



A REPORT BY ENVIROS CONSULTING LIMITED: OCTOBER 2008

**ERIC WRIGHT FACILITIES
MANAGEMENT LTD**

**CLITHEROE COMMUNITY HOSPITAL
FLOOD RISK ASSESSMENT**



Publication title Clitheroe Community Hospital Flood Risk Assessment
CAN ER016 0003
Volume number Volume 1 of 1
Version Final Report
Date October 2008
File Reference 030808 ER0160003 FRA Clitheroe V3 Khe.Doc

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EXECUTIVE SUMMARY

Enviros Consulting was commissioned by Eric Wright Facilities Management to undertake a flood risk assessment including outline drainage design for the proposed redevelopment of the Clitheroe Community Hospital site in July 2008. This report does not include the proposed drainage strategy as this has been submitted to the client separately.

Flood Risk

1. The proposed redevelopment has been assessed as two individual sites, one being developed from greenfield into a new hospital site (site A) and the other being re-developed from the old hospital site into a residential scheme (site B). These sites are shown on Appendix 1.
2. The Environment Agency flood map indicates that both sites are located in flood zone 1, where the annual probability of fluvial and tidal flooding is estimated to be less than 0.1% (1 in 1000 year). The low flood risk to the site from fluvial and tidal sources has been confirmed in this assessment.
3. Smaller, more localised flood sources have also been considered. These include the water mains, storm water drains and combined sewers on the roads surrounding the site, groundwater, overland flow and a pond to the south of the site.
4. The assessed risk posed by the water distribution main beneath site B to the proposed surrounding development was assessed to be moderate prior to mitigation. This risk can simply be reduced down to low by designing to discourage flow from entering the buildings. This could be achieved through raising finished floor levels or by creating features that will intercept and divert flows (e.g. gullies).



1. INTRODUCTION

1.1 Background

This assessment was commissioned in July 2008 by Eric Wright Facilities Management Ltd. It is designed to identify constraints to development due to potential flooding at an area of land near the Pimlico Brook just northeast of Clitheroe town in the Ribble Valley in Lancashire. A drainage strategy statement has been developed separately and is available as a stand-alone document (Reference 1).

The site area is approximately 3ha in size and is centred on National Grid Reference (NGR) 375502 443037. The site's address is at Chatburn Road (A671), Clitheroe BB7 4JX.

The site's location is shown on Figure 1.

1.1.1 Requirement for a Flood Risk Assessment

Planning Policy Statement 25 (PPS25; Reference 2) states that a flood risk assessment should be prepared to accompany any planning application for sites which have an area greater than 1 hectare (ha). As such, even though the site is located in an area of low flood risk, as indicated by flood zone 1 on the Environment Agency flood risk map, a flood risk assessment is required.

The potential effect of the proposed development on the surrounding area's drainage systems (both natural and artificial) should be considered in the flood risk assessment. In addition to this PPS25 requires that all sources of flooding, including more localised ones such as sewers, drains and smaller streams which may not be represented on the Environment Agency flood map, are then also considered.

1.1.2 Sequential Assessment

Under the sequential approach decision makers are required to direct development towards the lowest flood risk zone¹ available. In practice this means that where development is proposed in either flood zone 2 or 3 checks must be made to ensure that no more suitable sites are reasonably available in a lower flood risk zone.

The Environment Agency flood map (Figure 2) shows that the whole site is located in flood zone 1 indicating a low likelihood of flooding from major fluvial or tidal sources. As such the site is considered, from a flood risk perspective, to be suitable for development / re-development.

1.2 Objectives

The main objectives of the commission are to:

- ◆ identify and understand all potential flood sources,

¹ The Environment Agency flood map was produced as part of a nationwide project to provide visual representation of the extent and risk of flooding throughout England and Wales. This was undertaken for all tidal sources and fluvial sources where catchments are greater than 3km². The flood map classifies land as being in one of three zones (flood zones 1, 2 or 3). In areas defined as flood zone 3, the Environment Agency estimate that the annual risk of flooding exceeds 1% or 0.5%, for fluvial or tidal sources respectively. In flood zone 2 the annual risk is estimated to be between 0.1 and 1% for fluvial or between 0.1 and 0.5%, for tidal sources. In flood zone 1 the annual risk is assessed to be less than 0.1%.



- ◆ undertake an assessment of the risk from these flood sources in line with the requirements of PPS25 (Reference 2),
- ◆ demonstrate how any significant risks would be mitigated,
- ◆ provide advice as to the management of any residual risks,
- ◆ develop an outline drainage strategy for the site in line with current guidance.

1.3 Consultees

A Strategic Flood Risk Assessment (SFRA) is currently being prepared for the Ribble Valley. This was however not yet available at the time of writing this report.

The local water supply & sewerage company, United Utilities, provided sewer and water mains records (Appendix 2).

A site survey drawing produced by Nightingale Associates (Appendix 3) was provided by the client.

A site area walkover was undertaken by Enviro staff on 22nd July 2008.

1.4 Report Structure

Chapter 2 provides background information on the site, the surrounding area and the proposed development. Chapter 3 comprises a detailed baseline risk assessment for all identified sources of flooding with mitigation described in Chapter 4. The report is summarised and concluded in Chapter 5 with figures and appendices provided thereafter.



2. SITE DESCRIPTION AND BACKGROUND

2.1 Site Description

The site is located to the northeast of Clitheroe in Lancashire's Ribble Valley, north-western England. It is centred on NGR 375502 443037.

The site location is shown on Figure 1.

2.1.1 Land Use / Cover

As the proposed development is expected to be completed in separate phases, the site has been divided into two parts. In addition, this takes into account the possibility that two separate planning applications may be submitted for the hospital and residential sites.

The north-eastern section, site A, is currently greenfield. Site A has a cover of grass, shrubs and trees. Site A is bounded by Chatburn Road to the northwest and Pimlico Link Road to the northeast. Site B is located to its southwest and an industrial estate is being constructed to the southeast of the site.

Site B, the south-west, is occupied by the current hospital buildings. It is covered by a mixture of buildings, parking space and access roads, further paved areas and some limited green spaces. Site B is bounded by Chatburn Road to the northwest and by site A to the northeast. A grassy field forms the boundary of site B to the southwest with the same industrial estate as above being constructed to the southeast.

It should be noted that unless otherwise stated descriptions and assessments in this report relate to both of the two site areas.

Some of these features can be seen on Figure 1.

2.1.2 Topography

From comparison of the Ordnance Survey (OS) map with the topographic survey (see below) ground levels on site A slope down from a maximum elevation of approximately 97maOD on its south-eastern boundary to the lowest part of the site in the northwest. Ground levels here are elevated at some 92maOD, which is slightly lower than the level on adjacent Chatburn Road.

A topographic survey of site B was carried out by Nightingale Associates in June 2008 (Appendix 3). This survey indicates ground elevations on site B to be between 93.4maOD and 97.5maOD. These minimum and maximum elevations are located in the site's northern and southern corners respectively. The area on which the hospital building stands is generally fairly level at between 96maOD and 97.5maOD. Ground levels slope gently from this elevation down to Chatburn Road to the north, which is elevated at approximately 93.2maOD.

2.1.3 Geology / Hydrogeology

The British Geological Survey (BGS) map (Reference 3) indicates that drift cover at the site is Boulder Clay. The solid geology at the site is comprised of mudstones and limestones of the Worston Shale Group. This is underlain by the Chatburn Limestone, which is a minor aquifer.



The site is not located in a groundwater protection zone (Reference 4).

The local geology and hydrogeology are discussed in further detail in Section 2.2.4 below.

2.2 The Surrounding Area

2.2.1 Land Use

The site is located on the north-eastern edge of Clitheroe and south of Lanehead quarry. Land use in the area is mixed, consisting of residential buildings and schools to the south west, new industrial properties to the south, and open countryside and quarries to the north and east.

Some of these features are visible on Figure 1.

2.2.2 Topography

Ground levels in the area generally slope down towards the local watercourses, with the exception of the quarries. The site itself is located on a slope down towards the Pimlico Brook. The Pimlico Brook is located about 150m to the northeast of the site and, based on observations made during the site area walkover, is elevated some 5m below the lowest ground level on the site.

Land to the south and southeast of the site slopes down towards the Worston Brook, located approximately 600m to the southeast. From the site's south-eastern boundary ground levels first rise a little to the south- and southeast, thereby forming a ridge there. Ground level elevations reach highs of around 100maOD, before falling again towards the Worston Brook further south where ground levels are at an elevation of approximately 88maOD.

2.2.3 Clean Water and Sewerage Assets

Clean water and sewerage assets in the area are for the most part are owned and operated by United Utilities. Plans are included as Appendix 2.

Water Mains

The United Utilities map shows that two water distribution mains run along Chatburn Road and another along Pimlico Link Road, located respectively to the northwest and the northeast of the site. One of the water distribution mains turns south from Chatburn Road onto site B along its south-western boundary. This main supplies the existing hospital development there.

To the south of the site runs a network of water distribution mains which can be seen to supply the residential and industrial properties located there.

The sizes of the water mains have not been specified.

Storm Water Drains and Sewers

The United Utilities plan of the area does not have any indication of sewers or drains being present in the vicinity of the site. However, a number of manhole covers on site and along the Chatburn and Pimlico Link Roads indicate that systems are in place. From visual inspection of the manholes by Booth King Partnership it is known that storm water and foul drainage are discharged into a

combined sewer under Chatburn Road. This sewer is believed to flow to the west, where a sewage treatment plant is located just beyond Clitheroe town.

In addition, a deed of easement (Appendix 4) shows two existing storm water drains flowing roughly from south to north across the edge of the site, joining each other. One of these drains is thought to be disused as it ends at the site's south-western boundary. Highway drainage is also known to enter this system at a location a short distance south of Chatburn Road. From here the storm water drain then flows north and discharges into Pimlico Brook.

The deed does not include any information on the size of catchments contributing to the storm water drains. For the highway drain an estimated catchment of 0.2ha is stated.

2.2.4 Geology / Hydrogeology

Interpretation of geology has been undertaken using the 1:50,000 British Geological Survey (BGS) map (Reference 3). It is not known if any fill (Made Ground) overlies the natural strata although this is common in most previously developed areas which would include Site B.

The geological succession at the site and in the area is as follows:

- ◆ Boulder clay cover is extensive in the area and has been proved at over 9m thick in places.
- ◆ Boulder Clay at the site is underlain by the Worston Shale Group (*Solid / Carboniferous*), which outcrops to the south, east and west of the site for a number of kilometres. This is interbedded with limestone units, most notably the Knoll Limestone, which underlies part of the site.
- ◆ The Worston Shale group is underlain by the Chatburn Limestone (*Solid / Carboniferous*) a minor aquifer which outcrops to the north of the site.

The groundwater vulnerability map for the area (Reference 5) classifies the Carboniferous Limestone in the Ribble Valley as a minor aquifer (variably permeable) due to the presence of significant mudstone units, such as the Worston Shale group. These mudstone bands cause the rock unit to act as a series of small, individual aquifers. Where low permeability drift deposits are present these are given a low soil leaching classification but in areas where the aquifer is exposed, such as the quarries to the north and east of the site, a high soil leaching classification is given.

The nearest groundwater Source Protection Zone to the site is located over 4km to the north (Reference 4).

2.2.5 Local Natural Drainage Systems

The watercourses nearest to the site are the Pimlico Brook and the Worston Brook. These streams are both tributaries to the River Ribble, which flows northeast to southwest roughly 1km north of the site.

Pimlico Brook

The Pimlico Brook is located about 100m north of the site at its closest point. At this point the brook flows from northeast to southwest. This watercourse receives flow from the dewatering of Tarmac's Bankfield Quarry. This increased discharge



has, in combination with silting up of the stream, at times caused water to back up locally into the Bellman Marsh area, located just to the north junction of Pimlico Link Road with Chatburn Road.

The FEH CD-ROM defines the Pimlico Brook's catchment size at its closest location to the site as 0.96km² (Reference 6).

Worston Brook

The Worston Brook is fed by a number of tributaries, the most significant of which is the Rad Brook which joins it upstream of the site. Nearest the site, the brook flows generally east to west. It is located approximately 550m to the south of the site at its closest distance. At this location the brook joins a smaller watercourse called Mearley Brook. The combined flow runs through Clitheroe and discharges into the River Ribble roughly 4km to the southwest of the site. At its closest location to the site the banks of brook are at an elevation of approximately 88maOD.

The Worston Brook has a total catchment area of approximately 4.94km² at its closest location to the site (Reference 6). The Mearley Brook has a total catchment area of 7.86km² just downstream of its confluence with the Worston Brook (Reference 6).

2.2.6 Other / Artificial (Unnamed Pond)

A large pond with an estimated surface area of 0.3ha is located just south of site A's south-eastern boundary.

It was not immediately clear from visual observations made during the site walkover how this pond is fed and whether it has a piped outflow or overflow. However, due to its location on a ridge it cannot have a large contributing catchment area and therefore cannot be natural. As it is in the vicinity of a number of quarries and adjacent to a new industrial estate in the process of being built it is likely to be a holding pond for a quarry's de-watering processes or an attenuation drainage feature for the industrial sites which receives a pumped inflow.

2.3 Development Plans

It is understood that a development team including the Eric Wright Group is planning to construct a new building on site A which will house the existing hospital services currently located on site B. Subsequently the existing hospital building will be demolished and replaced by residential units.

The proposed development plans are included as Appendix 5.

3. EXTERNAL FLOOD SOURCES

3.1 Overview

Current guidance (Reference 2) recommends that a flood risk assessment should consider all possible sources of flooding for a given site. A large number of specific mechanisms exist, although usually many of these can be easily discounted. Table 1 below summarises a range of potential risks and whether they are likely to be of relevance to the study site.

Table 1 Summary of potential flood sources

Flood Type	Source	Pathway	Consider further
Fluvial	Pimlico Brook	Overtopping of the banks, then overland flow towards the site	Yes
	Worston Brook	Overtopping of the banks, then overland flow towards the site	Yes
Tidal	None	None	No
Services	Water supply mains	Pipe burst and overland flow	Yes
	Storm water drains	Blockage / surcharge followed by overland flow	Yes
	Combined sewers	Blockage / surcharge followed by overland flow	Yes
Overland flow	Adjacent higher ground	Intense rainfall and overland flow towards the site	Yes
Groundwater	Minor Aquifer	High groundwater levels expressed at surface	Yes
Other / Artificial	Unnamed pond to the southeast of the site	Overtopping, then overland flow towards the site	Yes

3.2 Risk Assessment

The risk assessment methodology used within this project is set out in Appendix 6 and is written based on guidance provided in PPS25. The guidance recommends that flood risk is assessed through consideration of both the magnitude of potential effects and the probability of occurrence. The magnitude of effect is then dependent on two factors; these are the sensitivity of potential receptors and the severity of the flooding. There are therefore three criteria on which flood risk is assessed. These are:

- ◆ Sensitivity of the receptor,
- ◆ Severity of flooding, and
- ◆ Probability of occurrence.

3.2.1 Sensitivity of Receptor

The proposal concerns two sites which will be developed separately: an area of residential properties on site A and a new hospital building on site B.

PPS25 defines hospitals as '*more vulnerable developments*'. Given this its sensitivity is defined as high (Appendix 6).

Residential development is also defined within PPS25 as a '*more vulnerable development*.' Given this its sensitivity is also defined as high (Appendix 6).

Although any parking and open green spaces would be considered less sensitive, to ensure a conservative assessment the sensitivity of these sites as a whole have been defined as high.

Human health is classified as being highly sensitive. Human health issues include any plausible threat to life or health of any person.

Development also has the potential to impact flood risk posed to off-site receptors. All off-site development is considered to be highly vulnerable to any increase in flood risk and therefore it is important that any adverse off-site impacts to flood severity or frequency are avoided. No potential impacts to off-site receptors have been identified for this site other than changes to the runoff regime. This issue is covered in a separate Enviro report on site drainage (Reference 1).

3.2.2 Severity and Probability of Flooding

The criteria used to classify both severity and probability of flooding are fully defined within Appendix 6 and their assignment as relevant to this study is discussed below and summarised in Section 3.9 (see Table 2 therein).

3.3 Fluvial

The Environment Agency flood map is shown in Figure 2 and clearly shows that the whole site is located in flood zone 1. This indicates that the annual risk of flooding at the site from major fluvial sources has been assessed by the Environment Agency as less than 0.1%.

The low flood risk from these sources, as assessed by the Environment Agency, is confirmed by the local topography.

3.3.1 Worston Brook

The Worston Brook is located approximately 500m south of the site at its closest distance. At this point the brook is at an elevation of some 88maOD. From the brook ground levels rise towards the site, reaching a ridge elevated at a little over 100maOD located to the south of the site. The Worston Brook, even once it has joined the Mearley Brook, has a relatively small catchment area.

From the above, it is concluded that the likelihood of flooding from this source occurring at the site is low, with a potential very low hazard magnitude.

3.3.2 Pimlico Brook

The Pimlico Brook is located approximately 100m to the north of the site at its closest distance. There is no elevation data for this brook but observations made



during the site walkover indicate that it is at an elevation of approximately 5m below the lowest part of the site. This is a small watercourse (catchment area just under 1km²) and its distance from and elevation in relation to the site mean that flooding of the site from this source is unlikely.

It is assessed that the magnitude of this potential hazard is very low and the likelihood of its occurrence is low.

3.4 Services

3.4.1 Mains Water Supply

The areas of the site which will be developed are at a higher elevation than Chatburn Road. A burst of one of the water distribution mains on this road would result in localised flooding on the road which would be conveyed along the slope of the road to the west and by the road drainage system. As such there is no viable pathway for flooding from this source.

The water distribution main on site B could cause localised flooding on site B if it were to burst. However, as the site slopes down towards Chatburn Road, water is unlikely to collect in developed areas of the site but would flow onto the road and away from the site. There is no feasible pathway for flooding from this main to reach site A.

A burst of the distribution main along Pimlico Link Road, if it occurred, would also cause water to flow along the slope of the roads and away from the site. As such this could not cause significant impact to the proposed development.

The land to the south of the site is at a higher elevation than the site. If one of the water distribution mains near to the site's south-eastern boundary were to burst, floodwater could flow across the site. However, as above, the existing slopes would convey water through the site preventing it collecting within the proposed development.

Any significant discharge from a burst water main would most likely be of short duration (less than one hour) assuming a rapid response from the emergency services or the water company.

The likelihood of a flood event due to a burst water main cannot be easily quantified. It is therefore conservatively assessed as medium. The magnitude of the potential hazard created by the water distribution main supplying the existing hospital site (site B) is assessed to be medium due to the likely high flow velocities associated with burst water mains. The hazard from the other distribution mains is assessed as very low.

3.4.2 Storm Water Drains and Sewers

A failure of the combined sewer on Chatburn Road could potentially occur, for example due to very high system flows after a large storm event or a collapse within the system itself. In this case storm water could surcharge, flooding Chatburn Road adjacent to the site. Due to the local topography water would however then preferentially flow down slope both to the east and also onto the field to the north of Chatburn Road where ground levels are lowest. Given this such flooding is highly unlikely to impact the development area.



Due to the risk posed to human health by contamination of the floodwater, the hazard's magnitude is assessed to be high. The likelihood of a flood event affecting the proposed development due to failure of the combined sewers is assessed to be of very low probability.

A failure of the storm water drain below site A could potentially occur, for example due to very high system flows after a large storm event or a collapse within the system itself. In addition, the deed of easement (Appendix 4) indicates the presence of two manholes in the northern corner of site A. As such, any surcharge (and resulting flooding) caused by a failure of the storm drain would likely occur at this location, also the lowest part of the site. Water would collect here but, due to the local topography, it would then flow onto Chatburn Road and away from the site. No development is proposed on the northern corner of the site and such there is no potential for the proposed residential properties or the hospital to be impacted by such flooding.

In light of the above it is assessed that the likelihood of a flood event from the storm water drain affecting the site development is very low with a resulting very low severity of flooding.

3.5 Overland Flow

A small area of land to the south / southeast of the site is elevated above it. During periods of very intense rainfall runoff from this higher ground could potentially flow onto the site. However, this area of higher elevation has been developed in quite recent years and is served by its own drainage system. As such the drainage system would either have to fail or the rainfall event would have to be extreme in order to flood the system. The area of land that would contribute to potential flooding by overland flow is very small and therefore the amount of runoff that can be generated there is equally very small.

As such the potential hazard magnitude has been assessed as very low. The likelihood of a flood event from this source is assessed to be of medium probability.

3.6 Groundwater

The Carboniferous Limestone present below the site is classified as a minor aquifer in the area. The site itself is also underlain by a drift cover of low permeability Boulder Clay which would act as an aquitard. In addition the site is at a higher elevation than the land to the north, making shallow groundwater seepage unlikely. There was no evidence of past groundwater flooding at the time of the site walkover.

From the above, it is concluded that both the likelihood and severity of impact of groundwater flooding occurring at the site are very low.

3.7 Other / Artificial (pond to southeast of site)

It is not immediately clear from visual observations made during the site walkover how this pond is fed and whether it has a piped outflow or overflow. However, due to its location on the higher elevation of a slope it cannot have a large contributing catchment area and cannot be natural. As it is in the vicinity of a number of quarries and adjacent to a new industrial estate in the process of being built it is likely a holding pond for a quarry's de-watering processes or an attenuation drainage feature for the industrial sites.



As such, it is deemed unlikely that this pond will flood. However, should any flooding occur floodwater would flow across the site, down the slope and onto Chatburn Road from where it would flow away from the site.

From the above it has been concluded that both the magnitude of this potential hazard would be very low and the probability of its occurrence medium.

3.8 Summary Table of Risks

The probability and severity of each type of flooding has been assessed in line with the methodology and guidance set out in Appendix 6. This is then combined with the assessment of receptor sensitivity to define the level of flood risk on a scale ranging from negligible to high.

Typically risks assessed to be low or less are acceptable whereas risks assessed to be moderate or high require additional mitigation or management to enable development to proceed.

Prior to mitigation the only potential flood mechanisms for which the resultant risk was assessed to be moderate or greater were the risks associated with overland flow from the small area of higher ground to the south of the site and the burst water main supplying the Hospital.



Table 2 Flood risk summary table

Flood Source	Receptor	Sensitivity	Magnitude of Hazard	Probability of occurrence*	Flood Risk
Fluvial	Worston Brook	High	Very low	Low	Low
	Pimlico Brook	High	Very low	Low	Low
Services	Mains water supply (distribution main below site B / no feasible pathway to site A)	High	Medium	Medium	Moderate
	Mains water supply (all other mains potentially affecting both sites)	High	Very low	Medium	Low
	Combined sewer	High	High	Very low	Low
Overland Flow	Storm water drains	High	Very low	Very low	Very low
	Adjacent higher ground	High	Very low	Medium	Low
Groundwater	Shallow Groundwater	High	Very low	Very low	Very low
	Pond to the southeast	High	Very low	Medium	Low

* During life time of development



4. FLOOD MITIGATION AND MANAGEMENT

4.1 Water Mains on site B

The proposed options for reducing the potential risk posed by the water distribution main below site B are:

1. raising finished floor levels for the parts of the buildings used for habitation to ensure a clear differential of 300mm when compared to the surrounding ground level,
2. constructing a gully or similar to intercept any surface flows created by a potential burst water main and direct them away from any buildings and onto Chatburn Road.

Both these options would prevent water flowing onto sensitive development on the site. It is not necessary for all the proposed residential properties on the site to have mitigation put in place against potential flooding from the mains; only those properties which are within the flow path of the water released by a possible burst main can be affected. The details of mitigation measures will be agreed at the detailed design stage for site B. At that stage it will also have to be agreed which properties will require mitigation. Following the implementation of this mitigation the risk posed by the mains water infrastructure will reduce down to low.



5. CONCLUSIONS AND RECOMMENDATIONS

Following the completion of this flood risk assessment, in line with the recommendations of PPS25, the following conclusions have been reached and the recommendations below have been made:

1. The risk posed to the whole site (i.e. both site A and site B) from fluvial sources is assessed to be low, confirming low probability flood zone indicated on the Environment Agency flood map. The sources which have been considered are the Worston Brook and the Pimlico Brook.
2. The risk posed to site B (the proposed residential development) and particularly the area near the south-western boundary, by the water distribution main which flows below the site is assessed as moderate prior to mitigation.
3. The design of the development in the south-western part of site B should be such that any flood water from a possible mains burst cannot flow onto sensitive parts of the development, i.e. most importantly the residential buildings. This could be achieved through creating a feature that will intercept and divert flows (i.e. a gully or similar) or by raising finished floor levels above the surrounding ground.
4. The risks posed to both areas of the site from all other smaller flood sources were assessed as being low to very low.



6. REFERENCES

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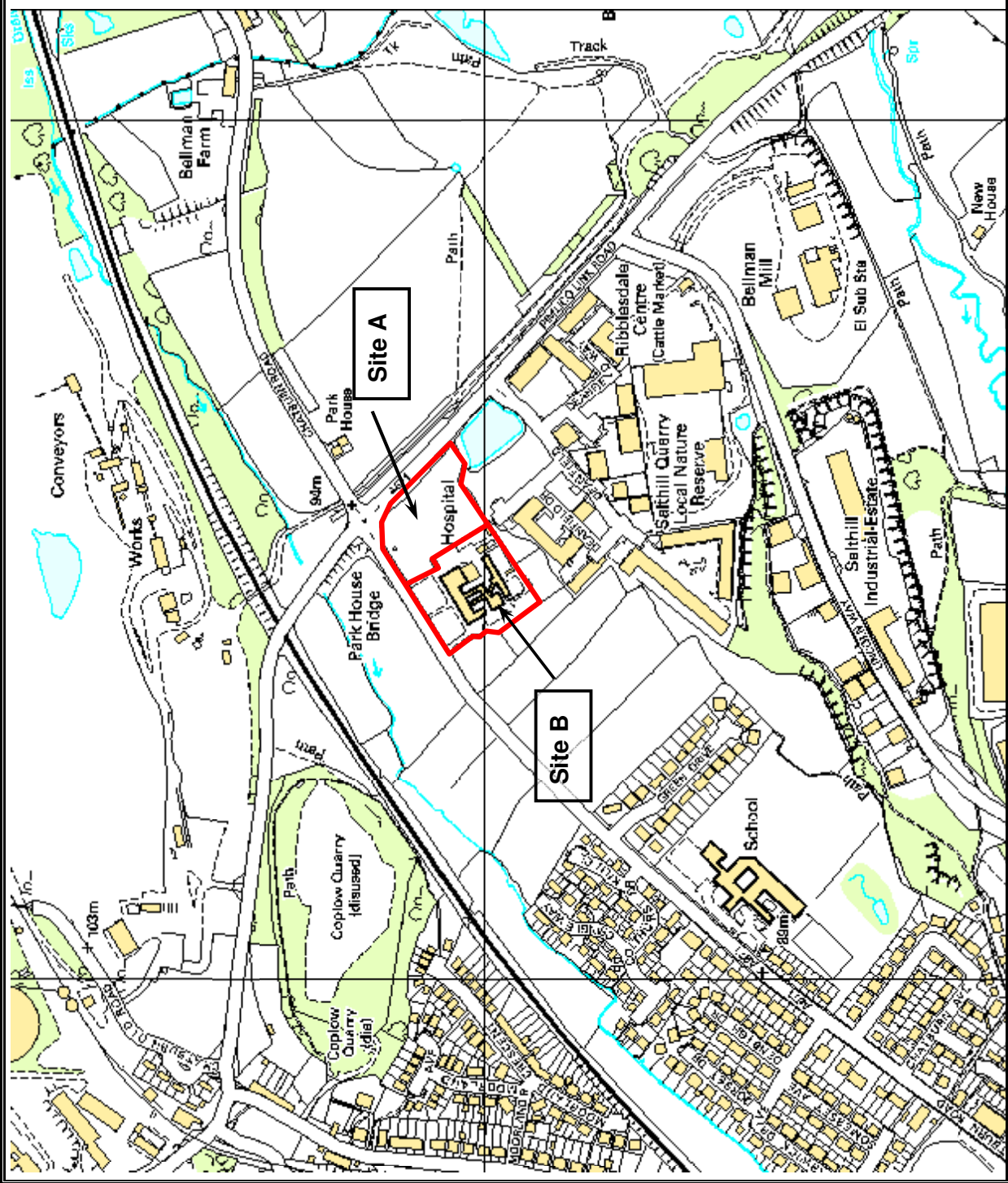
FIGURES



Figure 1 Site Location Plan



KEY		Site boundary
CLIENT	ERIC WRIGHT FACILITIES MANAGEMENT LTD	
PROJECT	CLITHEROE COMMUNITY HOSPITAL FLOOD RISK ASSESSMENT	
DRAWING	SITE LOCATION PLAN	
SCALE	CAN	ER016 0003
DRAWN	NTS	DRAWING NO
CHECKED	KHE	FIGURE 1
	JWO	DATE
		SEPTEMBER 2008
		



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Figure 2 Environment Agency Flood Map

KEY

Site boundary



CLIENT

**ERIC WRIGHT FACILITIES
MANAGEMENT LTD**

PROJECT

**CLITHEROE COMMUNITY HOSPITAL
FLOOD RISK ASSESSMENT**

DRAWING

**ENVIRONMENT AGENCY ONLINE
FLOOD RISK MAP**

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SCALE

CAN

ER016 0003

DRAWN

KHE

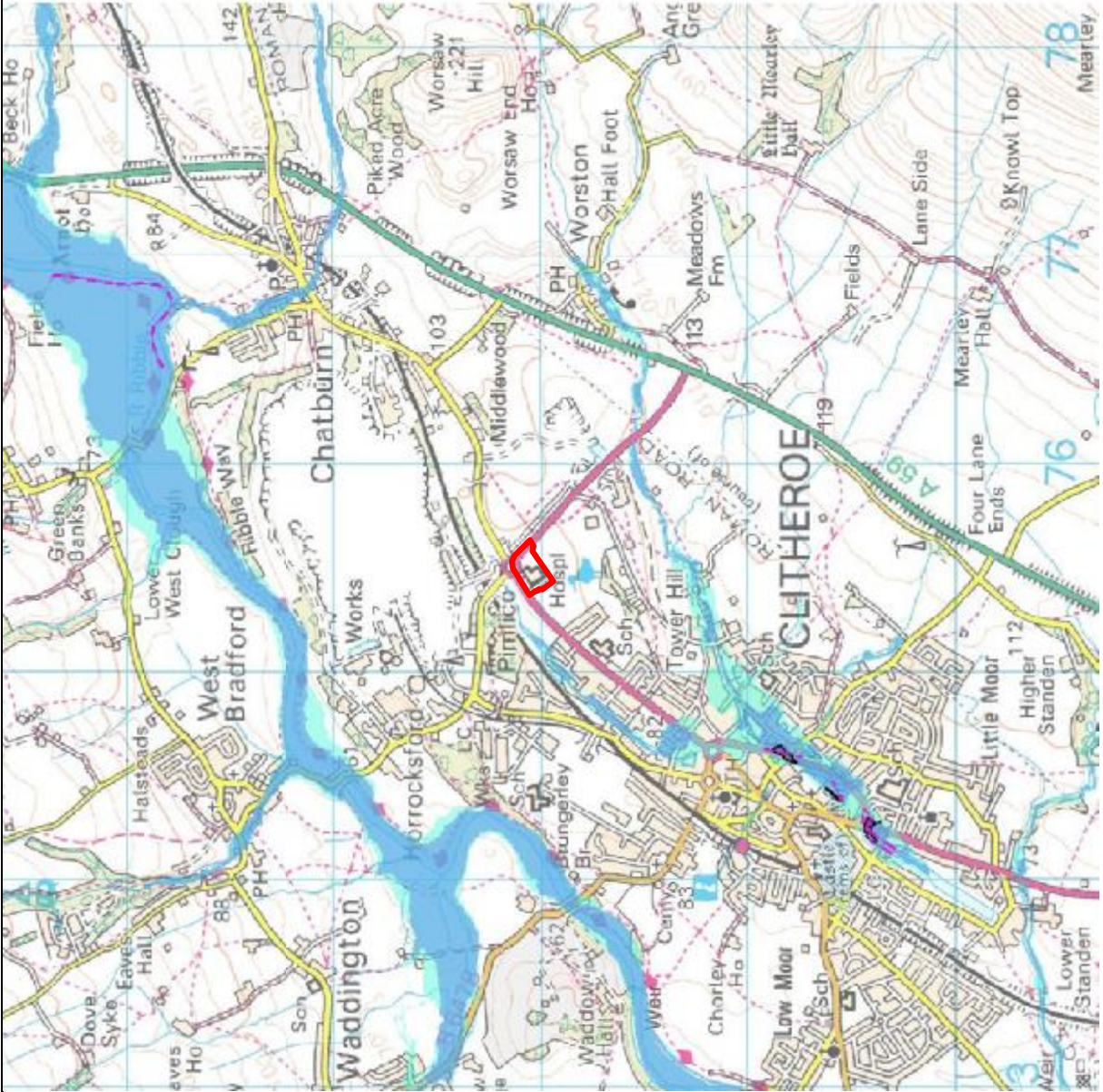
FIGURE 2

CHECKED

JWO

DATE

SEPTEMBER
2008



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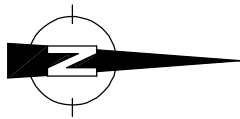


APPENDICES



1. PLAN SHOWING SITE A AND SITE B BOUNDARIES

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Combined Site A+B approx area
30645 sq m
3.06 hectares
7.57 acres



Site A approx area
9908 sq m
0.99 hectares
2.45 acres

Site B approx area
20737 sq m
2.07 hectares
5.12 acres

The Observatory, 1 Old Haymarket, Liverpool L1 6LA - Tel: 0151 709 2249 Fax: 0151 7097927 - e-mail: liverpool@nightingaleassociates.com - web: www.nightingaleassociates.com

Rev 0

date dd/mm/yy
revised by
checked by

NIGHTINGALE
associates

Hanwell London Brighton Cardiff
Rodingale Exeter Capetown Liverpool
Birmingham Dartford Leeds Bristol

Project 0375EL Clitheroe Community Hospital

Phased Redevelopment

Drawing Title Existing Location / Site Topographical Survey

Scale 1:250 Date 09.06.08 Drawn by TK Checked by Status PRELIMINARY

Drawing No AR-WS-XX-PL-100-001 Rev.



2. UNITED UTILITIES ASSET PLANS

These general conditions and precautions apply to the wastewater network of United Utilities.

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

1. United Utilities provides the approximate locations of its sewers according to its records. These records are not necessarily accurate or complete nor do they normally show the positions of every sewer culvert or drain, private connections from properties to the public sewers or the particulars of any private system. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated. The records do indicate the position of the nearest known public sewer from which the likely length of private connections can be estimated together with the need for any off site drainage rights or easements.
2. Special requirements relative to our sewers may be indicated. United Utilities employees or its contractors will visit any site at reasonable notice to assist in the location of its underground sewers and advise any precautions that may be required to obviate any damage. To arrange a visit or for further information regarding new supplies, connections, diversions, costing, or any notification required under these General Conditions, please call us on **0845 746 2200**.
3. Where public sewers are within a site which is to be developed and do not take any drainage from outside the area, they are from an operational viewpoint redundant. The developer must identify all redundant sewers affected by the development and apply to United Utilities in writing for these sewers to be formally closed. The developer shall bear all related costs of the physical abandonment work.
4. Public sewers within the site that are still live outside the area, will be subject to a "Restricted Building zone". This would normally be a surface area equivalent to the depth of the sewer measured from the centre line of the sewer on either side. No construction will be permitted within that zone. The developer should also note that deep and wide rooted trees must not be planted in close proximity to live sewers. Access to public sewers must be maintained at all times and no interference to manholes will be permitted during construction work.
5. Where there is a public sewer along the line of a proposed development/building, arrangements shall be made by the developer at his cost to divert the sewer around the development. Where this is not possible and as a last resort, a "Building Over Agreement" will need to be completed under section 18 of the Building Act 1984. The developer shall design building foundations to ensure that no additional loading is transferred to the sewer and submit such details both to the Local Authority's Building Control Officer and to United Utilities for approval/acceptance. United Utilities on a rechargeable basis would normally undertake all aspects of design work associated with the diversion of any part of the operational wastewater network.
6. Where there is a non-main river watercourse/culvert passing through the site, the landowner has the responsibility of a riparian owner for the watercourse/culvert and is responsible for the maintenance of the fabric of the culvert and for all works involved in maintaining the unrestricted flow through it. Building over the watercourse/culvert is not recommended. The developer must contact the local authority before any works are carried out on the watercourse/culvert. Where it is necessary to discharge surface water from the site into the watercourse/culvert the developer shall make an assessment of the available capacity of the watercourse/culvert (based on a 1 in 50 year event) and ensure that the additional flow to be discharged into the watercourse/culvert will not cause any flooding. In appropriate cases, flooding may be prevented by on-site storage. The developer shall submit the relevant details required to substantiate his development proposals. Details of any outfall proposed shall also be submitted to the Environment Agency, PO Box 12, Richard Fairclough House, Knutsford Road, Warrington, Cheshire, WA4 1HT for their approval.
7. Where there is a main river watercourse/culvert passing through the site, the developer shall submit all proposals affecting the river to the Environment Agency at the address stated in paragraph 6 for approval/acceptance.

8. Your attention is drawn also to the following:

- **Private drains or sewers which may be within the site.**

United Utilities has no duty to keep records of private drains and sewers, and there are no comprehensive records kept elsewhere. Local Authority Building Control Officers may have records of recent developments and they or the developer may be able to provide information in this respect.

- **Applications to make connections to the public sewer.**

The developer must write to United Utilities requesting an application form that must be duly completed and returned. No works on the public sewer shall be carried out until a letter of consent is received from United Utilities.

- **Sewers for adoption.**

If an agreement for the adoption of sewers under Section 104 of the Water Industry Act 1991 is being contemplated, a submission in accordance with "Sewers for Adoption", Fifth Edition, published by the Water Research Centre (2001) Plc, Henley Road, Medmenham, PO Box 16, Marlow, Buckinghamshire, SL7 2HD will be required, taking into consideration any departures from the general guide stipulated by United Utilities.

- **Further consultation with United Utilities.**

Developers wishing to seek advice or clarification regarding sewer record information provided should contact United Utilities to arrange an appointment. A consultation fee may be charged, details of which will be made available at the time of making an appointment.

9. Combined sewers, foul sewers, surface water sewers, and pumped mains. These are shown separately in a range of colours or markings to distinguish them on our drawings, which are extracts from the statutory regional sewer map. A legend and key is provided on each extract for general use, although not all types of sewer will be shown on every extract.

Combined sewers shown coloured red carry both surface water and foul sewage, especially in areas where there is no separate surface water sewerage system.

Foul sewers coloured brown may also carry surface water and there may be no separate surface water system indicated in the immediate area. Both combined and foul sewers carry wastewater to our treatment works before it can safely be returned to the environment.

Surface water sewers coloured blue on our drawings are intended only to carry uncontaminated surface water (e.g. rainfall from roofs, etc) and they usually discharge into local watercourses. It is important for the protection of the environment and water quality that only uncontaminated surface water is connected to the surface water sewers. Improper connections to surface water sewers from sink wastes, washing machines and other domestic use of water can cause significant pollution of watercourses.

Pumped mains, rising mains and sludge mains will all be subject to pumping pressures and are neither suitable nor available for making new connections.

Highway drains, when included, show as blue and black dashed lines. Highway drains are not assets belonging to United Utilities and are the responsibility of local authorities.

10. For information regarding future proposals for construction of company apparatus please write to United Utilities, PO Box 453, Warrington, WA5 3QN.

11. For information regarding easements, deeds, grants or wayleaves please write to United Utilities Property Solutions, Coniston Buildings, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington WA5 3UU (Tel: 01925 463 501).



United Utilities Water PLC
Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington WA5 3LP
www.unitedutilities.com

Registered in England and Wales Registered Number 2366678

01/07/UUNW/DC/1997a

These general conditions and precautions apply to the water distribution system of United Utilities.

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

1. United Utilities provides approximate locations of its water mains or apparatus according to its records. These records are not necessarily accurate or complete nor do they normally show the positions of private service pipes from the mains to properties. Where service pipes are shown, a blue broken line indicates their approximate position. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated.
2. Special requirements relative to our apparatus may be indicated. United Utilities employees will visit any site at reasonable notice to assist in the location of its underground water apparatus and advise any precautions that may be required to obviate any damage. To arrange a visit or for further information regarding new supplies, connections, diversions, costing, future proposals for construction of company apparatus or any notification required under these General Conditions, please telephone us on **0845 746 2200** or write to United Utilities, PO Box 453, Warrington, WA5 3QN.
3. In order to achieve safe working conditions adjacent to any water apparatus the following should be observed;
 - (a) All water apparatus should be located by hand digging prior to the use of mechanical excavation.
 - (b) During construction work where heavy plant may have to cross the line of a water main, and the main is not under a carriageway of adequate standard of construction, crossing points should be suitably reinforced with sleepers, steel plates or a specially constructed reinforced concrete raft as necessary. These crossing points should be clearly indicated and crossing the line of the water main at other places should be prevented. United Utilities employees will advise on the type of reinforcement necessary. This is particularly important on agricultural or open land, where tilling or erosion may have significantly reduced the original cover.
- (c) No explosive should be used within 32 metres of any United Utilities apparatus without prior consultation with United Utilities.
- (d) Where it is proposed to carry out piling within 15 metres of any water main United Utilities should be consulted so that the affected main may be surveyed.
4. During any excavation, it is important that measures should be taken to ensure continued support for any water main:
 - (a) Where excavation of trenches adjacent to any water main is likely to affect its support, the main must be supported to the satisfaction of United Utilities.
 - (b) Where a trench is excavated crossing or parallel to the line of a water main, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the main. In special cases it may be necessary to provide permanent support to a main which has been exposed over the length of the excavation before back-filling and reinstatement is carried out. No back-filled concrete should contact the main.
5. No other apparatus should be laid over and along the line of a water main irrespective of clearance. A minimum clearance of 450 millimetres should be allowed between any plant being installed and an existing main, to facilitate maintenance and repair, whether the adjacent plant is parallel to or crossing the main. No manhole, chamber, or other obstruction should be built over or around a water main.
6. Where a water main is coated with special wrapping and the wrapping is damaged, even to a minor extent, United Utilities must be notified, and the excavation must be left open for ready access so that repairs can be made. In case of any material damage to the main itself causing leakage, or weakening of the mechanical strength of the pipe, the person or body responsible should immediately notify United Utilities in order that the necessary remedial work can be carried out. The full cost of the necessary remedial work will be charged to the person or body responsible for the damage.

7. If you propose to change existing levels over water mains you will need to inform us. We will need specific locations to be identified together with precise details as to the scale of the proposed changes to existing ground levels. Changes to existing levels may require the diversion of our apparatus at your cost. However, in certain circumstances we may wish to leave our apparatus where it is. On these occasions you will usually be required to protect our apparatus by means of a concrete raft and either raise or lower any surface boxes affected.
8. Under no circumstances should our surface boxes be either buried or left in a situation where they are raised above finished ground levels. You should re-use and re-set any surface boxes affected by your works into the new surface so that they align over the water apparatus below. You will be responsible for the cost of repairing any damage to our apparatus as a result of your works.
9. Where proposals involve resurfacing, you must notify United Utilities if your excavation will be greater than 750mm in the highway and 300mm in a footpath, verge or other location.
10. For information regarding easements, deeds, grants, licences or wayleaves, please write to United Utilities Property Solutions, Coniston Buildings, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington WA5 3UU (Tel 01925 463 501).

Tree planting restrictions over water mains

- a) Poplar and willow trees have extensive root systems and should not be planted within 10 metres of any water main.
- b) The following trees and those of a similar size, whether they are deciduous or evergreen, should not be planted within six metres of any water main:
 - Ash, beech, birch, elm, horse chestnut, lime, oak, sycamore;
 - Apple trees and pear trees;
 - Most conifers.
- c) United Utilities requires access to the route of its mains at all times to inspect for leaks and carry out surveys. We recommend that no shrubs or bushes which might obstruct or interfere with our access should be planted within one metre of the centre line of any water main.
- d) There may be instances when both United Utilities and the landowner will wish to plant shrubs or bushes close to the water main for screening or other purposes. The following shallow rooting shrubs would be suitable for this purpose:
 - Blackthorn, broom, cotoneaster, elder;
 - Hazel, laurel, privet, quickthorn, snowberry;
 - Most ornamental flowering shrubs.
- e) In areas where soft fruit is grown, blackcurrant, raspberries and gooseberries may be planted close to the main, provided that a path is left clear for inspection access and surveys. United Utilities can give additional advice where required in particular circumstances.



United Utilities Water PLC
 Haweswater House, Lingley Mere Business Park,
 Lingley Green Avenue, Great Sankey, Warrington WA5 3LP
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Extract From Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.
The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.
United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

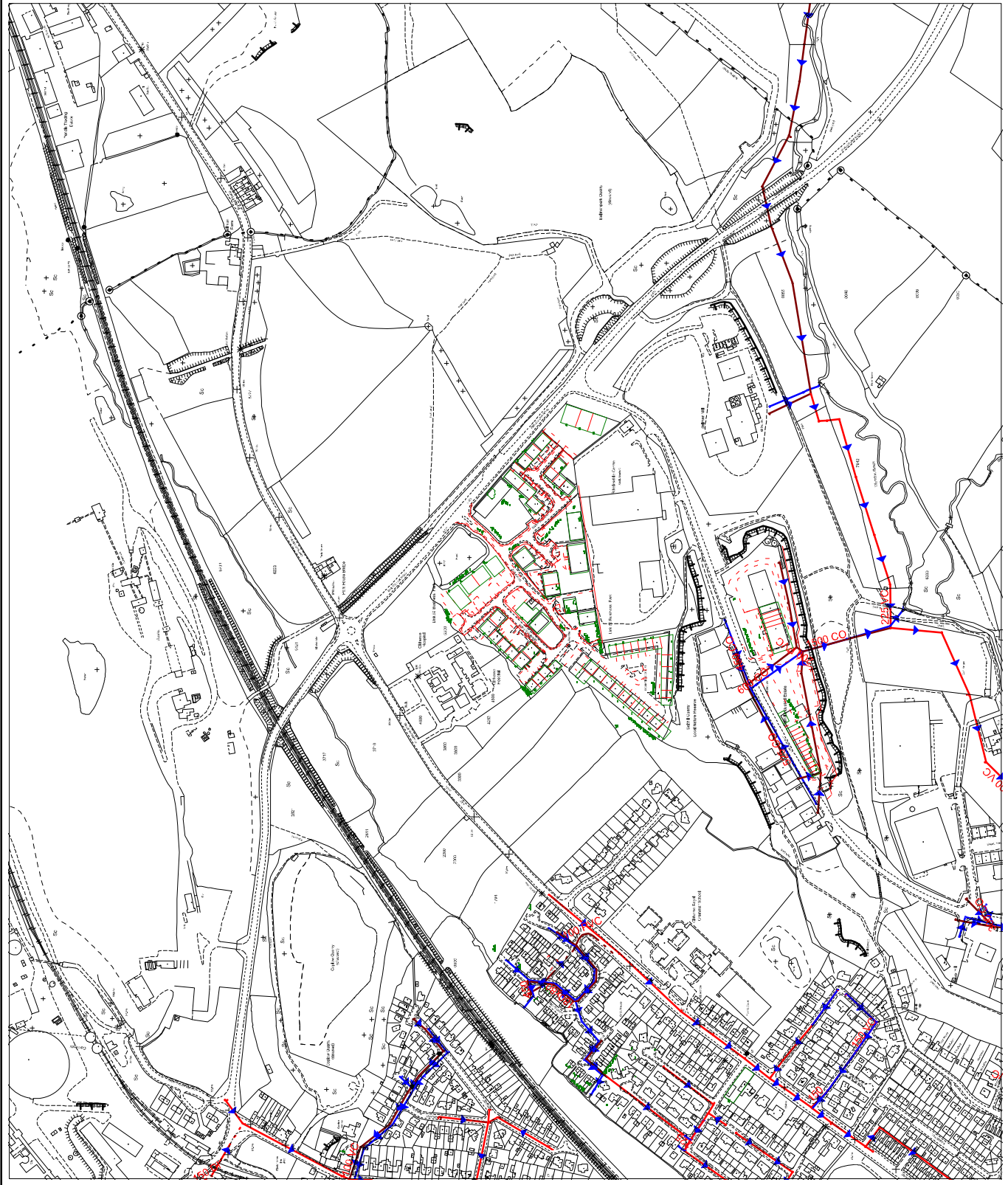
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Legend	
	Public Sewer
	Highway Drain
	Private Sewer
	Pumping Main
	Section 104 Sewers
Refer to colour guide for content of pipe	

Red or Brown - Foul Sewers
Blue - Surface Water Sewers

Pimlico Link Rd,
Clitheroe

Printed By: FT Date: 15/07/2008
DO NOT SCALE
Approximate Scale 1:5000



Extract From Map of Water Mains

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains are not recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

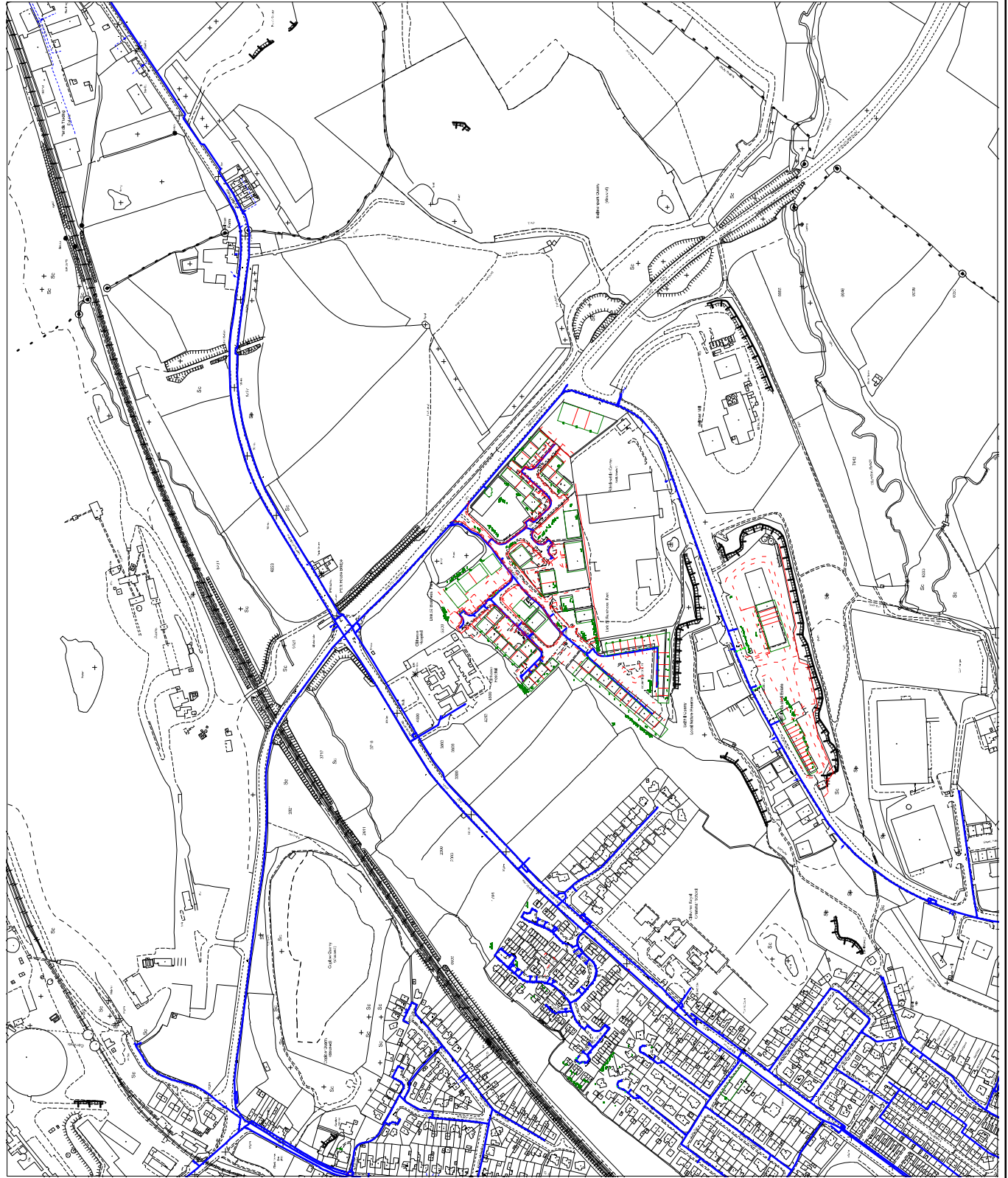
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Blue - Distribution Mains
Red or Mauve - Trunk Mains
Dark Green - Non Potable Mains
---X---X---X--- Disused Mains
(These may still be live)

Pimlico Link Rd,
Clitheroe

Printed By: FT Date: 15/07/2008

DO NOT SCALE
Approximate Scale 1:5000






3. SITE B SURVEY



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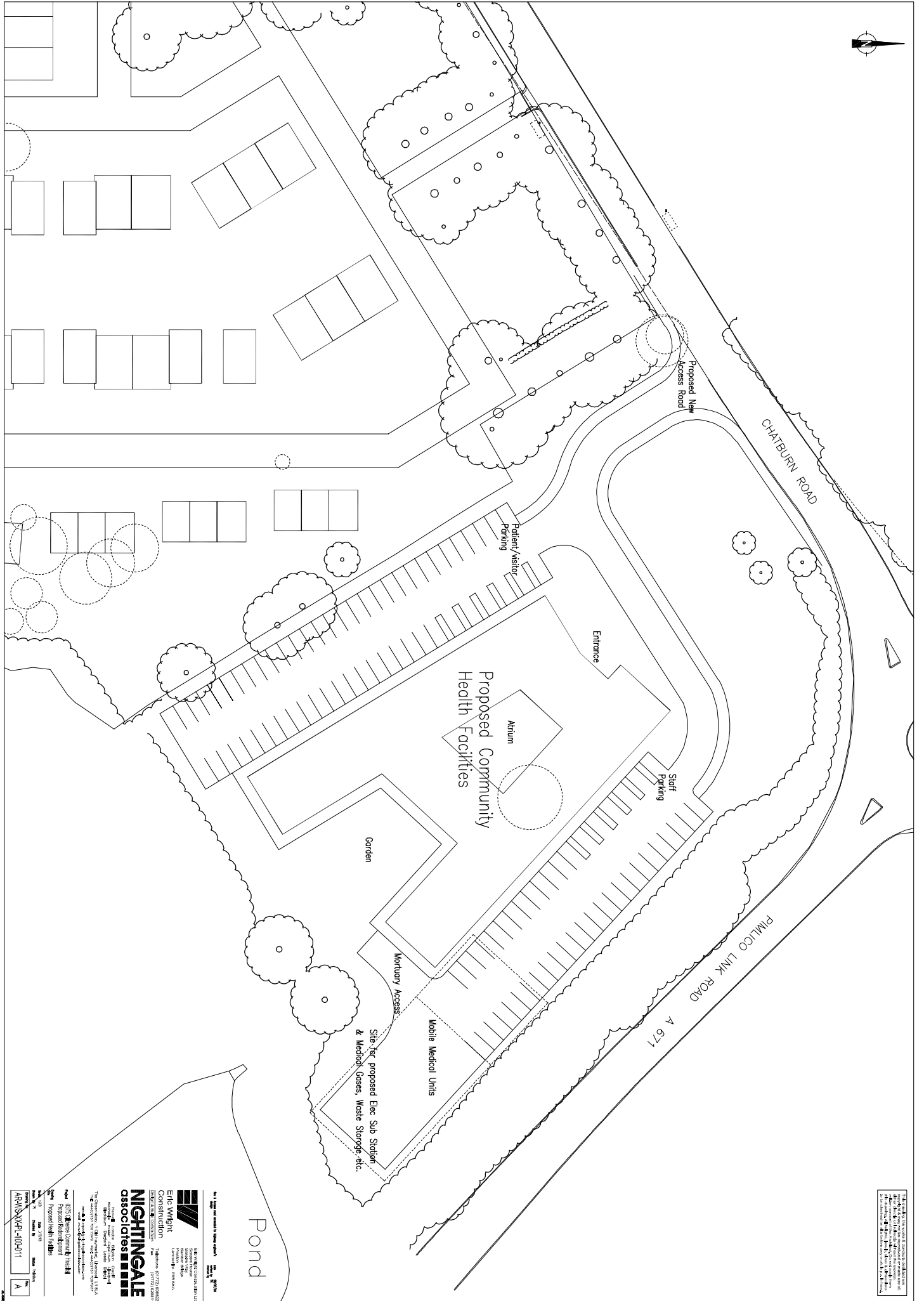
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4. EXISTING DRAINAGE INFORMATION



5. PROPOSED DEVELOPMENT PLANS



The Council has received a copy of the proposed development and has considered the same in accordance with the provisions of the Planning and Building Act, 2015. The Council has resolved to grant the proposed development subject to the following conditions:

Pond

Site Plan for Proposed Health Facilities

ERIE WRIGHT
Construction
1000 Highway 101, Suite 101
St. Catharines, Ontario L2R 6K1
Tel: (905) 681-1111 Fax: (905) 681-1112
www.eriwright.com

NIGHTINGALE ASSOCIATES
1000 Highway 101, Suite 101
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Tel: (905) 681-1111 Fax: (905) 681-1112
www.nightingaleassociates.com

APR/20/2018 10:00 AM
A



SCHEDULE OF ACCOMMODATION :

D1 4 BED DETACHED 1357m ² INT.GAR	7No.
D2 4 BED DETACHED OR SEMI 1234 ²	4No.
D3 3 BED DETACHED OR SEMI 924 INT.GAR	11No.
T1 4 BED TOWN 337Y 1200 ² INT.GAR	7No.
T2 4 BED TOWN 275 STY 1160 ²	2No.
T3 3 BED 850 ²	11No.
T4 2 BED	7No.
TOTAL = 52No.	

PPG3 DENSITY = 32 UNITS PER HECTARE.

25% PROVISION

2 BED - 2No.
3 BED - 4No.
4 BED - 6No.
TOTAL = 12No.

AFFORDABLE DWELLINGS :

PLOTS No. 6 - 18 INCLUSIVE



6. ENVIROS FLOOD RISK ASSESSMENT METHODOLOGY



It is recommended by both the Environment Agency and DEFRA that the primary assessment tool within a flood risk assessment should be the sequential test as set out in Tables D1 and D2 of PPS25: Development and Flood Risk. Such an assessment however, deals almost exclusively with the risks associated with tidal and fluvial sources and not the full range of flooding sources identified in Annex C of PPS25. In addition to this, the sequential test does not provide guidance for assessing the impact of mitigation and residual risk subsequent to development, as required by Annex G of PPS25.

Therefore in order to allow for the wider assessment of flood risk this more generalised assessment methodology has been developed. It should be noted that where applied to fluvial and tidal sources the results of the assessment should be cross checked against the results of the sequential test.

Assessment Methodology

In line with guidance set out in the PPS25: Development and Flood Risk, the key to the classification is that the designation of significance (or risk) is based upon the consideration of:

- ◆ The sensitivity of the receptor – takes into account the nature of the development or receptor and its likely response to increased risk.
- ◆ The magnitude of the potential hazard (i.e. severity) – takes into account the potential severity and nature of the flooding.
- ◆ The probability of occurrence (i.e. likelihood) – takes into account both the presence of the hazard and receptor, and the integrity of the pathway.

Classification of Sensitivity of the Receptor

When considering new developments, the classification of sensitivity is based (where possible) directly on the sequential test as set out within Table D2 of PPS25. When considering off site impacts there is a general assumption that all developments are highly sensitive. This assumption can however typically be relaxed when considering 'Water Compatible' development or undeveloped land. Given this the Sensitivity of the receptor is ranked as shown in Table 1.

Table 1 Classification of sensitivity of receptor

Sensitivity of receptor	New Development	Off site
Very High	Highly Vulnerable* developments	All built developments unless mitigating circumstances exist. Key access routes
High	More Vulnerable* developments	Other access routes
Medium	Less Vulnerable* developments	Undeveloped Land
Low	Water Compatible* developments	-
Very Low	Flood attenuation features	-

* For definition of italicised terms please see Table D2 of PPS25



Classification of Magnitude of Potential Effect

Magnitude of potential hazard

To classify the magnitude of the potential effects it is necessary to look at the nature and scale of the individual impacts. These include, but are not confined to, the extent of flooding, the depth of flooding, the duration of flooding and the velocity of flood waters. For new developments the assessment is based on the likely post development situation, for off site receptors it is based solely on the likely deterioration.

Given this the magnitude of the potential effect is then ranked as shown below in Table 2.

Table 2 Classification of magnitude of potential hazard

Magnitude of Hazard	New Development	Off site
High	Any one of the following criteria achieved: <ul style="list-style-type: none">• flood depths greater than 1m,• flood flow velocities greater than 0.45m/s• likely flood duration in excess of 24 hours	Any marked (>10%) increase in flood depth, flood flow velocity or flood duration. Any change in flood extent that impacts additional properties including access
Medium	Any one of the following criteria achieved: <ul style="list-style-type: none">• flood depths between 0.3m and 1m,• flood flow velocity greater than 0.15m/s• likely flood duration in excess of one hour• Any restrictions to access and egress	Any other measurable increase of flood depths, durations, flow velocities or extent.
Low	All of the following criteria achieved: <ul style="list-style-type: none">• flood depths below 0.3m,• likely flood duration below one hour• flood proofing measures planned	Likely, but unquantifiable small increases of flood depths, durations, flow velocities or extent
Very Low	Planned or permitted flooding that does not adversely impact the built development	-
Negligible	No potential for flooding, or no identifiable impact of flooding	No likely increase in flood severity at any off site location

Magnitude of potential effect

The magnitude of the hazard and the sensitivity of the receptor are combined using a matrix (shown below – Table 3) to determine the magnitude of the potential effect.



Table 3 Matrix for determining the magnitude of the potential effect

		Sensitivity of Receptor				
		Very Low	Low	Medium	High	Very High
Magnitude of Potential Hazard	High	Low	Moderate	Moderate	High	High
	Medium	Very Low	Low	Moderate	Moderate	High
	Low	Very Low	Very Low	Low	Moderate	Moderate
	Very Low	Negligible	Very Low	Very Low	Low	Low
	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Classification of Probability of Occurrence

To classify the probability of occurrence for a potential effect it is necessary to understand how regularly a given event or outcome will come to pass. This can be assessed in a number of ways including assessments based on historical data, quantitative analysis, or experience from other similar sites. Often this assessment will be based on standard guidance. The probability of occurrence of the potential effect is then ranked as shown below in Table 4.

Table 4 Classification of probability of occurrence

Probability of Occurrence	Potential effect
High	Any consequence would appear likely in the medium term and inevitable in the long term (Life time of the development).
	Equivalent to an annual probability of flooding of greater than 1% (0.5% for tidal) or flood zone 3*.
Medium	Circumstances are such that an event is possible in the medium term and likely over the long term, although not necessarily inevitable.
	Equivalent to an annual probability between 0.1 and 1% (0.1 and 0.5% for tidal) or flood zone 2*.
Low	It is unlikely that any consequence would arise within the lifetime of the development.
	Equivalent to an annual probability of less than 0.1% or flood zone 1*.
Very Low	It is unlikely that any consequence will ever arise.

* For definition of italicised terms please see Table D1 of PPS25

It should be noted that in circumstances where sites are defended determining an accurate assessment of probability of flood occurrence is complex and assumptions that defences will not fail are unlikely to be acceptable. In such cases assessments can not be prescriptive and site specific assessments should be undertaken. Factors that should be considered include construction, age, condition, maintenance, exposure and other external pressures.

Risk Assessment



Once the magnitude of the potential effect and likelihood of occurrence have been assessed these are then combined using a risk matrix (Table 5) to assess the flood risk of each potential effect.

Table 5 Risk matrix

		Likelihood of Occurrence			
		Very Low	Low	Medium	High
Magnitude of Potential Effect	High	Low	Moderate	High	High
	Moderate	Low	Low	Moderate	High
	Low	Very Low	Low	Low	Moderate
	Very Low	Negligible	Very Low	Low	Low
	Negligible	Negligible	Negligible	Negligible	Negligible

Typically flood risks assessed as low, or less are considered acceptable. If the assessment results in moderate or high risk, additional mitigation measure will be required to facilitate development.

In some situations the risk assessment procedure will result in an artificially low assessment of risk. This is particularly the case in situations where consequences of very rare flooding (i.e. breach scenarios) are so extreme that any residual risk however low should not be allowed. In such instances the assessed risk should be elevated. Such decisions must always be accompanied by detailed justification.