7.7	Maintenance access to luminaires	Access to luminaires mounted at high level - falling from height.		✓				Luminaires to be located only where local access is available, or from a safe platform.				✓			1	2	2		1	2	2	All staff to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	
7.8	Cleaning out ventilation ductwork systems. Exposure to dust and biocidal chemical.	Harm to operative through direct skin contact or inhalation.	✓					Works must only be carried out by a properly equipped Specialist Contractor. Consider having the works carried out outwith normal working hours to limit the number of people exposed to the potential hazard. Incorporate all relevant information within current design and highlight known hazards. Consider permanent access gantries for cleaning out high level ducts where relevant and minimise high level ductwork where possible.				✓			1	2	2		1	1	1	All staff to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	
7.9	Noise and Vibration	Harm to operatives hearing and body.	✓	✓	✓	✓	✓	Design to ensure that any noise and/or vibration resulting from the works are kept within acceptable published limits. Deal with at source where possible and properly isolate where not. Consider affect on adjoining properties. Suitable warning signage to be allowed for and access limitations and PPE where residual noise levels still cause concern.	✓	✓	✓	✓	✓	✓	2	2	4		1	1	1		Main Contractor	
6.4	Working in Plantrooms (inc. Rooftop plantrooms)	Restricted access/maintenance space and excessive manual handling.	✓	✓	✓	✓	✓	Discuss with architect the size of plantroom required, and ensure layout takes account of access for future maintenance of plant and ancillaries, escape routes and distances and low head height warning. Discuss means of access to roof and if any weight restrictions apply. Design in fall arrest/perimeter barriers and adequate external lighting where roof access is required for plant maintenance, demountable roof/wall panels, lifting beams and landing platforms as well as proper stair/lift access.	✓	✓	✓	✓	✓	✓	2	2	4	To be reviewed at design stage.	1	1	1		N/A	
7.11	Suface Temperatures: Contact with hot sufaces, plant items and distribution pipework.	Serious burns	✓					Design to recommended temperatures particularly where elderly persons and children are concerned. Use systems with out of reach hot surfaces where possible eg. ceiling radiant heating panels/LST radiators/guards. Discuss boxing in pipework normally exposed with other designers. Ensure all pipes are fully insulated. Only work on service when shut down. Warning signs required for all surface temperatures over 45DegC. ensure correct installation of thermal insulation on pipes.	✓			✓			1	2	2		1	2	2	All staff to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	Would only apply when system is operational.
6.5	Cleaning and disinfection of water services.	Poisoning / skin irritation / inhalation	✓		✓	✓		Ensure design complies with HSE ACoP L8 (& that of HSG274 Part 2). Ensure contractor complies with COSHH Regulations for any chemical brought to site.	✓	✓	✓	✓	✓	✓	2	2	4	To be reviewed at design stage.	1	1	1		N/A	
6.6	Entry into tank and exit.	Fall, entrapment, illness while alone.	✓		✓	✓		Ensure design allows maximum space around tank (particularly above). Provide adequately sized manhole cover, access ladders inside and outside tank. Ensure design allows adequate lighting. 2 person activity.	✓	✓		✓	✓	✓	3	2	6	To be reviewed at design stage.	1	2	2		N/A	
7.14	Maintaining/cleaning and inspecting ventilation ductwork systems.	Injury while accessing inspection hatches/access doors and fall from height.	✓					Ensure design locates access points in optimum accessible positions (low level whenever possible). Ensure doors are maximum size possible and comply with Specification.	✓			✓			1	2	2	Design Specification	1	1	1		N/A	
7.16	Refrigerants and Refrigeration Machines	Toxic poisoning and general environmental pollution from refrigerant discharges.	✓					Avoid refigerants if at all possible, alternatively specify refrigerants of low/zero toxicity. Avoid where possible routing refrigerant pipework through confined spaces. Consider specifying leak protection devices.				✓			2	1	2	Low toxicity refrigerant specified	1	1	1		N/A	

KEY:

M = Mechanical
E = Electrical
P = Public Health
C = Controls
L = Lifts

Note: Add Design / Construction Team initials on a project specific basis

Risk Assessment Scoring (Product of Severity x Likelihood)

S = Severity of Hazard	3 = **High:** Fatality, Major Injury or Illness 2 = **Medium:** Injury or Illness causing Short-term disability 1 = **Low:** Other Injury or Illness
L = Likelihood (Probability)	3 = **High:** Certain or Near Certain to Occur 2 = **Medium:** Reasonably likely to occur 1 = **Low:** Very Seldom or Never Occurs
A = Assessed Risk Score	9 = **High:** Avoid / Eliminate by Design 6 = Mitigate by Design 4 = Mitigate where possible, minimise and control where not 3 = Mitigate where possible, minimise and control where not 2 = Mitigate where possible, minimise and control where not 1 = Assumed to be within the Capabilities of a Competent Contractor - No reporting or mitigation measures required.

Notes:

1 All residual risk scores higher than 1 should be reported to Planning Supervisor and Installing Contractors.

2 All hazards to which maintenance, visitors and decommissioning personnel are exposed should be included in the O&M / Handover Documentation (Residual risk scores higher than 1)

3 Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

M&E DESIGNERS RISK ASSESSMENTS

SECTION 7: PLANT REPLACEMENT & DECOMMISSIONING

DSSR

Project Title: SaTH SSP

Project No: M4556 **Date:**

Ref.	Activity / Works Element	Description of Hazard	Element of Design					Anticipated Action to Reduce Risk	Persons at Risk						Initial Risk Assessment			Design Risk Mitigation (Hierarchy of Risk Control)	Residual Risk Assessment			Description of Residual Risk Control Measures to be followed	Residual Risk Owner	Comments
			M	E	P	C	L		Const	User	Public	Maint	Visitor	Decomm	S	L	A	Principle of Avoidance / Reduction / Protection and Control	S	L	A			
7.1	M & E main plant	Maintanence and removal access to all sides of existing plant (AHU's, etc) & to replace major plant: boilers, transformers, generators, etc.	✓	✓	✓	✓		Suitable withdrawal space between units may or may not be present in existing plantrooms. This to be assessed and high risk plant items to be identified.	✓			✓		✓	2	3	6	Site surveys to establish availability of space.	2	2	4	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.	N/A	
8.1	M & E main plant (future replacement)	Access to maintenance access sides of plant (AHU's, etc).	✓	✓				Adequate space/access to HSE guidance to be provided to all control/access points requiring routine maintenance /adjustment, i.e 600mm min. in front of equipment/sides(s) requiring access / the full width of the AHU (including pipe tails) If not full walk in access, then access off the corridor to be safely cordoned off from main routes. Access via riser doors/access panels in rooms around risers, where necessary. Accomodation space to be increased, inconjunction with architect, if space not sufficient.	✓			✓			1	2	2	Current access provision to be maintained or enhanced where applicable.	1	1	1	Staff / Contractors to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	
8.2	Working at height	Fall risk from roof or intermediate floor plant area or where façade is removable	✓	✓				Use specialist plant movement contractor and use harnesses fixed to permanent secure points.	✓			✓		✓	3	2	6		2	1	2	Specialist responsible for adopting safe working practices. Method Statement Required.	Client	
8.3	Working at height	Fall risk from plant areas where removing high level plant i.e. double stacked air handling unit	✓					Use high level platforms with safety rails or high level harnesses fixed to permanent secure points	✓			✓		✓	2	2	4		2	1	2	Contractor is responsible for adopting safe working practices. Method Statement Required.	Client	
8.4	Manual handling and lifting	Injury caused by lifting plant	✓	✓				Use suitable trolley with A-frame, block and tackle or other suitable lifting device for all lifting of plant items	✓			✓		✓	2	2	4		2	1	2	Staff / Contractors to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	
8.5	Hot works in confined spaces	Fre risk / toxic fumes associated with torch cutting of redundant plant in order to remove.	✓					Ensure plant access hatches are adequately sized, and routes to/ from hatches are suitably wide to allow all plant to be removed without cutting	✓			✓		✓	2	2	4		2	1	2	Contractor provides Method Statement detailing this work.	Client	
8.6	Electrical safety	Electrocution		✓				Survey supplies to plant, isolate, disconnect and where necessary remove supplies	✓			✓		✓	2	2	4		2	1	2	Staff / Contractors to be suitably trained. Method Statement in place detailing the works, and adopts safe working practices.	Client	
8.7	Mobile crane access	Risk to public in crane radius	✓					Ensure crane operation area has adequate signage and barriers to prevent general public access	✓	✓	✓	✓	✓	✓	3	2	6		2	1	2	Contractors Method Statement for Crane Safety in Use and adoption of safe working practices.	Client	
8.8	Mobile crane lifting	Lifting plant across 'live' areas	✓					Ensure live areas have adequate signage and barriers to prevent general public access. All cranes must be in good state of repair and all relevant certification in place. All crane operators must competent and trained on the machine being used. All slinger / signallers to be experienced, trained and qualified. The lift and slinging arrangement to be planned prior to commencement of contract. Where possible a lifting platform to be used, instead of slinging individual items. The cranes are not to slew over a wide area of the building, only in the direction as planned. The load to be kept to a minimum height over the building	✓	✓	✓	✓	✓	✓	3	2	6		2	1	2	Contractors Method Statement for Crane Safety in Use and adoption of safe working practices.	Client	
8.9	Mobile crane lifting	Collapse of ground beneath crane	✓					Ensure a full and in-depth ground condition report is carried out, and ground is reinforced to withstand pressures exerted if necessary	✓	✓	✓	✓	✓	✓	3	2	6	Contractor to provide drawing indicating location for crane and maximum load weights.	2	1	2	Contractors Method Statement for Crane Safety in Use and adoption of safe working practices.	Client	
8.10	Mobile crane lifting	Loss of load	✓					Ensure lifts are planned in advance and controlled by competent person. Maintain manufacturers information on load weights, centre of gravity for all plant to be lifted	✓	✓	✓	✓	✓	✓	3	2	6		2	1	2	Contractors Method Statement for Crane Safety in Use and adoption of safe working practices.	Client	
7.2	Isolating services	Existing services isolations may not be functional (valves etc.)	✓	✓	✓			Any high risk services for isolations to be identified. Provision to be made for shut downs, freezing of pipework etc.	✓			✓		✓	2	3	6	Surveys to be undertaken to establish high risk services	1	3	3	Ensure Contractor provides Method Statement detailing the works, and adopts safe working practices.		

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Note: Add Design / Construction Team initials on a project specific basis	**A = Assessed Risk Score**	**9 = High:** Avoid / Eliminate by Design **6** = Mitigate by Design **4** = Mitigate where possible, minimise and control where not **3** = Mitigate where possible, minimise and control where not **2** = Mitigate where possible, minimise and control where not **1** = Assumed to be within the Capabilities of a Competent Contractor - No reporting or mitigation measures required.

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3 Design, maintain and install in accordance with relevant design, materials, workmanship and access standards as BSEN, BS, HSE published documentation and where relevant HTM/SHTM, BCO / FO, BCSC requirements, as design drawings and specification being prepared

Appendix 8 - CDM HAZARD/RISK IDENTIFICATION SHEET

Project Description	Shrewsbury and Telford Hospital NHS Trust – Sustainable Services Project. Options B, C1 & C2.	**Project Ref No**	087958	**Stage**	OBC

Date of Latest Update	26th October 2016	**Prepared by**	David Middleton	**Checked by**	Andy James

Location of other information provided in accordance with Regulation 9(4)	1. Reports are part of the information issued by the client at tender and can be found on the information sharing website

	FORSEEABLE HAZARD/RISK IDENTIFIED [That has potential to cause harm to those constructing, repairing / maintaining, cleaning, demolishing or using the structure]	HAZARD/RISK APPLIES DURING tick one or more of the following: Construction	Maintenance	Cleaning	In Use	Demolition	COMMENTS: Provide; ▪ the actions taken by the designer to eliminate risk, ▪ the reasons why remaining risks cannot be eliminated, ▪ an explanation of the reduction and controls necessary and the significance of the residual risk; ▪ any special instructions (e.g. to include any pre-construction information)	Residual Risk still present? YES / NO
1	General structural instability for new build elements	x					Stability to the buildings will be generally provided by concrete cores in the concrete structures and braced bays in the steel structures. Construction method statements should include sequencing to ensure that stability is maintained throughout construction. More specific instability risks to existing structures are described below.	No
2	Poor state of repair of existing structures resulting in local or general instability	x					Full condition survey to be undertaken to understand condition and properties of existing structures where modifications proposed. This information is to be taken into account when planning methods of working to existing structures. The risk cannot be entirely eliminated and great care will be required for all work close to existing structures.	Yes

3	Retaining wall construction where significant level changes occur could result in instability of adjacent hospital external areas and buildings.	x					Temporary propping or design for temporary condition should be provided to all retaining walls during site operations. The groundworks contractor should be advised of any proximity issues and where relevant the condition of nearby structures should be taken into account in selecting construction proposals	Yes
4	Introduction of openings in existing walls within existing buildings	x					Method statement for creation of openings and installation of new lintels should take into account potential for collapse and appropriate temporary works provided.	No
5	Increased loading to existing structures likely to result from new equipment resulting in possible overstressing and potential collapse.	x			x		New equipment loads to be established and strengthening works designed if necessary.	No
6	In some cases new buildings are to be constructed against the existing hospital buildings. This could result in instability via foundation undermining.	x					A method of underpinning is to be established to ensure the stability of adjacent buildings and structures. Also new foundations are to be pulled back away from the existing foundations where possible and cantilevered/balanced bases adopted.	Yes
7	Where new buildings are to be constructed against the existing hospital buildings proposed superstructure cut lines maybe such as to generate instability	x					The deconstruction specification is to take cognisance of structural support lines and a method of temporary propping is to be established to ensure the stability of adjacent buildings and structures.	Yes
8	Existing hospital areas are known to contain asbestos	x	x		x	x	An asbestos management plan is to be prepared. Reference should be made to this and a safe method of working put in place for all work to the existing buildings. Arrangements should be put in place for the safe removal of asbestos.	Yes

9	Potential during digging out of material site personnel exposure to contaminated ground	x				x	SI has not identified any likely sources of contamination. Ground gas monitoring and soil testing does not show any significant areas of risk.	No
10	Striking services below ground	x				x	Subtronic, topographical survey and CCTV drainage surveys to be carried out. Diversions to be carried out as during enabling works as appropriate.	Yes
11	Clashes with existing structures below ground	x				x	Existing foundations to be cleared as part of demolition works. Contractor to advise if any obstructions encountered during construction.	Yes
12	Risk of falling/ground instability where deep excavations required	x					If deep foundations are required, appropriate method statements to be developed. Under the proposed car park at RSH (area of the former lake) piling to be adopted.	Yes
13	Site Access/Steel Delivery compromising hospital activities	x					Contractor to organise deliveries to suit tight access. Consideration to be given to limiting steel piece sizes.	Yes
14	Instability of existing buildings during demolition	x					Full structural survey and sourcing of existing plans to be carried out to delineate potential structural cut lines through interrogation of structural principles. Contractor to carry out full site appraisal and method statement for works	Yes

NOTE: those residual risks that are not likely to be apparent to a competent contractor / cleaner / maintainer / user / demolisher of the structure must be forwarded to the Principal Designer for inclusion in the pre-construction information.