

# St Julie's Catholic High School

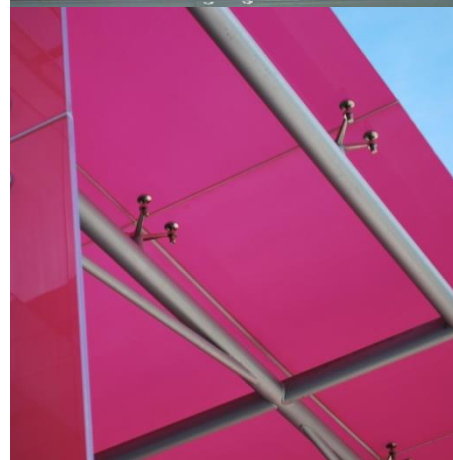
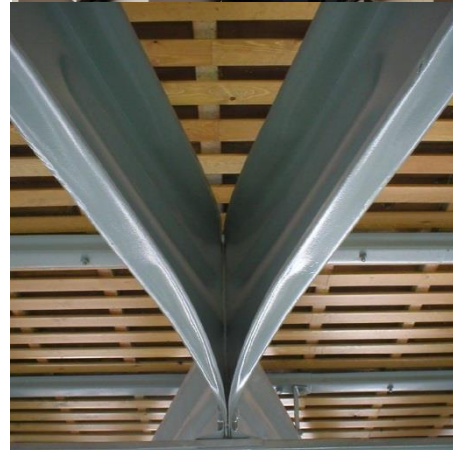
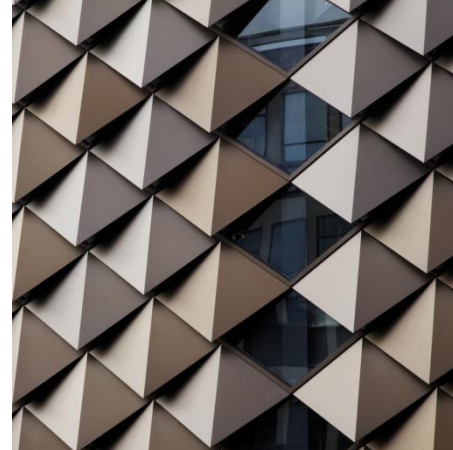
## Flood Risk Assessment

Curtins Ref: LI1195/FRA

Revision: C

Issue Date: 19 December 2014

Client Name: Kier Construction



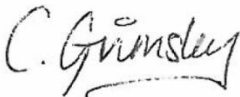
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## Revisions

| Revision | Date/ by | Description of Revision  |
|----------|----------|--|
| /        | 27/08/14 | DRAFT  |
| A        | 23/10/14 | DRAFT- Updated to new site proposals                                   |
| B        | 25/11/14 | Updated to suit latest site proposals                                  |
| C        | 19/12/14 | Updated to include Subscan survey and amended existing discharge rates |

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## Executive Summary

The following Flood Risk Assessment was commissioned by Kier Construction for the development of the proposed St Julie's Catholic High School, Liverpool.

The Flood Risk Assessment reviewed the following information:

- The EA flood maps for rivers and sea flooding, surface water flooding and reservoir flooding.
- Strategic Flood Risk Assessment (SFRA) for Liverpool City Council dated January 2008.
- Preliminary Flood Risk Assessment (PFRA) for Liverpool City Council dated June 2011.
- United Utilities Public Sewer Records

After reviewing the information, the findings are:

- The Environment Agency Rivers and sea flooding map and the Strategic Flood Risk Assessment maps show the development site to be within Flood Zone 1, where the risk of flooding from rivers and seas is considered low.
- The site is located within Flood Zone 1, of which is acceptable for any classification of development in accordance with Table 3 from Planning Practice Guidance.
- As the site is located within Flood Zone 1 (rivers and sea flooding) with areas classified as 'More Vulnerable' development the sequential and exception test are not required to be undertaken.
- Fluvial Flooding (Rivers and Streams) - no flood risk identified on the Environment Agency and SFRA flood maps for this area, the site is therefore regarded to be at low risk from fluvial flooding.
- Tidal Flooding (Coastal or Estuarine) - There is currently no flood risk identified on the Environment Agency and SFRA flood maps for this area, the site is therefore regarded to be at low risk from tidal flooding.
- Reservoir Flooding - There is currently no flood risk identified on the Environment Agency and SFRA flood maps for this area, the site is therefore regarded to be at low risk from reservoir flooding.
- Groundwater Flooding - The PFRA highlights that the site is not within an area susceptible for groundwater flooding. The site is therefore considered to be at low risk from groundwater flooding.
- Public Sewers or Highway Drainage Flooding (Infrastructure Failure) – There are no public sewers on site and the public sewers in the vicinity of the site are maintained by United Utilities. The site is therefore considered to be at low risk from public sewer and highway drainage flooding.
- Historical Flooding - The site has not been subject to any historical flood events.

- Surface Water Flooding to the site – The Environment Agency Surface Water flood map for the area indicates that the majority of the development is at very low risk of surface water flooding an isolated area along the northern elevation of the existing school building at low risk of surface water flooding. This is likely to be caused by a localised low point on site, which will be redesigned with new levels to fall away from any buildings. Therefore risk of flooding to the site from surface water flooding is considered very low.
- Surface Water Flooding from the site – If the principles set out within the report are followed and developed at detailed design stage by the design engineer, the site can be considered to have a low probability of suffering from any form of flooding and not increasing the probability of flood risk to other properties within the local catchment area.

The proposals and recommendations include:

- The site is surrounded by Flood Zone 1 and therefore finished floor levels lower than existing ground levels should not affect the Zone 1 flood risk classification.
- The proposed external levels should be fallen away from the proposed buildings so that low points are not created, encouraging surface water to fall towards the proposed buildings.
- A pathway for flood water should be created working with the existing site levels to allow free passage of any overland flows through the site, located to avoid building and other important structures.
- It is recommended that groundwater levels are monitored during ground investigation works to determine site specific groundwater levels.
- It is recommended that the ground conditions are investigated further to determine whether infiltration may be possible.
- Based on the nature of the development, a lifespan of approximately 50 years is anticipated. As such, an allowance of 20% for climate change on peak rainfall intensity will be included in calculations.
- There are no public sewers within the proposed development site and therefore sewer diversion works are not required.

It is not anticipated to have any existing private drainage within the green-open space or woodland areas on site; however there is private drainage within the areas on the existing school site. A subscan survey on the site has confirmed that within the extents of the planning boundary, there are two outfall pipes which discharge off site along the southern boundary. A CCTV survey is recommended to determine their locations, condition and existing outfalls to the public sewer network.

- The foul drainage from the development is proposed to be collected by new private foul drains which will connect into the existing combined public sewer within Speke Road at manhole 5501.

- As the exact details of the building are unknown, the peak flow rate has been calculated based on Sewers for Adoption 7<sup>th</sup> Edition, assuming 0.6 l/s/hectare. As the proposed buildings are located within an area of approximately 0.4 hectares of the site the peak foul discharge for the proposed development is estimated as 0.23 l/s based on a total site area of 0.5 hectares.
- It shall be assumed that when the site is developed the proposed surface water drainage network will outfall into the existing combined public sewer within Speke Road at manhole 5501.
- The proposed restriction of the new outfall in to the public sewer in Speke Road is 21.3 l/s.
- The attenuation required for up to the 1 in 100 year storm event plus an allowance of 20% for climate change would be in the region of 507-715m<sup>3</sup>.
- SUDS should be incorporated into the design wherever possible. Attenuation could be achieved by introducing a combination of ponds, permeable paving with high voids sub-base and percolation pipes, oversized pipes and cellular storage units. Use of ponds, and permeable paved areas would also be considered as methods of filtration to improve water run-off quality.
- Other methods of sustainability could be provided by use of rainwater harvesting tanks, rainwater butts or green roofs for the Building elements.
- The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Liverpool City Council and United Utilities.
- A copy of the as built drainage layout should be provided in the Operations and Maintenance Manual.
- A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

## 1.0 Introduction

### 1.1 Project Background

- 1.1.1 Curtins was appointed on behalf of Kier Construction to provide a Flood Risk Assessment (FRA) for the proposed development of the St Julie's Catholic High School, Liverpool. The FRA provides information on the nature of flood risk at the site and follows Government guidance with regards to development and flood risk.
- 1.1.2 The report is based on currently available information and preliminary discussions.
- 1.1.3 Proposals contained or forming part of this report represent the design intent and maybe subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertake as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.4 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

### 1.2 Scope of Flood Risk Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
- Investigate all potential risks of flooding to the site,
  - Consider the impact the development may have elsewhere with regards to flooding; and
  - Consider outline design proposals to mitigate any potential risk of flooding determined to be present.
- 1.2.3 The planning application site is approximately 2.43 hectares and following scrutiny of the Environment Agency flood maps it has been identified that the existing site lies within an area classified as Flood Zone 1, where the risk of flooding from rivers and sea is considered low. A Flood Risk Assessment is therefore required to support a planning application with the main focus on the management of surface water run-off.

### **1.3 Proposed Development**

- 1.3.1 The development proposals include a planning application for the demolition of existing buildings to the north-west corner of the existing St Julies Catholic High School site and to be replaced by the construction of new school buildings to approximately 0.4ha of the site, associated access road, car parking, external play areas and landscaping areas to the remainder of the site. The proposals for the existing school site outside of the proposed boundary and the woodland area are unknown. The General Arrangement Layout is enclosed in Appendix A.

## 2.0 Existing Site Details

### 2.1 History and Current Use

- 2.1.1 The site is located to the west of Speke Road in Woolton, which is in the south-eastern area of Liverpool. The majority of the site is partially within the existing St Julie's High School site, with the remainder within the Woodland area to the west and green-open space area to the north.
- 2.1.2 The site is loosely bordered with green-open space to the north, Speke Road to the east, the existing St Julies High School site to the south and Woolton Wood to the west. Refer to Figure 1 for the aerial photograph of the site.

**Figure 1: Aerial Photograph**



### 2.2 Existing Watercourses

- 2.2.1 There is an unnamed drain located approximately 700m to the north-west of the site parallel with Manlove Avenue.
- 2.2.2 There is an unnamed watercourse approximately 1km to the north-east and flows towards the Sewage Treatment work before out falling into the Netherley Brook.

## **2.3 Existing Drainage**

2.3.1 The public sewer records have been obtained for the development site. The records indicate that the following sewers are located in the vicinity of the site:

- There is an existing 300mm diameter combine public sewer to the north-east of the site in Woolton Street and flows in a southern to northern direction.
- There is an existing 225mm diameter combined public sewer to the north-east of the site in Woolton Street and flows in a western to eastern direction towards Speke Road.
- There is a 375mm diameter combined public sewer to the east of the site in Speke Road and flows in a south-eastern to north-western direction.

2.3.2 The public sewer records are enclosed in Appendix A.

2.3.3 No further public sewers were observed in the vicinity of the proposed site.

2.3.4 It is not anticipated to have any existing private drainage within the green-open space or woodland areas on site; however there is private drainage within the areas on the existing school site. A subscan survey on the site has confirmed that within the extents of the planning boundary, there are two outfall pipes which discharge off site along the southern boundary. A CCTV survey is recommended to determine their locations, condition and existing outfalls to the public sewer network. The subscan survey drawing is enclosed in Appendix A.

## **2.4 Topography**

2.4.1 A topographical survey has been carried out on the site; the contours appear to show the site levels fall in a south-western to north-eastern direction, with a fall of approximately 9 metres across the site. The topographical survey drawing is enclosed in Appendix A.

## 3.0 Development and Flood Risk

### 3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In March 2012 the Department of Communities and Local Government published National Planning Policy framework document (NPPF) and Planning Practice Guidance was published in March 2014 which provides guidance on how flood risk should be assessed during the planning and development process.

**Table 1 (Extract Planning Practice Guidance) Flood Zone Classifications**

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea !\[\]\(ef57557257cbb5c674d51a9e0a98bb4d\_img.jpg\)](#)), available on the Environment Agency's web site, as indicated in the table below.

| Flood Zone                                 | Definition   |
|--|--|
| Zone 1<br>Low<br>Probability               | Land having a less than 1 in 1,000 annual probability of river or sea flooding.<br>(Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)  |
| Zone 2<br>Medium<br>Probability            | Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or<br>Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.<br>(Land shown in light blue on the Flood Map)   |
| Zone 3a<br>High<br>Probability             | Land having a 1 in 100 or greater annual probability of river flooding; or<br>Land having a 1 in 200 or greater annual probability of sea flooding.<br>(Land shown in dark blue on the Flood Map)  |
| Zone 3b<br>The<br>Functional<br>Floodplain | <b>This zone comprises land where water has to flow or be stored in times of flood.</b><br>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.<br>(Not separately distinguished from Zone 3a on the Flood Map) |

**Table 2 (Extract Planning Practice Guidance) Flood Risk Vulnerability Classification**

#### **Essential Infrastructure**

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

#### **Highly Vulnerable**

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring **hazardous substances consent**. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

#### **More Vulnerable**

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill\* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

#### **Less Vulnerable**

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill\* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

#### **Water-Compatible Development**

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

**Table 3 (Extract Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone compatibility**

| Flood Zones | Flood Risk Vulnerability Classification |                         |                         |                 |                  |
|-------------|---|-------------------------|-------------------------|-----------------|------------------|
|             | Essential infrastructure                | Highly vulnerable       | More vulnerable         | Less vulnerable | Water compatible |
| Zone 1      | ✓                                       | ✓                       | ✓                       | ✓               | ✓                |
| Zone 2      | ✓                                       | Exception Test required | ✓                       | ✓               | ✓                |
| Zone 3a †   | Exception Test required †               | ✗                       | Exception Test required | ✓               | ✓                |
| Zone 3b *   | Exception Test required *               | ✗                       | ✗                       | ✗               | ✓*               |

**Key:**

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

\* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

### 3.2 Site Specific NPPF Flood Risk Categorisation

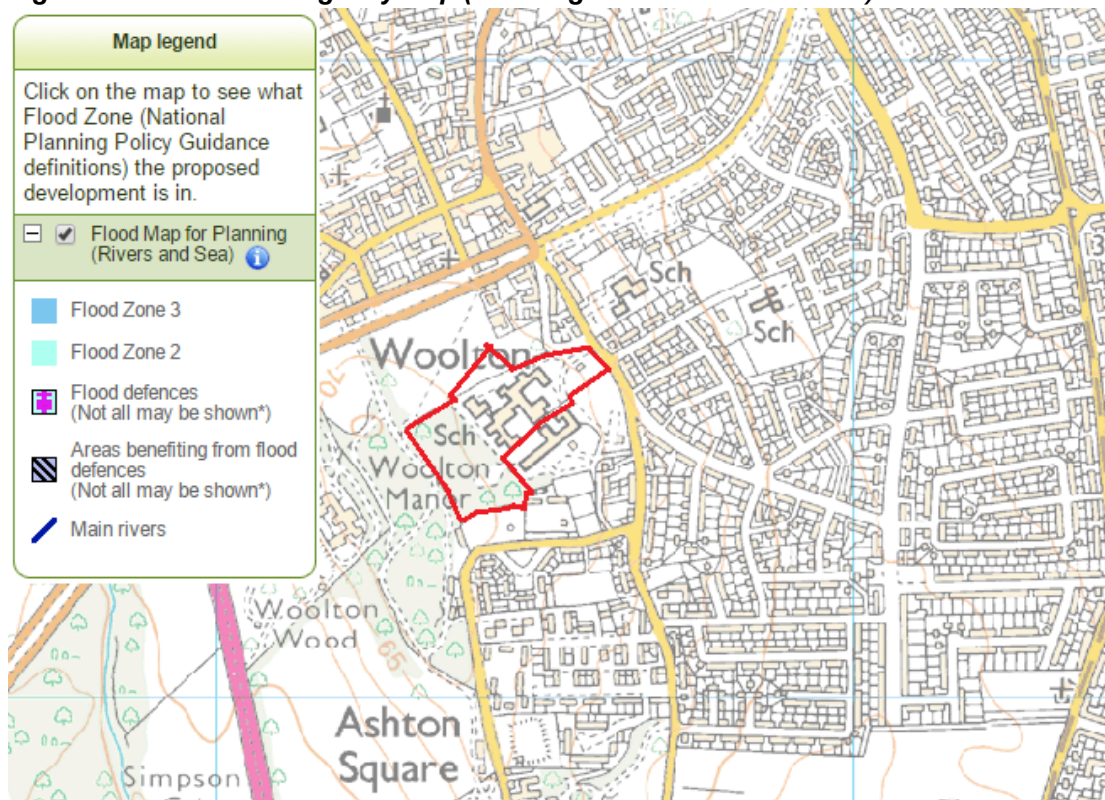
3.2.1 To assess the NPPF flood risk classification for the site the first step was to inspect the Environment Agency web based flood mapping data for flooding from rivers and seas, surface water and reservoirs. The rivers and sea flood map is used to inform planning of a sites Flood Zone(s), however the surface water and reservoir flood maps should also be used to identify other flood risks.

3.2.2 From the Environment Agency flooding from rivers and seas map:

- Where a site is located in a dark blue shaded zone, this indicates that the site is within Flood Zone 3b where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is located in a blue shaded zone, this indicates that the site is within Flood Zone 3a where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is located in a turquoise shaded zone; this indicates that the site is within Flood Zone 2 where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area, it is generally deemed to be classified as Flood Zone 1 where there is a chance of flooding of less than 1 in 1000 (0.1%).

3.2.3 Flooding to the site from rivers and seas is indicated in Figure 2 and it can be seen that the site is clear of the blue and turquoise shading and is classified as Flood Zone 1.

**Figure 2: Environment Agency Map (Flooding from Rivers and Seas)**



3.2.4 From the Environment Agency flooding from surface water map:

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is located in a blue shaded zone, this indicates that the site is at medium risk of flooding where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is located in a turquoise shaded zone; this indicates that the site is at low risk of flooding where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area; this indicates that the site is at very low risk of flooding where there is a chance of flooding of less than 1 in 1000 (0.1%).

3.2.5 Flooding to the site from surface water is indicated in Figure 3 and it can be seen that the majority of the site is located outside of any areas susceptible to surface water flooding and is classified as at very low risk of surface water flooding, however there is an isolated area along the northern elevation of the existing school building which classified as at low risk of surface water flooding and is likely to be caused by a localised low point on site.

**Figure 3: Environment Agency Map (Flooding from Surface Water)**



- 3.2.6 Flooding to the site from reservoirs is indicated in Figure 4 and it can be seen that the site is located outside of any areas susceptible to reservoir flooding and is therefore classified as at very low risk of reservoir flooding.

**Figure 4: Environment Agency Map (Flooding from Reservoirs)**



### 3.3 Strategic Flood Risk Assessment

- 3.3.1 A Strategic Flood Risk Assessment (SFRA) for Liverpool was carried out in January 2008 and A Preliminary Flood Risk Assessment (PFRA) for Liverpool was carried out in June 2011. The data and findings of these assessments have been used to inform this report.

### 3.4 Site Specific Flood Zone Compatibility

- 3.4.1 The proposals for the site are likely to fall within the 'educational establishments' and would therefore be classified as 'More Vulnerable' development. The site is located within Flood Zone 1, of which is acceptable for any classification of development. Refer to figure 3 for the Flood Zone compatibility table taken from NPPF technical guidance.

### **3.5 Sequential and Exception Tests**

- 3.5.1 As the site is located within Flood Zone 1 (rivers and sea flooding) with areas classified as 'More Vulnerable' development the sequential and exception test are not required to be undertaken.

### **3.6 Climate Change**

- 3.6.1 Based on the nature of the development, a lifespan of approximately 50 years is anticipated. As such, an allowance of 20% for climate change on peak rainfall intensity will be included in calculations.

## 4.0 Hydrological Assessment

### 4.1 Summary of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site are as follows: rising groundwater and surface water flooding (from sewers or overland flows). The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

### 4.2 Fluvial Flooding (Rivers and Streams)

- 4.2.1 There is an unnamed drain located approximately 700m to the north-west of the site and there is an unnamed watercourse approximately 1km to the north-east of the site which outfalls into the Netherley Brook. The and there is currently no flood risk identified on the Environment Agency maps for this area, the site is therefore regarded to be at low risk from fluvial flooding.

### 4.3 Tidal Flooding (Coastal or Estuarine)

- 4.3.1 The site is located approximately 3.7km to the north-east of the River Mersey and there is currently no flood risk identified on the Environment Agency flood maps for this area, the site is therefore regarded to be at low risk from tidal flooding.

### 4.4 Reservoir Flooding

- 4.4.1 The site is located approximately 8.4km to the south-west of the Pex Hill Reservoirs. The site is located outside of any areas susceptible to reservoir flooding and is therefore classified as at very low risk of reservoir flooding.

### 4.5 Groundwater Flooding

- 4.5.1 The PFRA indicates that flooding records do not show instances of Groundwater flooding, however this is due to the nature of the recordings and are unlikely to have been diagnosed as Groundwater flooding. The PFRA does highlight areas susceptible to Groundwater flooding and indicates that the site is not within an area susceptible for groundwater flooding. The site is therefore considered to be at low risk from groundwater flooding. Refer to the Areas susceptible to Groundwater Flooding map enclosed in Appendix A.

#### **4.6 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)**

- 4.6.1 There are no public sewers within the site and the public sewers in the vicinity of the site are maintained by United Utilities. The site is therefore considered to be at low risk from public sewer and highway drainage flooding.

#### **4.7 Surface Water Flooding to the site**

- 4.7.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.
- 4.7.2 The Environment Agency Surface Water flood map for the area indicates that the majority of the site is located outside of any areas susceptible to surface water flooding and is classified as at very low risk of surface water flooding, however there is an isolated area along the northern elevation of the existing school building which classified as at low risk of surface water flooding and is likely to be caused by a localised low point on site. Therefore risk of flooding to the site from surface water flooding is considered low.

#### **4.8 Surface Water Flooding from the site**

- 4.8.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. The proposed surface water drainage network shall be designed to not flood for the critical 1 in 30 year storm event and flood water generated up to the critical 1 in 100 year plus climate change storm event shall be constrained within areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 4.8.2 Where additional hard surfaces are introduced for example roads, car parks, building roofs and temporary site accommodation the development would have the potential to increase flood risk.
- 4.8.3 A detailed assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

#### **4.9 Historical Flooding**

- 4.9.1 Historical flood events are noted within the PFRA and it appears that there is no record of any historical flooding on the site. Refer to the historical flood map enclosed in Appendix A.

## 5.0 Mitigation

### 5.1 Fluvial/Tidal/Reservoir Flood Mitigation

- 5.1.1 The development site lies within Flood Zone 1 and therefore there is low risk of fluvial and tidal flooding.
- 5.1.2 The site is surrounded by Flood Zone 1 and therefore finished floor levels lower than existing ground levels should not affect the Zone 1 flood risk classification.

### 5.2 Groundwater Flood Mitigation

- 5.2.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.2.2 The risk of groundwater flooding to this site is considered to be low, however it is recommended that groundwater levels are monitored during any ground investigation works to determine site specific groundwater levels.

### 5.3 Surface Water Flooding to the site Mitigation

- 5.3.1 The Environment Agency Surface Water flood map for the area indicates that the majority of the development is at very low risk of surface water flooding an isolated area along the northern elevation of the existing school building at low risk of surface water flooding. This is likely to be caused by a localised low point on site, which will be redesigned with new levels to fall away from any buildings. Therefore risk of flooding to the site from surface water flooding is considered very low.
- 5.3.2 It is recommended that proposed external ground levels across the site should fall away from the proposed buildings so that it does not create low points and encourage any surface water to fall towards the proposed building. The flooding risk to the development site from the surrounding areas is therefore considered low.

### 5.4 Surface Water Flooding from the site Mitigation

- 5.4.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated from up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

- 5.4.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. The ground conditions should be investigated further to determine whether it is suitable to support the use of Sustainable Urban Drainage Systems (SUDS) and therefore an alternative method of surface water discharge has been assumed until the ground conditions are confirmed.
- 5.4.3 It shall be assumed that when the site is developed the surface water drainage network is proposed to outfall into the existing private drainage on site which is assumed to outfall into the existing combined public sewer network to the east of the site.
- 5.4.4 To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.4.5 Assuming that the proposed drainage system is designed to provide adequate capacity as stated in 5.4.1 and 5.4.2 and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.
- 5.4.6 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Liverpool City Council and United Utilities.
- 5.4.7 Providing the mitigation measures recommended are incorporated, the site can be regarded as low risk from all primary and secondary flood mechanisms as required to be investigated by NPPF.

## 6.0 Drainage Strategy

### 6.1 Existing Drainage

- 6.1.1 The existing public sewer records indicate that there are no public sewers within the proposed development site and therefore sewer diversion works are not required.
- 6.1.2 It is not anticipated to have any existing private drainage within the green-open space or woodland areas on site; however there is private drainage within the areas on the existing school site. A subscan survey on the site has confirmed that within the extents of the planning boundary, there are two outfall pipes which discharge off site along the southern boundary. A CCTV survey is recommended to determine their locations, condition and existing outfalls to the public sewer network.
- 6.1.3 There is an existing 300mm diameter combined public sewer to the north-east of the site in Woolton Street and flows in a southern to northern direction. There is an existing 225mm diameter combined public sewer to the north-east of the site in Woolton Street and flows in a western to eastern direction towards Speke Road. There is a 375mm diameter combined public sewer to the east of the site in Speke Road and flows in a south-eastern to north-western direction.

### 6.2 Proposed Foul Water Drainage

- 6.2.1 The foul drainage from the development is proposed to be collected by new private foul drains which will connect into the existing combined public sewer within Speke Road at manhole 5501.
- 6.2.2 As the exact details of the building are unknown, the peak flow rate has been calculated based on Sewers for Adoption 7<sup>th</sup> Edition, assuming 0.6 l/s/hectare. As the proposed buildings are located within an area of approximately 0.4 hectares of the site the peak foul discharge for the proposed development is estimated as 0.24 l/s based on a total site area of 0.4 hectares.

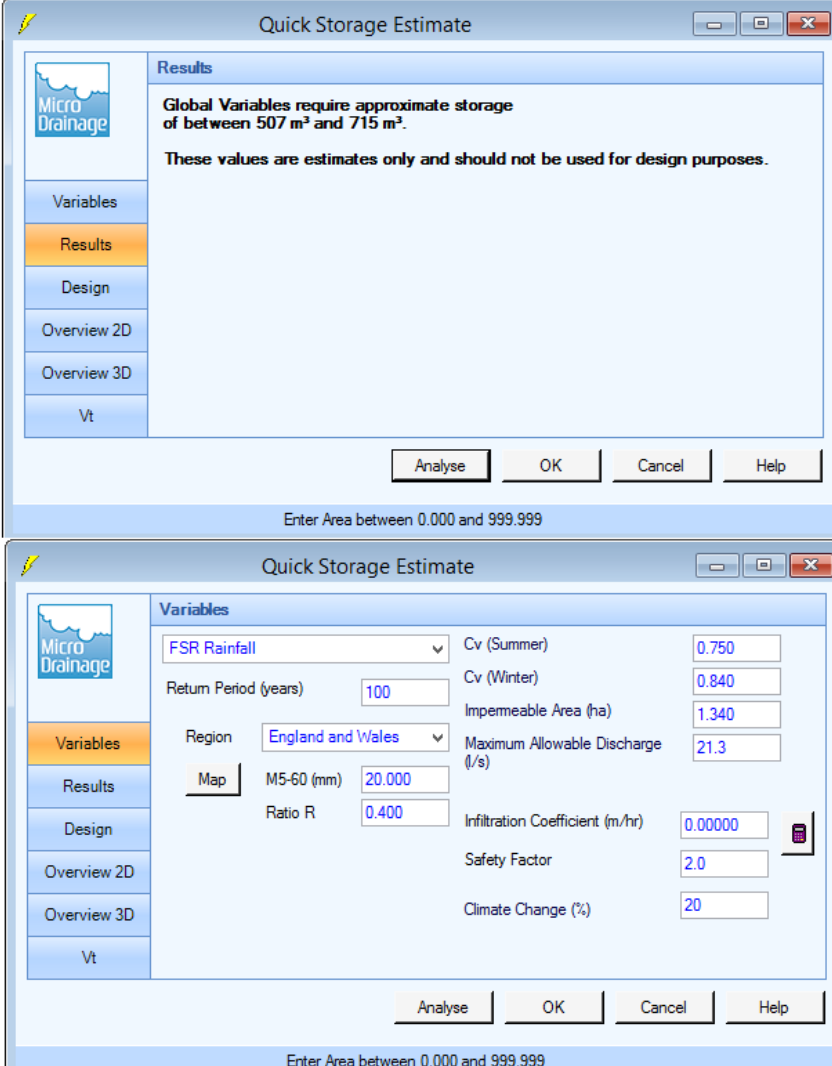
### 6.3 Proposed Surface Water Drainage

- 6.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated for up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 6.3.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. The ground conditions should be investigated further to determine whether it is suitable to support the use of Sustainable

Urban Drainage Systems (SUDS) and therefore an alternative method of surface water discharge has been assumed until the ground conditions are confirmed.

- 6.3.3 It shall be assumed that when the site is developed the proposed surface water drainage network will outfall into the existing combined public sewer within Speke Road at manhole 5501.
- 6.3.4 The existing subscan survey drawing shows that there are two outfall pipes which discharge off site along the southern boundary. Discussions with United Utilities confirms that they would accept a new connection on to the public sewer within Speke Road and they would expect the proposed run-off rates to be restricted to the maximum capacity provided in the two existing connections off site.
- 6.3.5 The existing gradients for the outfall pipes are unknown as the downstream manholes were unable to be surveyed. However an assumption has been made that the outfall from MH59 (subscan reference) is a 150mm diameter pipe at 1 in 100, therefore using the Wallingford Hydraulic Capacity for pipes tables and using a ks value of 1.5mm the capacity of the pipe is 15.47 l/s. It is also assumed that the outfall from MH14 (subscan reference) is a 100mm diameter pipe at 1 in 80, therefore using the Wallingford Hydraulic Capacity for pipes tables and using a ks value of 1.5mm the capacity of the pipe is 5.83 l/s.
- 6.3.6 The proposed restriction of the new outfall in to the public sewer in Speke Road is 21.3 l/s.
- 6.3.7 The impermeable areas on site equate to approximately 1.34 ha, the attenuation required by restriction to 21.3 l/s for up to the 1 in 100 year plus 20% for climate change storm event is 507-715m<sup>3</sup>. Refer to Figure 5.

**Figure 5: Attenuation Volumes**



**Quick Storage Estimate**

**Results**

Global Variables require approximate storage of between 507 m³ and 715 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

---

**Quick Storage Estimate**

**Variables**

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map

M5-60 (mm) 20.000

Ratio R 0.400

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 1.340

Maximum Allowable Discharge (l/s) 21.3

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 20

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

- 6.3.8 Attenuation volumes can be achieved using a combination of ponds, permeable paving with high voids sub-base and percolation pipes, oversized pipes and cellular storage units. Use of ponds, and permeable paved areas would also be considered as methods of filtration to improve water run-off quality.
- 6.3.9 Other methods of sustainability could be provided by use of rainwater harvesting tanks, rainwater butts or green roofs for the Building elements.
- 6.3.10 The proposed drainage strategy is enclosed in Appendix A.
- 6.3.11 The final design of the foul and storm water network needs to be in accordance with legislation set by the Environment Agency, Liverpool City Council and United Utilities.

## 6.4 Maintenance

- 6.4.1 A copy of the as built drainage layout should be provided in the Operations and Maintenance Manual.
- 6.4.2 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 6.4.3 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

## 6.5 BREEAM

- 6.5.1 Where BREEAM credits may be required for the POL3 Surface Water run-off element; the below table summarises the potential achievability for the current site proposals.

| Criteria                         | Credits | Credits Achievable   | Compliance/Evidence Requirements  |
|----------------------------------|---------|----------------------|---|
| Flood Risk                       | 2       | 2                    | <ul style="list-style-type: none"> <li>The site is in Flood Zone 1 (rivers and seas) and therefore low risk areas of flooding on site.</li> <li>This FRA confirms that if the principles set out within this report are followed, the site is considered to be at low risk of flooding from all sources.</li> </ul>   |
| Surface Water run-off            | 2       | 1-2 (refer to 6.5.2) | <ul style="list-style-type: none"> <li>Ensure appropriate consultant is appointed for design.</li> <li>Ensure peak run off is restricted to pre development flow rates for up to the 1 in 100 year event.</li> <li>Include an allowance for climate change in the design- a 20% allowance for climate change is proposed.</li> </ul> <p>At detailed design it should be demonstrated that:</p> <ul style="list-style-type: none"> <li>Flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance).</li> <li>The post development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development.</li> <li>Any additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.</li> </ul> |
| Minimising Watercourse Pollution | 1       | 0-1 (refer to 6.5.2) | <p>This could only be achieved if:</p> <ul style="list-style-type: none"> <li>The Appropriate Consultant confirms that there is no discharge from the developed site for rain-fall up to 5mm.</li> <li>Specification of Sustainable Drainage Systems (SUDs) or source control systems such as permeable surfaces or infiltration trenches where run-off drains are in areas with a relatively low risk source of watercourse pollution.</li> <li>Specification of oil/petrol separators (or equivalent system) in surface water drainage systems, where there is a high risk of contamination or spillage of substances such as petrol and oil (see Compliance notes for a list of areas).</li> </ul>   |

|  |  |  |  |
|--|--|--|--|
|  |  |  | <ul style="list-style-type: none"> <li>• All water pollution prevention systems have been designed and detailed in accordance with the recommendations of Pollution Prevention Guideline and where applicable the SUDS manual.</li> <li>• A comprehensive and up-to-date drainage plan of the site will be made available for the building/site occupiers.</li> <li>• There are no proposed chemical/liquid gas storage areas.</li> <li>• Where present, all external storage and delivery areas designed and detailed in accordance with the recommendations of the Environment Agency's publication Pollution Prevention Pays Guidance.</li> </ul> |
|--|--|--|--|

6.5.2 The credits for the Surface Water run-off and Minimising Watercourse pollution cannot be confirmed yet as this is dependent on the confirmation of any infiltration on site. If infiltration is achievable then the following criteria may be achievable and the credits could be awarded (subject to all other criteria being achieved):

- Any additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques; and
- The Appropriate Consultant confirms that there is no discharge from the developed site for rain-fall up to 5mm.

6.5.3 Where infiltration is not possible, it may be necessary for water reuse to be proposed to be awarded the credits such as rainwater harvesting.

## 7.0 Conclusions and Recommendations

- A Flood Risk Assessment has been conducted for the proposed development of St Julie's Catholic High School, Liverpool. The FRA has been conducted in accordance with the requirements of NPPF.
- The EA flood map (rivers and sea flooding) shows the development site in Flood Zone 1, where the risk of flooding from rivers and seas is considered low.
- A Strategic Flood Risk Assessment (SFRA) for Liverpool was carried out in January 2008.
- The proposed external levels should be fallen away from the proposed buildings so that low points are not created, encouraging surface water to fall towards the proposed buildings.
- A pathway for flood water should be created working with the existing site levels to allow free passage of any overland flows through the site, located to avoid building and other important structures.
- It is recommended that groundwater levels are monitored during any ground investigation works to determine site specific groundwater levels.
- It is recommended that the ground conditions are investigated further to determine whether infiltration is suitable.
- There are no public sewers within the proposed development site and therefore sewer diversion works are not required.
- It is recommended that a CCTV survey is carried out on all existing sewers within the development area to determine the locations, condition and the locations of any existing connections to the public sewers.
- The foul drainage from the development is proposed to be collected by new private foul drains which will connect into the existing combined public sewer within Speke Road at manhole 5501.
- The peak foul discharge for the proposed development is estimated as 0.24 l/s based on a site area of 0.4 hectares (proposed buildings) and assuming 0.6 l/s/hectare.
- It is assumed that when the site is developed the proposed surface water drainage network will outfall into the existing combined public sewer within Speke Road at manhole 5501.
- The proposed restriction of the new outfall in to the public sewer in Speke Road is 21.3 l/s.
- The attenuation required for up to the 1 in 100 year storm event plus an allowance of 20% for climate change would be in the region of 507-715m<sup>3</sup>.
- SUDS should be incorporated into the design wherever possible. Attenuation could be achieved by introducing a combination of ponds, permeable paving with high voids sub-base and percolation pipes, oversized pipes and cellular storage units. Use of ponds, and permeable paved areas would also be considered as methods of filtration to improve water run-off quality.
- Other methods of sustainability could be provided by use of rainwater harvesting tanks, rainwater butts or green roofs for the Building elements.

- The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Liverpool City Council and United Utilities.
- A copy of the as built drainage layout should be provided in the Operations and Maintenance Manual.
- A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

Therefore, if the principles set out within the previous sections of this report are followed and developed at detailed design stage by the design engineer, the site can be considered:

- To have a low probability of suffering from any form of flooding.
- To be proved as not increasing the probability of flood risk to other properties within the local catchment area.

## Appendix A

General Arrangement Layout

United Utilities Sewer Records

Subscan Survey Drawing

Topographical Survey Drawing

Areas susceptible to Groundwater Flooding Map

Historical Flooding Map

Proposed Drainage Strategy

LANDSCAPE KEY

SOFT LANDSCAPE

- EXISTING TREES TO BE RETAINED  
Refer to Tree Survey for details
- EXISTING TREES TO BE REMOVED  
Refer to Tree Removal Plan for details
- WOODLAND TREE PLANTING
- FORMAL TREE PLANTING

- HEDGE PLANTING  
To delineate entrance routes
- ORNAMENTAL PLANTING
- MEADOW GRASS  
Under retained and new woodland trees
- AMENITY GRASS  
To courtyard areas and re-landscaped play areas

HARD LANDSCAPE

- EXISTING HARD SURFACE AREAS  
To be retained
- ROAD SURFACE - PROPOSED  
Vehicular Movement
- FOOTPATH SURFACE - PROPOSED  
Pedestrian Movement to all circulation routes and play areas
- FOOTPATH SURFACE - PROPOSED  
Bike/Paved Surface to Entrance Plaza
- TACTILE PAVING  
To road crossings and step thresholds
- STEPS  
To be built with high contrast surf, tactile paving and handrails
- PARKING BAY  
Where necessary may be included where adjoining buildings
- DISABLED PARKING SIGNAGE  
Post mounted sign to each bay
- CYCLE PARKING  
100% additional covered, secure spaces
- SEATING  
To be provided to provide resting places for non-ambulant users
- RETAINING WALL  
Back-filled retaining wall with ballistate protection to edges
- EXISTING FENCE  
Refer to Existing Plan 1207/112
- SITE BOUNDARY FENCE  
2.4m high steel weathered panel
- MUGA FENCE  
3.0m high balltop fencing
- VEHICLE & PEDESTRIAN GATES  
To retain adjacent parking
- BIN STORE - GENERAL WASTE
- BIN STORE - FOOD & RECYCLING



purpose INFORMATION

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client  
**KIER NORTHWEST**

project  
**ST JULIES  
LIVERPOOL SCHOOLS INVESTMENT  
PROGRAMME**

drawing title  
**LANDSCAPE  
GENERAL ARRANGEMENT**

scale @ A1 1:500

date 19/11/14

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1206/100

/

**Curtins Consulting Engineers**

**10 Oxford Court  
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M2 3WQ**

**FAO: Chloé Grimsley**

**United Utilities Water PLC**

Property Searches  
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Great Sankey  
Warrington  
WA5 3LP

DX 715568 Warrington  
Telephone 0870 751 0101

Fax Number 0870 7510102

[Property.searches@uuplc.co.uk](mailto:Property.searches@uuplc.co.uk)

Your Ref: TPIN  
Our Ref: 14/ 1032815  
Date: 03/07/2014

Dear Sirs

**Location: ST JULIES HIGH SCHOO SPEKE ROAD HUNTS CROSS LIVERPOOL L25 7TN**

I acknowledge with thanks your request dated 01/07/14 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

I attach General Condition Information sheets, which details contact numbers for additional services (i.e. new supplies, connections, diversions) which we are unable to deal with at this office. In addition you should ensure they are made available to anyone carrying out any works which may affect our apparatus.

I trust the above meets with you requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0870 7510101.

Yours Faithfully,



Sue McManus  
Operations Manager  
Property Searches

## **TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS**

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UW apparatus) of United Utilities Water PLC ("UW").

### **TERMS AND CONDITIONS:**

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UW apparatus shown on the Map are approximate only. UW strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UW apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UW apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UW apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UW apparatus by reason of the actual position and/or depths of UW apparatus being different from those shown on the Map and any information supplied with it.

## 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. For further advice please call asset protection on **01925 678 306**

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.**

On 1 October 2011 all privately owned sewers and lateral drains which communicate with (that is drain to) an existing public sewer as at 1 July 2011 will become the responsibility of the sewerage undertaker. This includes private sewers upstream of pumping stations that have yet to transfer, but excludes lengths of sewer or drain that are the subject of an on-going appeal or which have been excluded from transfer as a result of an appeal or which are on or under land opted-out by a Crown body. The transfer specifically excludes sewers and lateral drains owned by a railway undertaker. Sewers upstream of such assets, however, are transferred. Such assets may not be recorded on the public sewer record currently as it was not a requirement to keep records of previously private sewers and drains.

• **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", Seventh 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** carries 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.

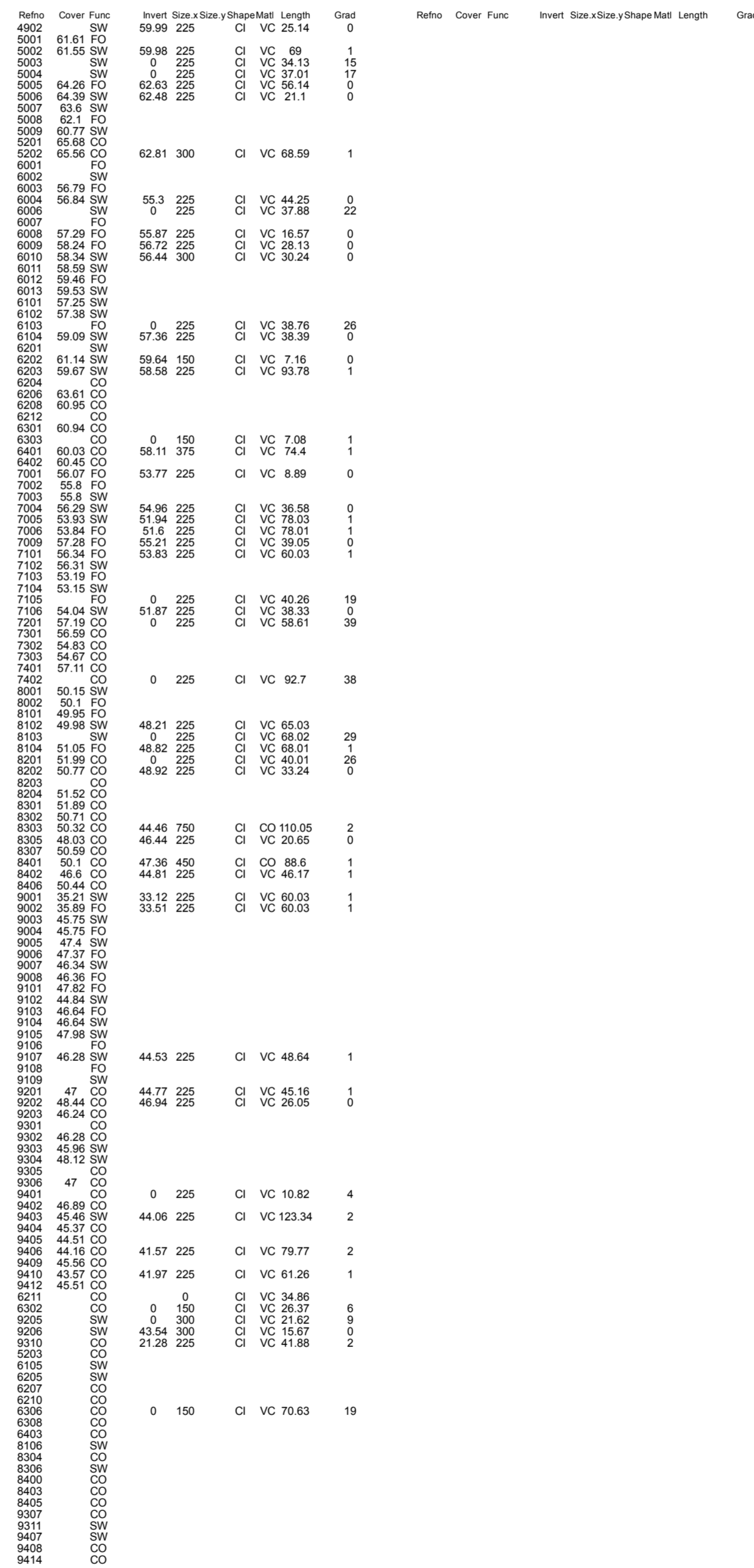
**Surface water sewers coloured blue** on our drawings are intended only to carry uncontaminated surface water (e.g. rainfall from roofs, etc) and they usually discharge into local watercourses. It is important for the protection of the environment and water quality that only uncontaminated surface water 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 731 365).



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.

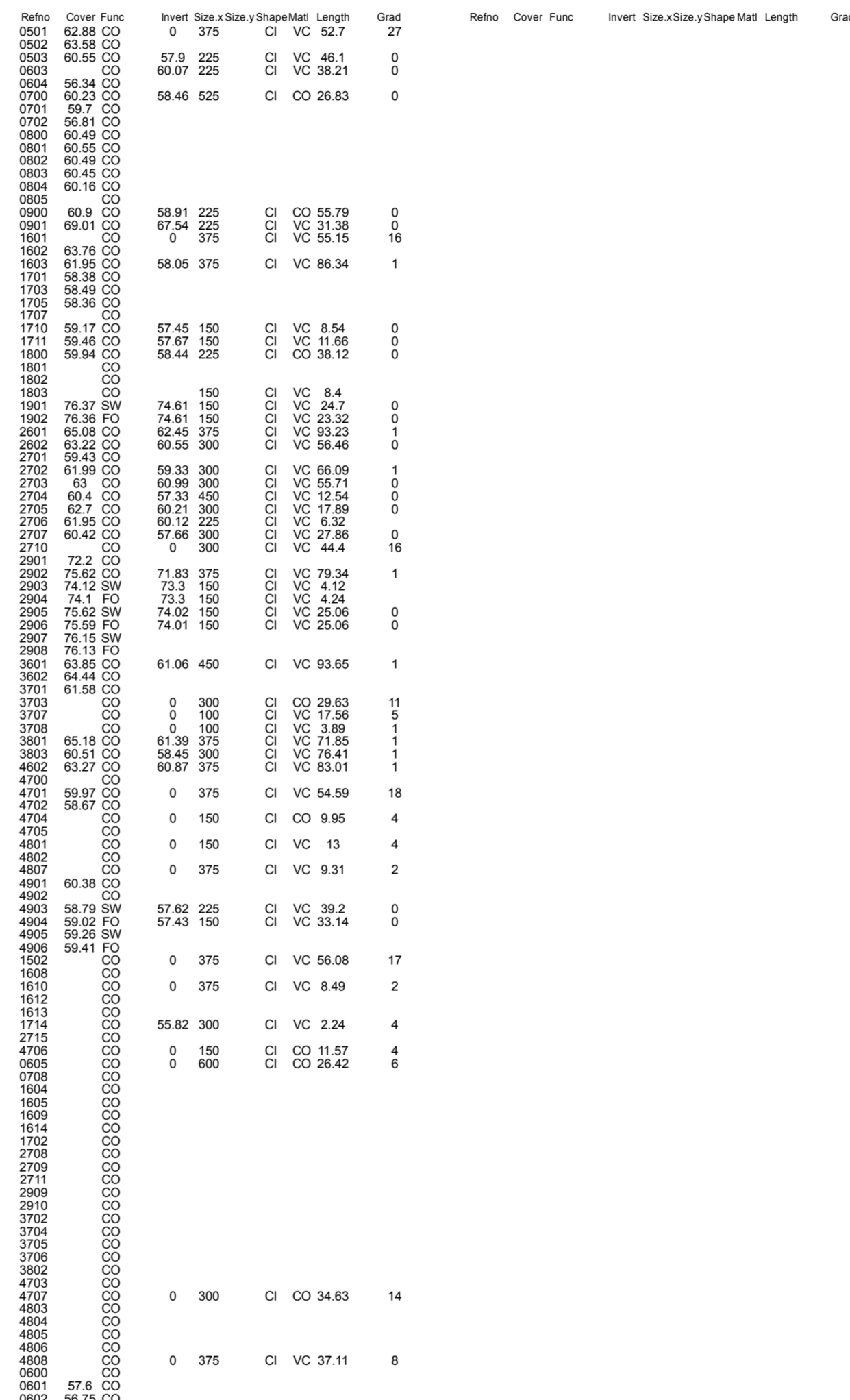
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Scale: 1: 1250    Date: 03/07/2014  
135 Nodes  
Sheet    1 of 1



## SEWER RECORDS

Scale: 1: 1250    Date: 03/07/2014




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.

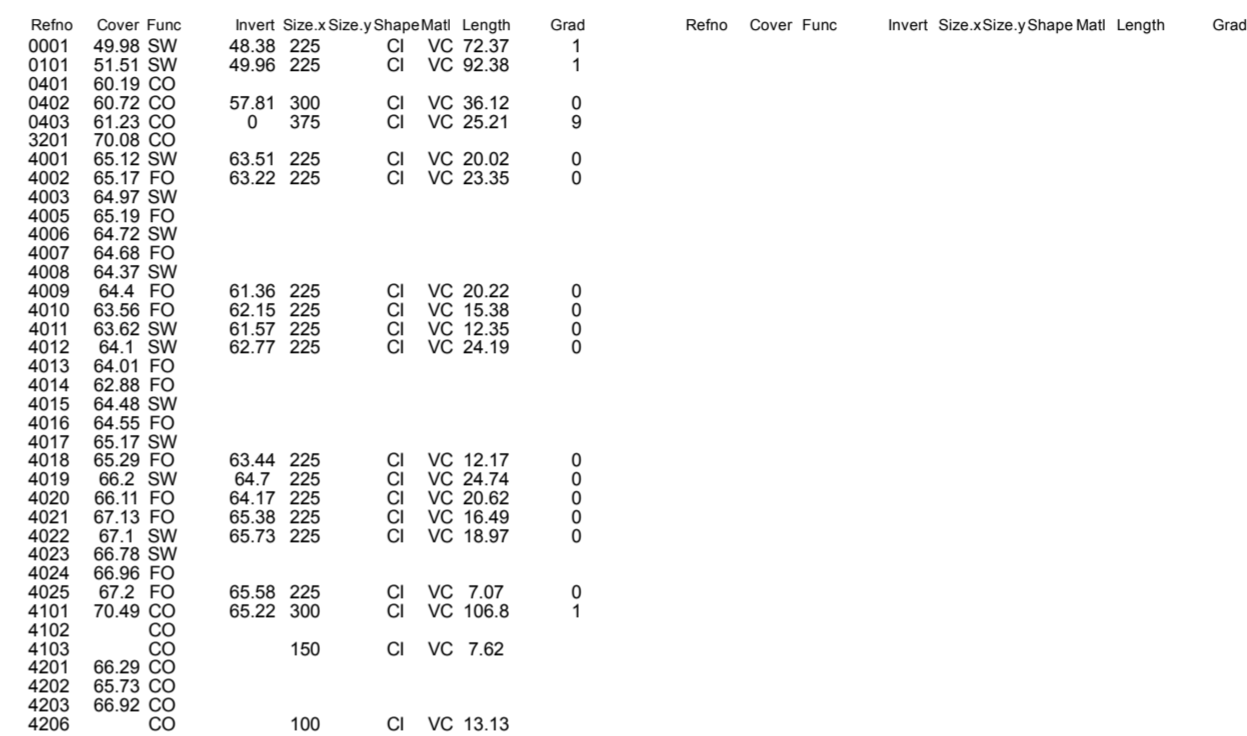
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**SEWER RECORDS**





| MANHOLE FUNCTION |                           |
|------------------|---------------------------|
| FO               | Foul                      |
| SW               | Surface Water             |
| CO               | Combined                  |
| OV               | Overflow                  |
| SEWER SHAPE      |                           |
| CI               | Circular                  |
| TR               | Trapezoidal               |
| EG               | Egg                       |
| AR               | Arch                      |
| OV               | Oval                      |
| BA               | Barrel                    |
| FT               | Flat Top                  |
| HO               | HorseShoe                 |
| RE               | Rectangular               |
| UN               | Unspecified               |
| SQ               | Square                    |
| SEWER MATERIAL   |                           |
| AC               | Asbestos Cement           |
| DI               | Ductile Iron              |
| BR               | Brick                     |
| PVC              | Polyvinyl Chloride        |
| PE               | Polyethylene              |
| CI               | Cast Iron                 |
| RP               | Reinforced Plastic Matrix |
| SI               | Spun Iron                 |
| CO               | Concrete                  |
| ST               | Steel                     |
| CSB              | Concrete Segment Bolted   |
| VC               | Vitrified Clay            |
| CSU              | Concrete Segment Unbolted |
| PP               | Polypropylene             |
| CC               | Concrete Box Culverted    |
| PF               | Pitch Fibre               |
| PSC              | Plastic/Steel Composite   |
| MAC              | Masonry, Coursed          |
| GRC              | Glass Reinforced Concrete |
| MAR              | Masonry, Random           |
| GRP              | Glass Reinforced Plastic  |
| U                | Unspecified               |

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 on this plan.

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## SEWER RECORDS

Scale: 1: 1250      Date: 03/07/2014

Printed By: Gareth Hindley





Figure 5.2.3 Areas Susceptible to Groundwater Flooding (AStGF)

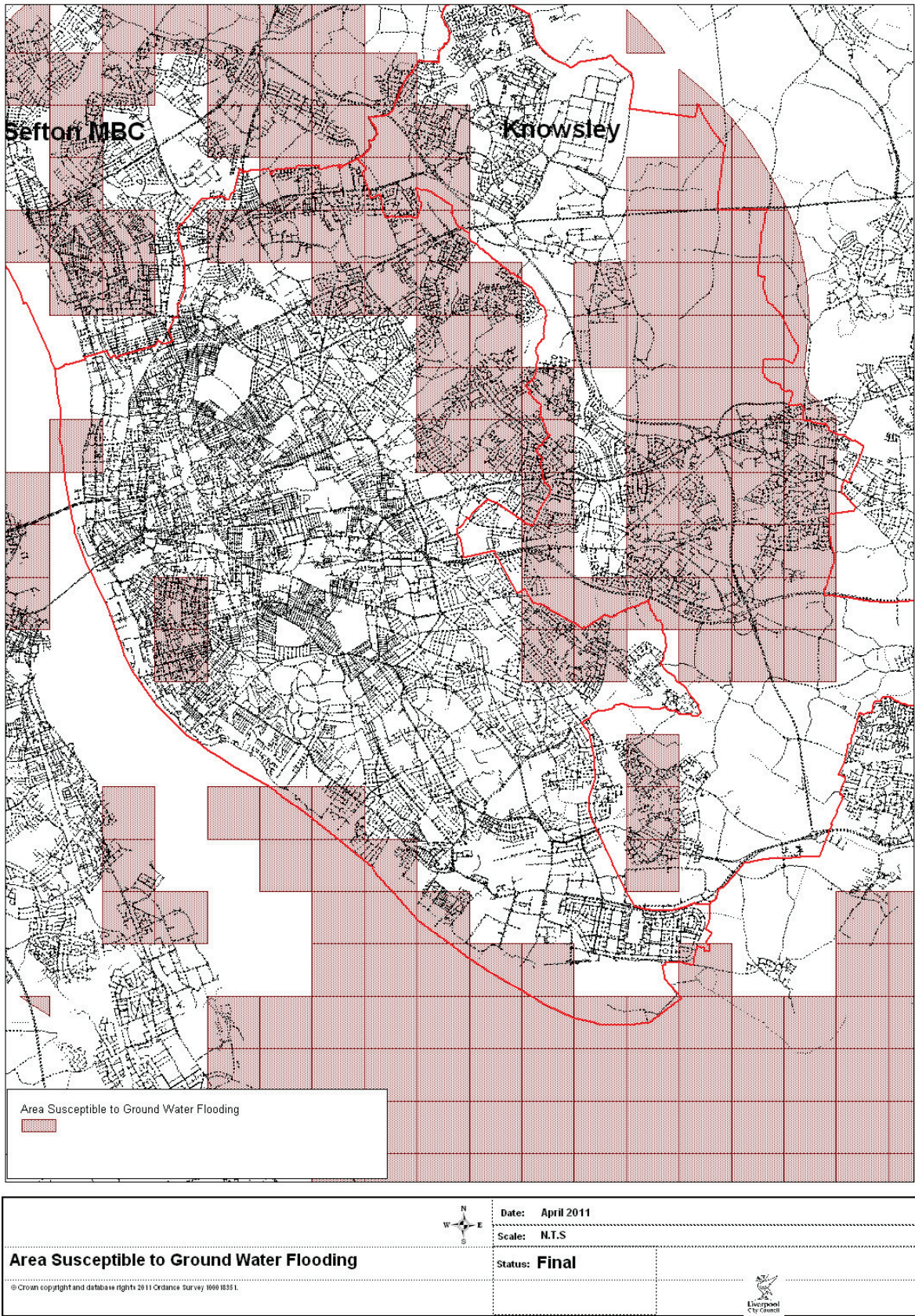
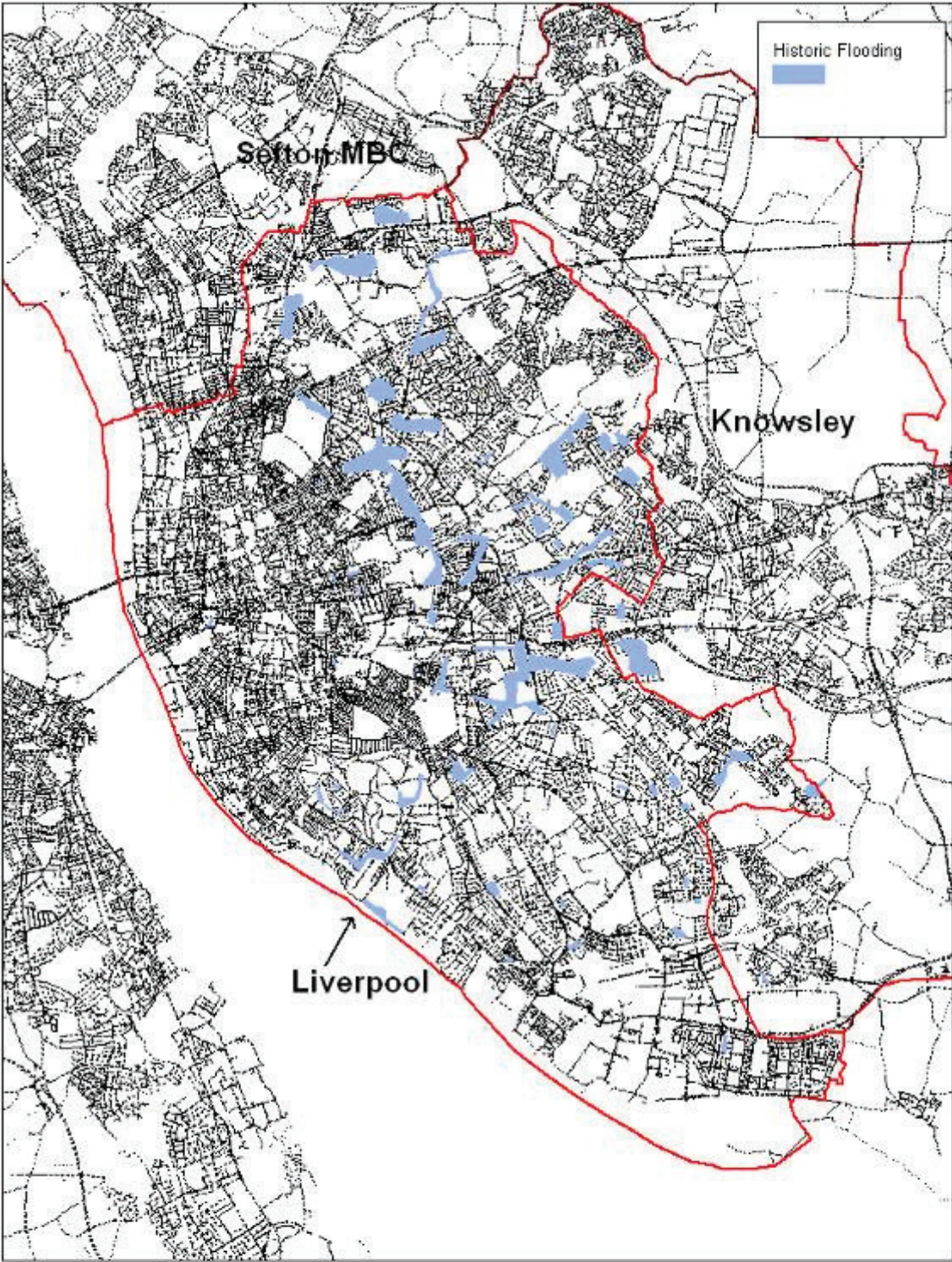


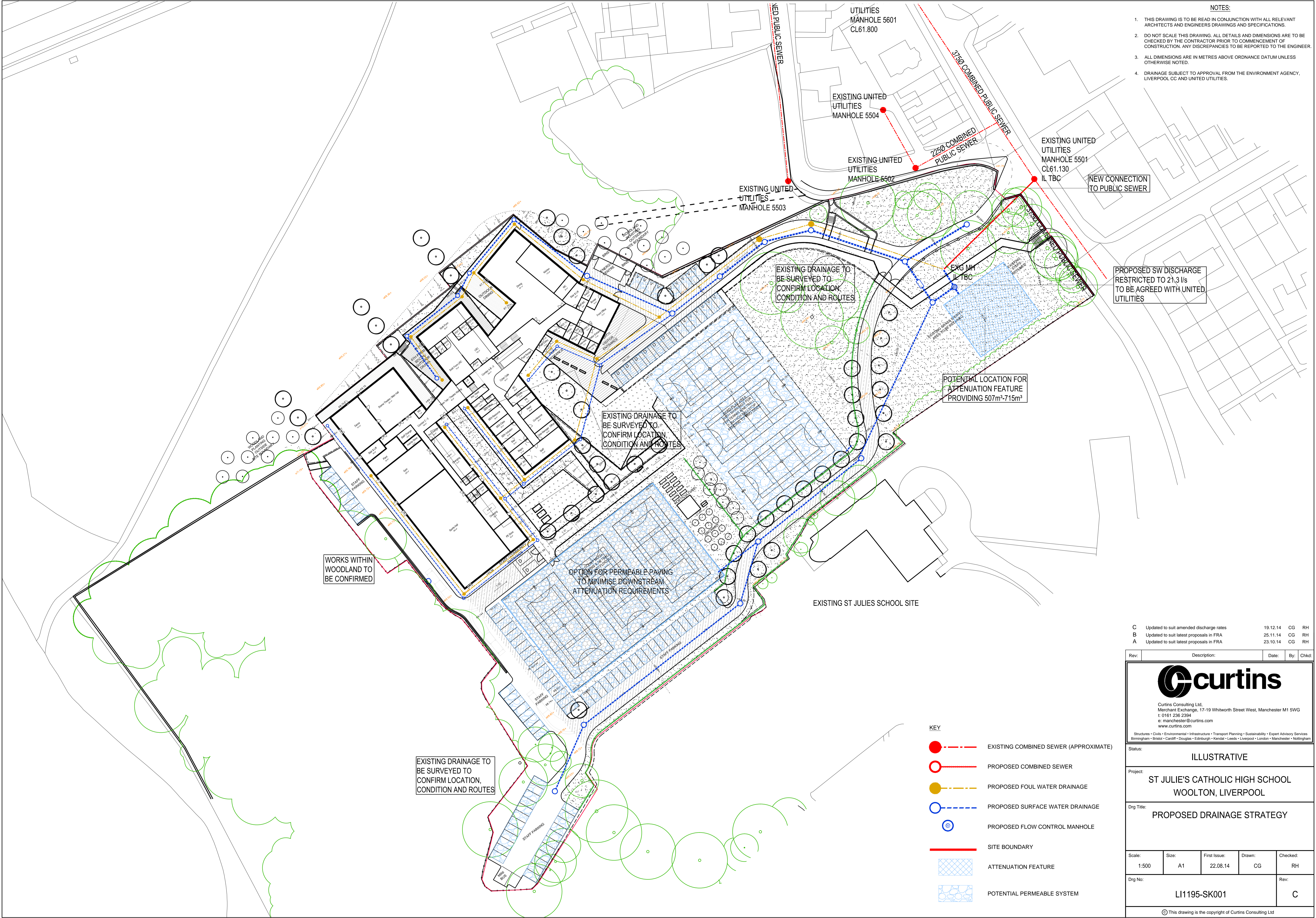


Figure 4.2.2 Summary of past flooding



|   |  |
|---|--|
|    | Date: April 2011   |
| <b>Historic Flooding Locations</b>  | Scale: N.T.S   |
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