FLOOD RISK ASSESSMENT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT
LAND NORTH OF LIVERPOOL ROAD, FORMBY
ON BEHALF OF
BARRATT HOMES MANCHESTER

JULY 2013

[ISSUE 4]

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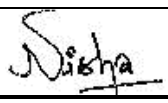
Signature:				
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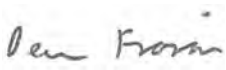
Signature:				
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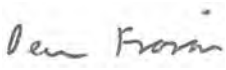
Signature:				
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1.0 INTRODUCTION

1.1 This Flood Risk Assessment has been prepared by Cole Easdon Consultants on behalf of Barratt Homes Manchester in respect of a planning application for a proposed residential development on land to the north of Liverpool Road in Formby. Refer to CEC Figure 3556/500/Figure 1 [*Site Location Plan*] in Appendix 1.

1.2 A draft of this document (Issue 3) has previously been commented on by the Environment Agency (EA) in April 2013. Refer to Appendix 4. In that response the EA confirmed that they considered the FRA to be acceptable in principle in its content and that it should be used to inform the future design of the development, including the proposal for surface water management. We would confirm that this current issue (Issue 4) of the FRA is unchanged from the previous issue commented on by the EA.

Development Proposals

1.3 The proposals include comprise the construction of some 256 No. residential units and associated access road, parking and landscaped areas.

1.4 This study is based on Drawing No. C1500/SK020T [*Preliminary Site Layout*] prepared by IDP Midlands Architects, revised in June 2013. Refer to Appendix 2.

Need for Study

1.5 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per guidance provided within the *National Planning Policy Framework (NPPF)*.

1.6 Accordingly, this study has been prepared to:

i) assess flood risk to the development from fluvial sources;

ii) assess flood risk to the development from other potential sources, including ditches, sewers, groundwater and overland flows;

iii) ensure that the proposed development does not exacerbate flood risks within the locality; and

iv) ensure that the proposed development will fully comply with the requirements of the Environment Agency's policy on the safeguarding of floodplains, as detailed within the NPPF.

Scope of Study

1.7 In Section 2.0, we describe the characteristics of the development site and surrounding area. In Section 3.0, we assess flood risk issues. Finally, conclusions are presented in Section 4.0.

1.8 The following documents have been reviewed as part of this assessment:

- *Knowsley and Sefton Metropolitan Borough Councils (MBC) Strategic Flood Risk Assessment (SFRA, June 2009);*
- *Sefton MBC Preliminary Flood Risk Assessment (PFRA, May 2011);*
- *Sefton MBC Surface Water Management Plan (SWMP, August 2011);*
- *Lower Alt with Crossens Pumped Drainage Catchment: Draft Flood Risk Management Strategic Plan (DFRMSP);*
- *National Planning Policy Framework (NPPF) (March 2012);*
- *Technical Guidance to the National Planning Policy Framework (March 2012)*

1.9 The following abbreviations are used in this report:

AOD – Above Ordnance Datum
AEP – Annual Exceedance Probability
CDA – Critical Drainage Area
CC – Climate Change
EA – Environment Agency
FRA – Flood Risk Assessment
LFRZ – Local Flood Risk Zone
FZM – Flood Zone Map prepared by the EA
NPPF – National Planning Policy Framework
SAB – SuDS Approving Body
SFRA – Strategic Flood Risk Assessment
SuDS – Sustainable Drainage Systems
SWMP – Surface Water Management Plan

2.0 THE EXISTING SITE

Refer to CEC Figure 3556/500/Figure 1 [*Site Location Plan*] in Appendix 1 and CEC Plan 3556/500 [*Existing Site Layout*] within Appendix 9.

Site Location and Topography

2.1 The application site is situated within the outskirts of Formby, some 2.0km to the southeast of the town centre. The town of Formby is located within Sefton MBC in Merseyside. Refer to CEC Figure 3556/500/Figure 1 [*Site Location Plan*] in Appendix 1.

2.2 The application site is located adjacent to the A456 Formby By-pass. The site is bounded by Alt Road and Savon Hook highways and residential properties along the western boundary, with an open field adjoining the lower western site boundary. To the north lies a Public Open Space (POS) and children's play area with residential properties beyond. The site is bounded by Liverpool Road Highway to the south and by the Formby By-pass to the east with open agricultural fields beyond.

2.3 The existing site is an elongated parcel of greenfield land extending over an area of some 12.1 hectares, and includes an open agricultural field. A public footpath runs through the site joining Liverpool Road to the west and Formby Bypass to the east and continues eastwards.

2.4 Land within the site generally falls in a southeasterly direction. The site levels vary from 5.65m AOD within the northeastern region, to 3.56m AOD within the southeastern region. A Topographical Survey (*Plan No. SDL 1959/3 Sheet 1 and 2*) dated 23.10.2012 by Survey and Design Limited has been used for this study. This topographical survey is included within CEC Plans 3556/500 [*Existing Site Layout*] and 3556/500/SK01 [*Proposed Site Layout*], both located in Appendix 9.

Nearby Watercourses/Drainage Features

2.5 The local catchment is lowlying and is drained by the River Alt and its tributaries, namely Downholland Brook, Arnolds Cop Brook, North End Watercourse, Ravens Meols Brook and Lighthouse Brook in Formby. A network of drainage ditches and land drains collecting runoff from the urban and rural land of Formby feed into these watercourses via gravity connection or pumping. It is understood that water levels within these watercourses and channels are mostly controlled under different winter and summer regimes to prevent

flooding, to provide irrigation and to prevent peat shrinkages *(Source: Preliminary FRA, May 2011)*.

2.6 The River Alt is located some 110m to the south of the site at its nearest point. The watercourse flows in its meandering course in a westerly and then southerly direction to join the North Sea to the south of Hightown, some 5.0km to the south of Formby. The Downholland Brook flows parallel to New Causeway located beyond the Formby By-pass, some 200m to the east of the site and joins the River Alt downstream of a bridge at Liverpool Road, some 100m to the south east of the site.

2.7 The River Alt discharges into the sea by a combination of gravity discharge (at low tide) and pumping (at high tide via the Altmouth Pumping Station). The Altmouth Pumping Station helps to maintain water levels in the Alt to benefit rural land drainage, provides some urban flood risk benefit, particularly near Formby and prevents tidal flooding upstream in all but the most severe events. The operation of Altmouth Pumping Station also reduces the time that water levels are held high in Downholland Brook and this reduces the potential from surface water flooding along Whams Dyke, Moss Side and Boundary Brook *(Source: Lower Alt with Crossens Pumped Drainage Catchment: Draft Flood Risk Management Strategic Plan)*.

2.8 In addition to Altmouth Pumping Station, the Lower Alt system is protected from fluvial and tidal flooding by a system of raised embankments on the River Alt and along Downholland Brook. The River Alt and Downholland Brook in Formby are defended with maintained channel sections and raised defences up to a design standard of 1% AEP (1 in 100 year event). Refer to the EA data within Appendix 4.

2.9 A drainage ditch (Ditch 1) is routed along the southern and eastern site boundary with a raised lip/mound separating the ditch from the adjoining field. The ditch enters a 225mm dia. culvert beneath the Formby By-pass and continues easterly towards the Downholland Brook as an open channel. Refer to Photographs 3 – 5 in Appendix 3. A second ditch (Ditch 2) exists along the southwestern boundary with no visible outfall, and is presumed to discharge directly to the River Alt.

Existing Sewers/Highway Drains

2.10 Sewer records obtained from United Utilities (UU) indicate an extensive network of foul and surface water sewers existing within the locality. A 225mm dia. sewer runs beneath Monks Drive and then continues along Savon Hook as a 300mm dia. sewer, where it is joined by

another 300mm dia. surface water sewer running along the other leg of Savon Hook. This then continues in a northerly direction parallel to the western site boundary, and terminates in a 375mm dia. sewer near River Close as indicated within the UU sewer records. Another 225mm dia. surface water sewer runs beneath Alt Road, turns into Monks Drive and then into River Close to join the former sewer before its termination point. It is presumed that this 375mm dia. sewer continues northwards to connect to the 450mm dia. surface water sewer located beneath Alt Road, and continues along Alt Road. A 300mm dia. surface water sewer exists beneath Liverpool Road to the south, which discharges into the River Alt to the south of the site. Refer to sewer records within Appendix 5. It is understood that UU public surface water sewers serving the area eventually drain into the Downholland Brook to the east via a number of small watercourses, ditches and drains.

2.11 Public foul sewers located serving the residential areas within the vicinity mostly run westerly towards the Sewage Treatment Plant (STW) located to the south of Altcar Lane, some 500m to the west of the site boundary. A 400mm dia. foul water rising main routed beneath the Formby By-pass and a 150mm dia. foul water rising main routed through the field to the east both enter the site from the east and run parallel to the existing footpath in a westerly direction towards the STW. Refer to sewer records within Appendix 5.

2.12 Highway drains exist beneath the Formby By-pass carriageway and adjoining footway, with no apparent outfall recorded. Refer to sewer records within Appendix 5.

Water Management

2.13 Sefton MBC has overall responsibility for the management of watercourses other than 'main rivers', which are maintained by the EA. The EA is also responsible for the operation and maintenance of the Altmouth Pumping Station. Sefton MBC currently undertakes maintenance on a number of ordinary watercourses and, in some locations, main rivers, to ensure that they function effectively. This typically takes place in Formby, which is particularly sensitive to the effects of vegetation and siltation. Dobbs Gutter in Formby is cleared on an annual cycle, whilst other watercourses are cleaned on a four yearly basis. The maintenance of ordinary watercourses and surface water features is the responsibility of the riparian owner. However, Sefton MBC may exercise its power if there are local flood risk issues such as in Norburn Crescent, by Sunningdale Gardens and on Piercefield Road in Formby within Critical Drainage Area (CDA) 17: Whym Dyke and Downholland Brook. United Utilities is responsible for the management of the public sewerage system throughout the

Borough, including surface water, foul and combined sewerage. Together, these authorities are responsible for managing flood risk within the Lower Alt catchment.

Existing Ground Conditions

2.14 The British Geological Survey (BGS) 1:50000 Map (Sheet 83 Formby) indicates the local area to be underlain by superficial deposits of Blown Sand within northern and western region and Alluvium within southeastern region over Sidmouth Mudstone Formation. The EA's Aquifer Map identifies the superficial deposits beneath the site as a 'Secondary A' Aquifer with high vulnerability. The Sidmouth Mudstone Formation is classified as a 'Secondary B' Aquifer. The site does not lie within any groundwater source protection zones.

2.15 Intrusive site investigation work has been undertaken by Curtins Consulting Ltd in September 2012. The fieldwork included 27 No. trial pits, 6 No. window sample boreholes and 4 No. cable percussion boreholes excavated to depths varying between 3.0m and 12.30m bgl (below ground level). These determined the site to be underlain by clayey topsoil (typically 0.2 – 0.3m thick) across the site with a maximum thickness of 0.55m recorded at WS3. Beneath the topsoil occurs loose to medium dense Sand, very soft Clay and Silt, with localised thin layer of peat. These represent Alluvium, Blown Sand and Downholland Silt superficial deposits. These superficial deposits extended to the full depth of all exploratory holes (at 4.0m bgl) except within BH1 and WS6 where these strata ended at 5.1m and 3.3m bgl. Silty fine Sand (possible Tidal Flat Deposits) occur beneath the superficial deposits within BH1 and WS6 which extended to a maximum depth of 11.45m bgl. Water entry was recorded at depths between 1.0m and 2.5m bgl across the exploratory holes, with standing water level observed as shallow as at 0.6m bgl. Refer to Excerpt of SI report in Appendix 6.

3.0 FLOOD RISK ISSUES

3.1 This section presents an assessment of flood risk to the development from:

a) external sources; and

b) surface water discharge from the proposed development.

3.2 Recommended flood risk mitigation measures appropriate to the level of perceived risk are included in the assessment. The mitigation measures are summarised in Table 3.1 on page 16.

A) • Assessment of Flood Risk to the Development Site from External Sources

Ai) Flood History

Catchment-wide Issues

3.3 Information has been collated from various studies (i.e. SFRA, PFRA, SWMP etc) and local knowledge so as to aid an understanding of flooding within the Borough. The SFRA for Knowsley and Sefton MBC indicates that fluvial flooding is the primary source of flooding in the Sefton area, with risk areas being defined along Three Pools Waterway, The Pool, Fine Jane's Brook, Downholland Brook, River Alt, Dover's Brook. Areas that have prevalent fluvial flooding have been identified in the northeast of Southport, north east and east of Formby, the left and right bank of the River Alt at its confluence with Downholland Brook and the areas of Maghull and Aintree. United Utilities hold records of flooding issues relating to surface and foul water sewers in the sewer flooding DG5 register which shows that sewer flooding is an issue in Aintree, Bootle, Litherland, Orrell, Crosby, Thornton, Maghull, Formby, Ainsdale and Southport. Refer to *Preliminary FRA Maps (Figures A-1 and A-2)* in Appendix 7 for flood records.

3.4 Formby is one of the primary areas where flooding from ordinary watercourses is currently and has historically been an issue, particularly with respect to Dobb's Gutter running through the centre of Formby. Such flooding has typically been associated with high water levels in the main river (Downholland Brook and ultimately the River Alt), as much of the surface water drainage within the urban areas is held back if flows are high within the river system to which they discharge. The sewerage infrastructure in the urbanised parts of the Borough of Sefton is largely Victorian construction and there is a risk of localised flooding associated with the public sewerage infrastructure related to hydraulic inadequacy, insufficient capacity or failure. United Utilities records indicate that the capacity of the network varies greatly across the Borough and in places has capacity as low as for a 1 in 1

year storm event. There are sections of the network in all parts of Sefton that have an existing capacity of less than 1 in 5 year event.

3.5 The risk of flooding within the Alt catchment is currently managed by undertaking channel maintenance in conjunction with continued operation of Altmouth Pumping Station by the EA. The Altmouth Pumping Station constructed in the early 1970s helps to maintain water levels in the Alt low enough to allow free discharge from the drainage network in Formby. The Altmouth Pumping Station also provides protection to Formby against tidal ingress.

Site-specific Issues

Critical Drainage Area

3.6 The site is located within Critical Drainage Area (CDA) 17: Whym Dyke and Downholland Brook and the SWMP identifies discrete areas of 'Local Flood Risk Zones' (LFRZ) within the site. Refer to ***Figure C-23*** within Appendix 7. Local knowledge suggests that the development site is susceptible to flooding, with pools of standing water observed on the site for a number of months in a year. Refer to Photographs 1 and 2 in Appendix 3. The topographical survey undertaken in February 2011 identifies such areas of standing water within the low lying southeastern site corner between the highways (Liverpool Road and Formby By-pass), along a strip of land adjacent to the existing public footpath and within a small area to the north adjacent to Alt Road. Refer to CEC Plan 3556/500 [***Existing Site Layout***] in Appendix 9 for details. These areas coincide with the LFRZs identified within the ***Figure A4-7*** in Appendix 7.

Public Sewer Flooding

3.7 The public drainage networks beneath the highways within the adjoining residential areas have been observed by local residents to frequently surcharge and overflow at times of heavy rainfall.

Groundwater Flooding

3.8 Groundwater has been observed by local residents at shallow depths (within a foot) within adjacent existing gardens, with flooding of garden areas having been reported from rising groundwater during heavy rainfall.

Aii) Assessment of Flood Risk from Fluvial/Tidal Sources

3.9 According to the EA's Indicative Flood Zone Map (FZM), the site lies within Flood Zone 1 (Low Risk) with less than a 1 in 1000 (0.1%) annual probability of fluvial flooding in any year. Refer to CEC Figure 3556/500/Figure 2 [***Flood Zone Map***] within Appendix 1. The

EA's Flood Zone 3 for the Downholland Brook is confined by the Formby By-pass, which appears to act as a flood barrier preventing the floodplain from extending further west.

3.10 Notwithstanding this, the site maintains hydraulic continuity with the Downholland Brook via Ditch 1 and it is anticipated that the floodplain associated with the Downholland Brook will extend into the site via this hydraulic link, flooding parts of the site lying at similar floodwater levels.

3.11 The Altmouth Pumping Station limits the tidal extent within the River Alt and prevents tidal flooding upstream in all but the most severe events; however the protection standard remains unconfirmed. The River Alt and Downholland Brook within the site vicinity are defended with maintained channel sections and raised defences up to a design standard of 1% AEP (1 in 100 year event). Together these defences benefit areas to the east of New Causeway and areas to the south of Formby. The area to the east of New Causeway is shown to be defended for the 1% AEP event; however the site and the area between New Causeway and the Formby By-pass do not benefit from these defences. Refer to the EA data within Appendix 4.

3.12 Modelled flood data has been obtained from the EA to delineate the 100 year, 100 year plus climate change and 1000 year floodplains. Flood data provided by the EA contains modelled flood levels for both defended and undefended scenarios. The undefended scenario (presumably without the presence of raised defences and Altmouth Pumping Station) denotes the influence of tidal effects on the flood levels, as water levels display a negative gradient. The defended scenario gives higher flood levels in the Downholland Brook, but with flood levels decreasing in a positive direction and gives lower flood levels in the Alt signifying the effect of pumping at Altmouth. Refer to the EA's modelled flood data within Appendix 4. The EA's modelled flood data however do not distinguish between fluvial and tidal floodplain extents.

3.13 The 1 in 100 year (1% AEP) and the 1 in 200 year (0.5% AEP) modelled flood levels in the Downholland Brook at Node ea01214DOWD01_405 relevant to the site are both 3.53m AOD for the undefended scenario and 3.71m and 3.76m AOD respectively for the defended scenario. As a conservative approach, the higher flood levels as derived by the defended scenario (no tidal effect) have been adopted in this study. Since no modelled flood levels are available for the 100 year and climate change (1% + CC AEP) scenario, the 200 year food level is deemed appropriate to delineate this floodplain, henceforth referred as the 1% + CC

AEP floodplain. The 1000 year (0.1% AEP) flood level for the defended scenario is 3.92m AOD. Refer to Appendix 4.

3.14 Accordingly, some 0.46ha of site area within the southeastern region adjacent to Ditch 1 lies within the 1% AEP floodplain of the Downholland Brook. Some 1.0ha of site area lies within the 1% + CC AEP floodplain. Refer to CEC Plan 3556/500 [*Existing Site Layout*] within Appendix 9 for EA's modelled floodplain extents.

3.15 As such, the site partly lies within an area at medium to high risk of fluvial/tidal flooding.

3.16 The 1% AEP and the 1% + CC AEP modelled flood levels in the River Alt in the vicinity of the site at Node RALT02_3334 are 3.77m AOD and 4.0m AOD respectively for the undefended scenario) and 3.55m AOD and 3.70m AOD respectively for the defended scenario. Refer to Appendix 4. However the site is unaffected by flooding in the River Alt according to the EA flood map.

Fluvial Flood Risk Mitigation Measures

Compensatory Floodplain Storage

3.17 The development will slightly encroach upon an existing 1% + CC AEP floodplain (3.76m AOD), and slightly within the 1% AEP floodplain (3.71m AOD) of the Downholland Brook. The area to be developed within the 1% + CC AEP lies between 3.60m AOD and 3.76m AOD. As such, development within this area will result in loss of floodplain volume of some 245m^3 between these levels as calculated using ground models generated in ***PDS Software***. Accordingly, compensatory storage will be provided on a volume for volume and level for level basis as required by the EA to compensate for the floodplain volume displaced. This will be provided by lowering levels over a 3265m^2 surface area within the southeastern corner (adjacent to the perimeter ditch) to a minimum of 3.60m AOD to provide an additional volume of 245m^3. Refer to CEC Plan 3556/500/SK01 [*Proposed Site Layout*] within Appendix 9 and volume calculations in Appendix 8.

Finished Floor Levels

3.18 Finished site levels, and finished floor levels will largely be governed by the provision to drain the site positively. Land within the site will be raised and finished floor levels will be set sufficiently high to facilitate positive drainage from the development site. As a minimum requirement, finished floor levels will be set at least 600mm above the 1% + CC AEP flood level of 3.76m AOD, at 4.36mAOD.

Safe Evacuation Route

3.19 The entire developed area will be located above the 1% + CC AEP flood level. Furthermore, the adjoining highways, Formby By-pass and Liverpool Road are also located above the 0.1% AEP flood level. As such, a dry evacuation route will always be available to and from the site towards the adjoining highways.

Flood Resilient and Resistant Construction

3.20 As a further precautionary measure, flood resistant and resilient construction techniques may be incorporated within the new development in accordance with *Improving the Flood Performance of New Dwellings (CLG, 2007)* as follows:

- in general, building materials with good resistance to water penetration and good drying ability should be selected up to flood slab level, e.g. engineering bricks;
- if ground conditions are favourable, ground bearing floor slabs should be utilised to prevent water entering below a suspended type floor;
- an interna/external water resistant(cement) plaster/render with lime content;
- ceramic or concrete based floor tiles, marbles or stone;
- flood resilient kitchen units, sealed PVC external doors and windows;
- installation of non-return valves on sewers to prevent backflow;
- installation of drop down electrical wiring;
- electrical and gas appliances elevated above flood levels; and
- periscopic air vents etc.

Incorporation of flood resilient and resistant construction techniques will future-proof new properties from any unprecedented or extreme flooding events.

Aiii) Assessment of Flood Risk from Existing Ditches

3.21 Ditch 1 is in hydraulic continuity with the Downholland Brook. As such, flood risk from this ditch is discussed under Section Aii) above.

Flood Risk Mitigation Measures - Existing Ditches

3.22 Fluvial flood risk mitigation measures as detailed above will ensure that residual flood risk from Ditch 1 will remain low.

3.23 The onsite ditches 1 & 2 are crucial to the effective surface water drainage of the local area including the site. These ditches will be retained/maintained with provision of an appropriate maintenance corridor (at least 3m either side) under the development proposal.

Aiv) Assessment of Flood Risk from Overland Flow

3.24 The site is identified to include discrete areas of LFRZs within CDA17 and is subject to localised frequent surface water flooding incidents. The site is relatively flat, falling gently in a southerly direction, and is drained by a complex system of drains and ditches that finally discharge into the Downholland Brook and the River Alt. Rainfall runoff within the site collects at certain lowlying locations and creates standing pools of water. There are four principle areas of surface water ponding. These are shown on CEC Plan 3556/500 [*Existing Site Layout*] in Appendix 9. Ponding to the south of the public footpath is exacerbated somewhat by a raised earth lip present along the entire length of Ditch 1 that prevents field runoff from entering into the ditch.

Overland Flow Flood Risk Mitigation Measures

Overland Flow Routes

3.25 Land within the site will be raised, suitably graded, localised low spots eliminated and a positive drainage system comprising swales will be implemented to manage site runoff.

Removal of Raised Lip along Perimeter Ditch

3.26 It is further proposed that the raised lip present along the southeastern perimeter Ditch 1, be removed so as to prevent accumulation of standing water at this location.

Finished Floor Levels and Flood Resilient and Resistant Construction

3.27 Setting finished floor levels at least 150mm above the adjoining ground levels and incorporation of flood resilient and resistant construction as explained within Paragraphs 3.19 – 3.21 will keep properties safe from any potential flood damage.

Av) Assessment of Flood Risk from Existing Sewers/Highway Drains

3.28 United Utilities hold records of flooding issues relating to surface and foul water sewers in the sewer flooding DG5 register which shows that sewer flooding is an issue in Aintree, Bootle, Litherland, Orrell, Crosby, Thornton, Maghull, Formby, Ainsdale and Southport. The public drainage networks beneath the highways within the adjoining residential areas have been observed by local residents to frequently surcharge and overflow at times of heavy rainfall. Local residents have noted that they believed that the public sewer system was at capacity, and have cited a number of problems in the area with collapsed sewers.

Sewers/Highway Drains Flood Risk Mitigation Measures

3.29 Land within the site will be suitably raised and finished floor levels set accordingly to facilitate drainage from the development site. This will ensure that the proposed

development remains safe from sewer overflows emanating from sewers located in adjoining highways. Any offsite sewer overflows entering the site will be routed safely via the proposed swale and highway corridor network towards the low lying landscaped area provided within the southeastern corner. These floodwaters will discharge to the Downholland Brook via Ditch 1.

3.30 The development site will not be discharge any surface water runoff into the existing public sewerage system, and as such will not worsen existing flood risk within the existing sewerage system.

Avi) Assessment of Flood Risk from Groundwater

3.31 The geology beneath the site includes Blown Sand within northern and western region and Alluvium within the southeastern region over Sidmouth Mudstone Formation. The superficial deposits beneath the site are classified as 'Secondary A' Aquifers with reasonable permeability whereas Sidmouth Mustone Formation is a Non Aquifer with negligible permeability. The *SWMP Figure A4-7* does not show the site at groundwater emergence risk. Refer to Appendix 7. However, site investigation works undertaken in September 2012 established groundwater table at depths varying between 1m and 2.5m bgl. Refer to Appendix 6. It therefore remains a possibility for groundwater to rise to the surface to cause flooding at the site.

Groundwater Flood Risk Mitigation Measures

3.32 Proposed flood mitigation measures including raised finished floor levels, land reprofiling and site wide ground raising, incorporation of overland flow routes and a swale drainage network, and flood resilient and resistant construction to be implemented within the new development will afford protection to proposed dwellings.

B) • Assessment of Flood Risk Arising from Surface Water Discharge from the Proposed Development

Refer to CEC Plan 3556/500/SK01 [*Proposed Site Layout*] within Appendix 9 and calculations within Appendix 8.

3.33 The site is identified as a LFRZ located within a critical drainage area (CDA17) of Formby with known flooding problems. As such, adequate surface water control measures will be adopted within the new development to manage surface water runoff and to ensure that post development runoff does not exacerbate flood risk either on site or elsewhere.

Bi) Surface Water Runoff Control

3.34 Surface water runoff from the development will be managed sustainably, taking into account the requirements of the EA, the *NPPF Technical Guidance, Building Regulations* and any site-specific constraints, as follows:

- the discharge rate from the proposed development will not exceed the existing site discharge rate;
- surface water runoff will be managed as close to source as possible;
- Sustainable Drainage Systems (SuDS) will be implemented wherever possible;
- surface water runoff will be managed on site for storm events up to and including the 1 in 100 year event plus 30% to allow for the climate change.

Existing Site Runoff Rate

3.35 The development is on a greenfield site and covers some 12.1ha. The existing site generates a 1 in 100 year greenfield runoff of 54 l/s. Greenfield runoff rates have been calculated using WinDes (from MicroDrainage) in accordance with *'ICP for SuDS - IH124'* method. Refer to calculation in Appendix 8. The site is currently drained by Ditch 1 routed adjacent to the southeastern site boundary, then drains into a 225mm dia. culvert which discharges via an open ditch into the Downholland Brook.

Proposed Site Discharge

3.36 The proposed development will include some 4.5ha of hard areas. Surface water runoff will be managed on site and site discharge will be limited to the existing greenfield rate for events up to and including the 1 in 100 year and 30% climate change storm.

Infiltration Drainage Potential

3.37 Site investigation works have shown that a high groundwater table exists beneath the site within the overlying Sand and Alluvium deposits, thereby precluding the use of infiltration SuDS. Attenuation based SuDS will be utilised on site to dispose of surface water runoff.

Proposed Site Drainage

3.38 Surface water runoff generated by impermeable areas within the development will be managed utilising attenuation SuDS. This will primarily comprise a site wide network of shallow, wide swale features located adjacent to the highway and within landscaped areas. These swale features will be interconnected by pipework beneath highway and footpath crossing locations. The swales may be lined to prevent groundwater ingress.

3.39 Outflow from the swale system will be limited to a maximum of 54.0 l/s for events up to and including the 1 in 100 year and 30% climate change. The proposed swale system will discharge directly into the River Alt via a culverted connection, or into Ditch 1 which in turn discharges to the Downholland Brook. The swale network will need to be designed with a surcharged outfall of 4.0m AOD representing the 1% AEP + CC event fluvial floodwater level in the River Alt. Preliminary calculations undertaken in Windes (from Microdrainage) indicates some 2230m^3 of storage will be required on site to accommodate the design storm under River Alt surcharged conditions. Refer to calculations in Appendix 8.

3.40 There will be no off-site surface water discharge to public sewers, and therefore no increase in flood risk to areas that already suffer from sewer flooding problems. In fact, the development will provide betterment through the removal of existing on-site ponding areas and the incorporation of a sustainable drainage system. It is therefore concluded that the development can be suitably accommodated without worsening flood risk within the site itself or the locality.

Design Exceedence

3.41 Should the onsite drainage system fail/block or overwhelm under extreme rainfall events exceeding the design standards, flooding may occur within the site. Any resultant floodwater would however be directed in a southeasterly direction along the highway corridor network to the floodplain compensatory storage area and Ditch 1, and away from dwellings.

3.42 Similarly, raising finished flood levels within the dwellings by at least 150mm above the adjacent ground level and at least 600mm above the design (1% + CC AEP) flood level of 3.76m AOD, and incorporation of flood resilient and resistant construction techniques will help to mitigate residual flood risks associated with such design exceedance or drainage system failure events.

Adoption

3.43 All onsite SuDS features (swales) will be offered for adoption by the SAB (SuDS Approving Body) or will be maintained by a private management company.

Water Quality

3.44 Swales provide storm water storage as well as treatment benefits. The pollutant removal capability of swales is recognised by CIRIA in the *The SUDS Manual*.

Table 3.1: Assessment of Flood Risk to the Development Site Arising from External Sources

Source of Potential Flooding to the Development Site	Flood Risk	Mitigation/Comments
§ Fluvial/Tidal/Ditches	Low to High	§ A small part of the site to be developed is located within the 1% + CC AEP floodplain of the Downholland Brook. § Appropriate flood mitigation measures as follows will be adopted to keep the new development safe from fluvial/tidal flooding : - Compensatory storage will be provided to compensate for floodplain volume lost. - Floor levels will be set at 4,36mAOD, 600mm higher than the 1% + CC AEP flood level. - A safe & dry evacuation route will always be available to and from the site to the adjoining highways. - Flood resilient and resistant construction techniques may also be incorporated to future-proof properties from extreme or unprecedented events.
§ Overland Flow	Medium	§ The site is known to be affected by surface water ponding within pockets of lowlying areas. § Site will be suitably raised and finished floor levels set accordingly and localised low spots will be eliminated to keep properties safe and prevent any surface water ponding. § Removal of lip along the ditch will allow overland runoff to discharge into Ditch 1. § Flood resilient and resistant construction techniques may also be incorporated.
§ Sewers/Highway Drains	Medium	§ Sewer overflow from the adjoining highways could potentially enter the site. § Raised finished floor levels and suitable overland flow routes will direct overflow away from properties. § Flood resilient and resistant construction techniques may also be incorporated.
§ Groundwater	Medium	§ Groundwater occurs at depths between 1.0m and 2.5m bgl beneath the site, which might rise to the surface in extreme events. § Raised finished floor levels, site wide ground raising and suitable overland flow routes will direct any gorundwater away from properties. § Flood resilient and resistant construction techniques may also be incorporated.

4.0 DISCUSSION AND CONCLUSIONS

Assessment of Flood Risk from External Sources

4.1 Flood risk to the proposed development from various sources, such as fluvial, tidal overland flow, sewers and groundwater has been considered in this study. Part of the undeveloped site is at high risk from fluvial flooding and at some risk from sewer, surface water runoff and groundwater flooding. Mitigation measures have been proposed and these are summarised below. Please note that in preplanning correspondence dated 9 April 2013, the EA has advised that they do not have any issues with respect to flood risk issues, mitigation and surface water drainage as presented in this report. Refer to Appendix 4.

Fluvial/ Tidal Flood Risk

4.2 The site is shown to be located within the EA's Flood Zone 1. However, it is anticipated that a hydraulic link exists between the existing ditch (Ditch 1) and the Downholland Brook. As such, a small part of the development site lies within 1%+CC AEP Floodplain.

4.3 The new development will largely be located within Flood Zone 1. A small part of the area to be developed will encroach into the 1%+CC AEP floodplain. Notwithstanding this, the site levels will be raised and the extents of existing floodplains realigned to locate the development above the 1% + CC AEP floodplain.

4.4 The modelled 1% + CC AEP flood levels in Downholland Brook is 3.53m AOD (undefended) and 3.76m AOD (defended). The development will be located outside the 1% + CC AEP floodplain above 3.76m AOD (defended case), this being higher.

4.5 Fluvial flood risk mitigation measures will be provided as follows:

- compensatory storage (245m^3) will be provided by lowering land within the southeastern region to compensate for the floodplain volume displaced arising from development.
- the site ground levels will be sufficiently raised and finished floor levels set accordingly to facilitate positive drainage from the site. This will ensure that the finished floor levels are set at least 600mm above the 1% + CC AEP flood level of 3.76m AOD.
- flood resilient and resistant construction techniques may also be incorporated.

Overland Flow Flood Risk

4.6 The site is identified to include discrete areas of LFRZs and is subject to localised frequent surface water flooding incidents and ponding. Land within the site will be raised, suitably graded, localised low spots eliminated and a positive drainage system comprising swales will be implemented to manage site runoff. Furthermore, the raised lip along Ditch 1 will be removed so that surface water can enter without ponding. Setting finished floor levels at least 150mm above the adjoining ground levels and incorporation of flood resilient and resistant construction will also mitigate flood risk from this source.

Existing Sewer Overflow Flood Risk

4.7 The public drainage networks beneath the highways within the adjoining residential areas have been observed by local residents to frequently surcharge and overflow at times of heavy rainfall. Local residents have noted that they believed that the public sewer system was at capacity, and have cited a number of problems in the area with collapsed sewers.

4.8 Land within the site will be suitably raised and finished floor levels set accordingly to facilitate drainage from the development site. This will ensure that the proposed development remains safe from sewer overflows emanating from sewers located in adjoining highways. Any offsite sewer overflows entering the site will be routed safely via the proposed swale and highway corridor network towards the low lying landscaped area provided within the southeastern corner. These floodwaters will discharge to the Downholland Brook via Ditch 1.

4.9 The development site will not discharge any surface water runoff into the existing public sewerage system, and as such will not worsen existing flood risk within the existing sewerage system.

Groundwater Flood Risk

4.10 The *SWMP Figure A4-7* does not show the site at groundwater emergence risk. However, site investigation works undertaken in September 2012 established groundwater table at depths varying between 1.0m and 2.5m bgl. It therefore remains a possibility for groundwater to rise to the surface to cause flooding at the site.

4.11 Proposed flood mitigation measures including raised finished floor levels, land reprofiling and site wide ground raising, incorporation of overland flow routes and a swale drainage

network, and flood resilient and resistant construction to be implemented within the new development will afford protection to proposed dwellings.

Assessment of Flood Risk Arising from Surface Water Discharge from the Proposed Development

4.12 The proposed development is on a greenfield site and will be 37% impermeable with some 4.5ha of impermeable area, which substantially increases the existing site impermeability, and therefore resulting runoff. Notwithstanding this, surface water runoff from the development site will be stored on site and site discharge limited to the existing greenfield runoff rates for storms up to the 1:100 year + 30% climate change event.

4.13 Surface water runoff will be managed on site using shallow, wide swale features provided adjacent to the highways and landscaped areas. Outflow from the swale system will be limited to the existing 100 year greenfield runoff rate of 54.0 l/s using an orifice plate or similar flow control device. The swales may be lined to prevent groundwater ingress.

4.14 The site will discharge directly into the River Alt located to the south of the site via a culverted connection, or to the Downholland Brook located to the east via onsite and offsite ditches.

4.15 All on site SuDS drainage facilities will be offered for adoption by the SAB or maintained by a private management company.

4.16 There will be no off-site surface water discharge to the public drainage network, and therefore no increase in flood risk to areas that suffer from existing sewer flooding problems.

Design Exceedance

4.17 Should the onsite drainage system fail/block or overwhelm under extreme rainfall events exceeding the design standards, flooding may occur within the site. Any resultant floodwater would however be directed in a southeasterly direction along the highway corridor network to the floodplain compensatory storage area and Ditch 1, and away from dwellings.

4.18 Similarly, raising finished flood levels within the dwellings by at least 150mm above the adjacent ground level and at least 600mm above the design (1% + CC AEP) flood level of 3.76m AOD, and incorporation of flood resilient and resistant construction techniques will

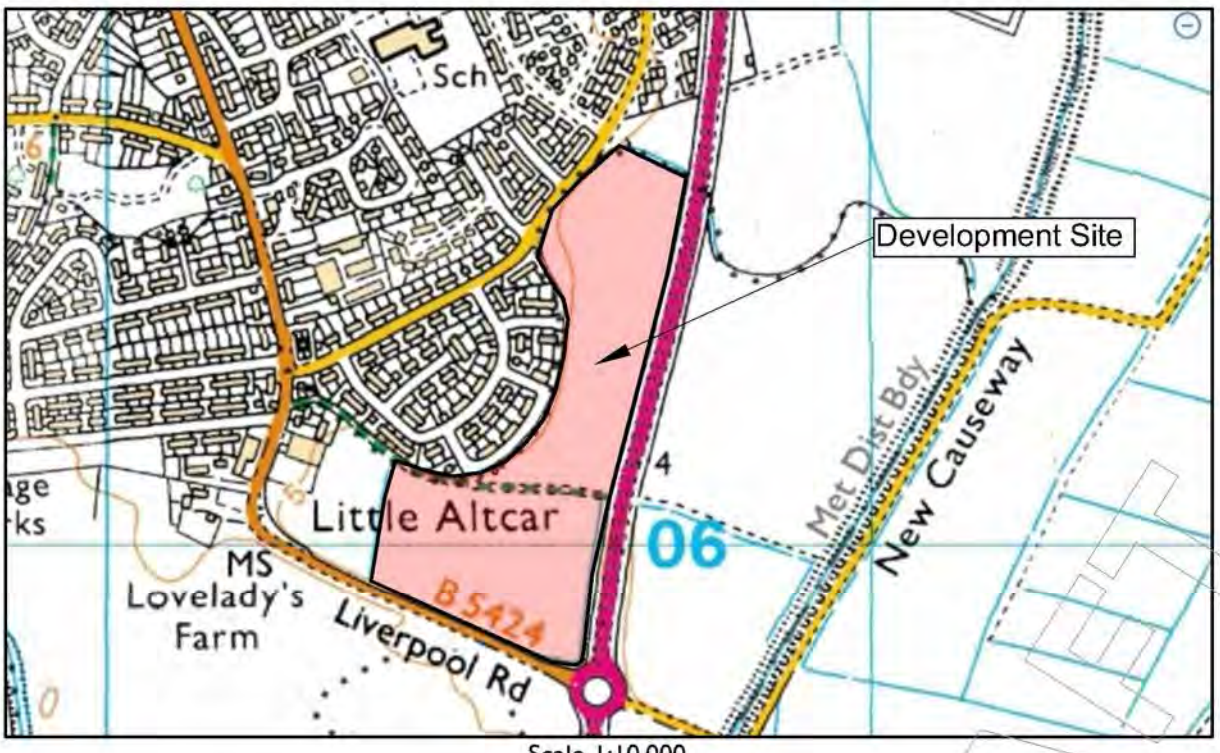
help to mitigate residual flood risks associated with such design exceedance or drainage system failure events.

4.19 This study has been undertaken in accordance with the principles set out in the NPPF. We can conclude that the said development proposals can be accommodated without increasing flood risk within the locality and without placing the development itself at risk of flooding, all in accordance with objectives set by Central Government and the EA.

Cole Easdon Consultants Limited
July 2013

Appendix 1

Scale 1:100,000



Scale 1:10,000

CEC
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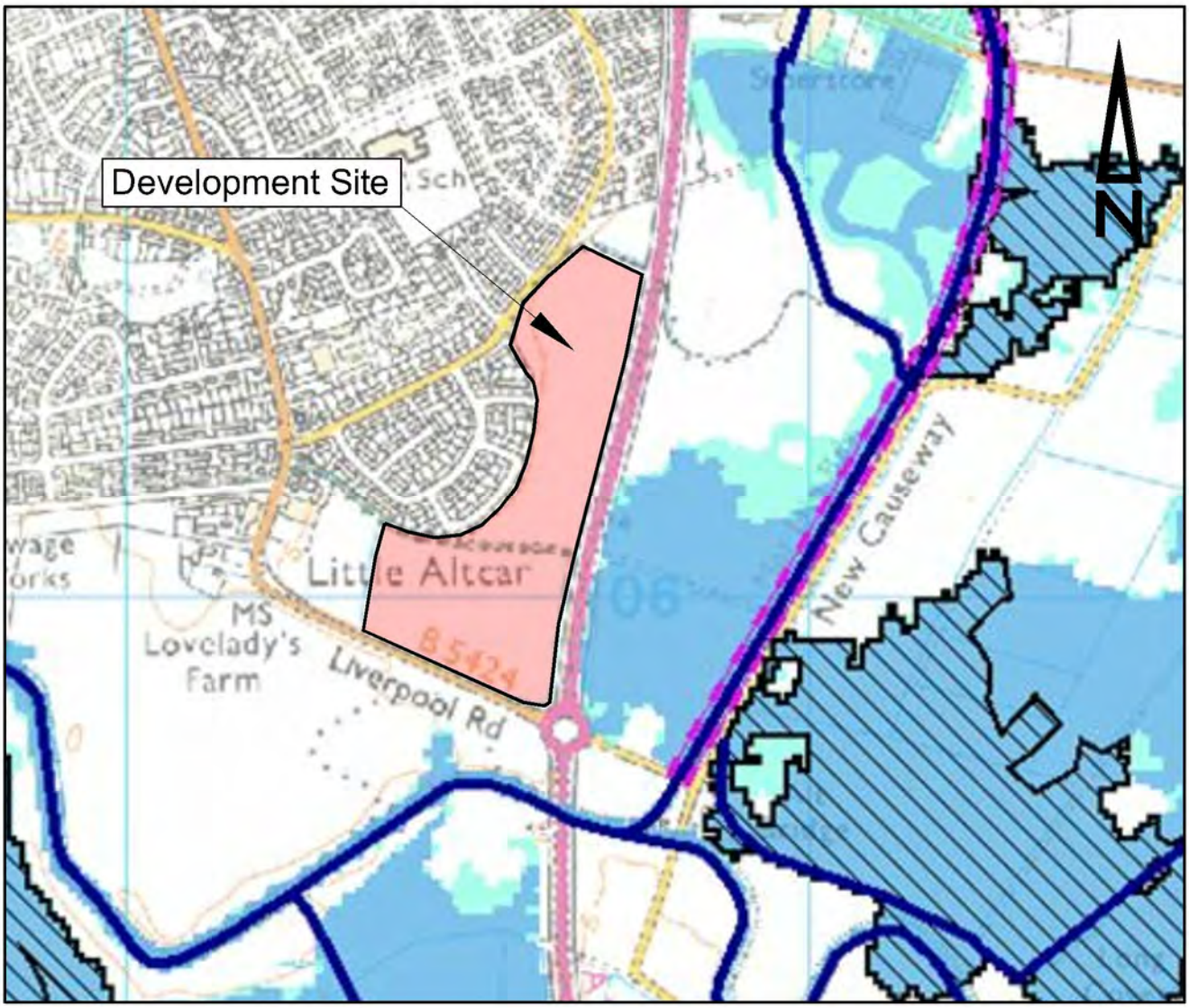
Job Title:	Client:		
Formby	Barrett Homes, Manchester		
Drawing Title:	Drawn By	Date Drawn	Scale
Site Location Plan	PN	August 2012	As shown (A4)
	Checked By	Drawing No.	Revision
		3556/500 Figure 1	



KEY:

Flood Zone 1 - Low Risk

Flood Zone 2 - Medium Risk

Flood Zone 3 - High Risk

Main River

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Job Title: Formby	Client: Barrett Homes, Manchester		
Drawing Title: Flood Zone Map	Drawn By: PN	Date Drawn: August 2012	Scale: 1:10,000 @ A4
	Checked By: DF	Drawing No.: 3556/500 Figure 2	Revision:

Appendix 2

Title Block Version 20.03.12

DO NOT SCALE:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT

NOTES:-

Drawing Legend

- Existing trees and hedges
- Indicative new trees (for details of tree replacement policy please see landscape strategy proposals)
- Indicative swales (For full extent of footprint required to contain the 1:100 year + 30% storm event within the swale system see drawing 'Schematic Surface Water Drainage Strategy' drawing ref: 3556/ 500/ SK01 D' by Cole Easdon Consultants
- Flood compensation area (6900m²)
- Sewer and rising main easements in accordance with 'Existing Drainage Constraints' drawing
- Red line boundary. Taken from centre line of hedge and fence, wall, edge of path positions and Registry Plan.
  29.9 acres/ 12.1 hectares.
  (Where topographical survey does not cover site area the red line boundary has been assumed from Ordinance Survey Map)
- 3m offset both sides of existing ditch to developed areas, including footpaths
- Existing ditch
- 2.25m / 4.45m * — Car ports - along Formby By Pass (to serve as part of acoustic barrier)
- af — 1.8m high timber panel fence - proposed boundary treatment to rear gardens of dwellings (Those highlighted 'af' are 1.8m high acoustically rated fences/noise barriers)
- sw — 2.4/ 2.6m high solid wall - proposed boundary treatment separating rear gardens of dwellings to POS & highways. (Those highlighted 'sw' are 2.4m high acoustic barriers)
- SA — Sales Area
- PS — Pump station within 10mx10m compound
- SS — Substation with 1m unrestricted access all around the substation

Notes:
- 'Part Site Survey' by Survey & Design Limited (Drawing Reference: SDL 1959/1)
- 'Existing Drainage Constraints' drawing by Barratt Homes Manchester (Drawing Reference: Form/ED/01B)
- 'Flood Compensation Zone' drawing
- 'Tree Constraints Plan' drawing by TEP (Drawing Reference: D3565.001)
- 'Schematic Surface Water Drainage Strategy' drawing by Cole Easdon Consultants (Drawing Reference: 3556/500/SK01E)
- 'Preliminary site layout with mitigation measures' drawing by WSP
- 'Preliminary site layout with barriers' drawing by WSP

Accommodation schedule

Notes:
30% affordable unit provision based on number of bed spaces per house

Parking provision: Generally in line with Sefton Council's Parking Standards in the 'Ensuring Choice of Travel SPD' document though advised by L.A that standards for residential developments are guidelines only

Residential Mix (Private units only):

Barratts: 1 bed - 2no. (2%) DWH: 3 bed - 13no. (20%)
3 bed - 91no. (76%) 4 bed - 45no. (68%)
4 bed - 26no. (22%) 5 bed - 8no. (12%)

Rev A. North point re-orientated to correct position. 3m offset both sides of existing ditches to developed areas, including footpaths. Swale at the northeastern extent of the site added. Housing clusters to south east and north east redesigned to create a more refined visual impact. Surrounding POS and flood compensation area revised. Schedule of accommodation added. Affordable units updated and repositioned so as not to overlook opens space. All plots repositioned to be at least minimum of 2m apart. Sales arenas shown. PDHT - 12.11.2012
Rev B. 1no. dwelling removed in accordance with comments received from C.E.C on 18.11.2012.South eastern cluster redesigned to ensure all roads, driveways and paths to any of the associated dwelling is wholly outside of the flood compensation area to be provided (In accordance with drawing 3556/500/SK01E). POS increased. PDHT - 18.11.2012
Rev C. Pump station with adequate offset shown. Housing cluster adjacent Savon Hook Park amended to provide better site view. Building line to Liverpool Road and associated boundary treatments amended in accordance with comments from acoustic engineers PDHT - 19.11.2012
Rev D. Carports omitted where possible in line with comments received from L.A on 22.11.2012.Revisions to housing clusters (Barratts side only) made in accordance with clients comments received by email on 22.11.2012. Courtyards omitted where possible. Residential and schedule of accommodation revised to accommodate a 30% affordable unit provision based on number of bed spaces per house PDHT - 23.11.2012
Rev E. DWH schedule of accommodation updated to reflect clients (Barratts) request on unit mix
Rev F. Link through to the existing bus stop on Liverpool Road from the site shown as requested by Sefton Highways. Substation added PDHT - 10.12.2012
Rev G. Slight repositioning of carports and garages to accommodate acoustic restriction. Shared surface increased towards north end of site PDHT - 04.01.2013
Rev H. Scheme revisions on DWH side made in accordance with CAD layout received from MC (DWH) on 14.01.2013. Schedule of accommodation updated to suit
Rev I. Speed reduction measures shown PDHT - 29.01.2013
REVISIONS

Existing Play Area
Extended Play Area
Alt Road Park
Alt Copse
River Copse
Hook Copse
Savon Hook Park
Swales
Possible pedestrian connection
Gable response minimises view obstruction to exsiting bungalows on Savon Hook
Existing bungalows and dormer bungalows
Private housing along Formby By Pass provided with garages which provides acoustic barrier
Demountable bollards
Existing alignment of public footpath to be retained and extended to 3.5m wide for Emergency access
Maximised retention of existing hedgerows
Area designed to ensure all roads, driveways and paths to any of the associated dwellings are wholly outside of the flood compensation area to be provided (In accordance with drawing 3556/500/SK01E).
Flood Compensation area 6900m²
Maximised retention of existing hedgerows
New vehicular access location (position to be approved by Local Authority)
3m cycle path
15m offset from dwellings
PS
SA
SS
LEAP
3m cycle path
Ditch
FORMBY BY-PASS A565
A 565
B 5424
LIVERPOOL ROAD
ARBUTUS WAY
PRIORY CLOSE
RIVER CLOSE
MONKS DRIVE
MONKS CLOSE
MANNS DRIVE

Preliminary

Preliminary site layout

To be read in conjunction with drawing C1500/ SK022 and C1500/ SK023

27 SPON STREET, COVENTRY, CV1 3BA TEL:- (024) 76527 600 FAX:- (024) 76520 424 E-mail:- info@idpmidlands.com Web:- www.idpmidlands.com

BARRATT HOMES find the one — Where quality lives David Wilson Homes — idp MIDLANDS ARCHITECTS

SCALE @ A1	1:1000	CLIENT	Barratt Homes and David Wilson Homes
DATE	22.10.2012	JOB TITLE	Liverpool Road, Formby
DRAWN	PDHT	DRAWING TITLE	Preliminary site layout
CHECKED	BDF	DRAWING NO.	C1500/ SK 020I

Appendix 3

Photo 1: View of the southwestern site corner from Liverpool Road

Photo 2: View towards the site (looking east) from the foopath adjacent to Savon Hook

Photo 3: Perimeter Ditch along eastern site boundary (looing north)

Photo 4: 225mm Culvert at the end of Perimeter Ditch (looking north)

Photo 5: Outfall (offsite) Ditch within the eastern field running towards Downholland Brook (looking east)

Appendix 4

Mr Dean Frosoni
Cole Easdon
York House
Unit 2 Hindle Way
Swindon
Wiltshire
SN3 3RB

Our ref: SO/2012/111543/02-L01
Your ref: N/A

Date: 09 April 2013

Dear Mr Frosoni

DRAFT FLOOD RISK ASSESSMENT
LAND AT LIVERPOOL ROAD, FORMBY

Thank you for forwarding the final Flood Risk Assessment for comment which was received in this office 21 February 2013.

Firstly we apologise for the considerable delay in responding.

We confirm we consider the Flood Risk Assessment to be acceptable in principle in its content and it should inform the future design of development including providing an acceptable surface water management scheme.

Should you wish to discuss the contents of this letter in more detail please do not hesitate to contact us.

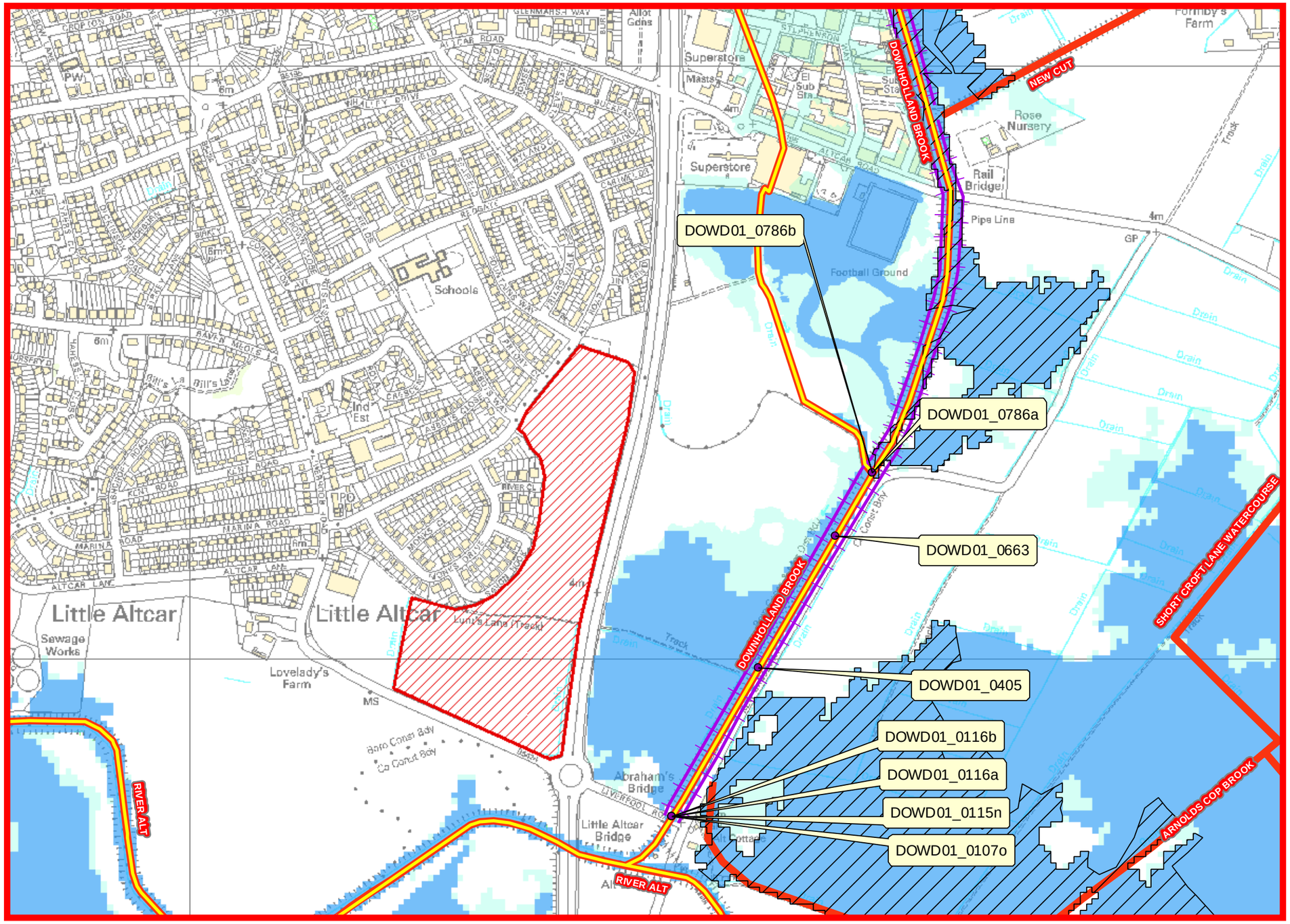
Yours sincerely

Mr Stephen Sayce
Planning Liaison Officer

Direct dial 01925 542518
Direct fax N/A
Direct e-mail stephen.sayce@environment-agency.gov.uk

Flood Map (PRE5022) - Little Altcar, Formby, L37 6DP

National Grid Reference: SD 30642 06212



Environment Agency

North West Region - North Area

Lutra House, Dodd Way, Off Seedlee Road, Walton Summit, Bamber Bridge. Preston. PR5 8BX.

Tel: 03708 506 506 | www.environment-agency.gov.uk

Produced by Flood Risk Mapping

Map produced on: *21 August 2012*

Legend

- Location
- Node Points
- Modelled Flood Group
- ABD
- Flood Map Defences
- Main River
- Flood Zone 3
- Flood Zone 2

The datasets used in this plan may not have been audited. The Agency cannot ensure that the data in its possession will always be accurate, up to date or valid but the Agency will use reasonable care to ensure an accurate copy of the data. The accompanying disclaimer should be used in conjunction with this plan.

Flood Zone 3: Shows the area that could be affected by flooding from rivers or the sea, if there were no defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) chance or greater of happening each year.
- or from a river by a flood that has a 1% (1 in 100) chance or greater of happening each year.

Flood Zone 2: Shows the additional extent of an extreme flood from rivers or the sea, if there were no defences. These outlying areas are likely to be affected by a major flood, that has up to a 0.1% (1 in 1000) chance of occurring each year.

Historic Flooding:
We hold no flood event information relating specifically to this location.

ABD (Area benefiting from defences): show the area benefiting from defendces during a 1 in 200 tidal or a 1 in 100 fluvial flood event.

0 55 110 220
Metres

N W E S

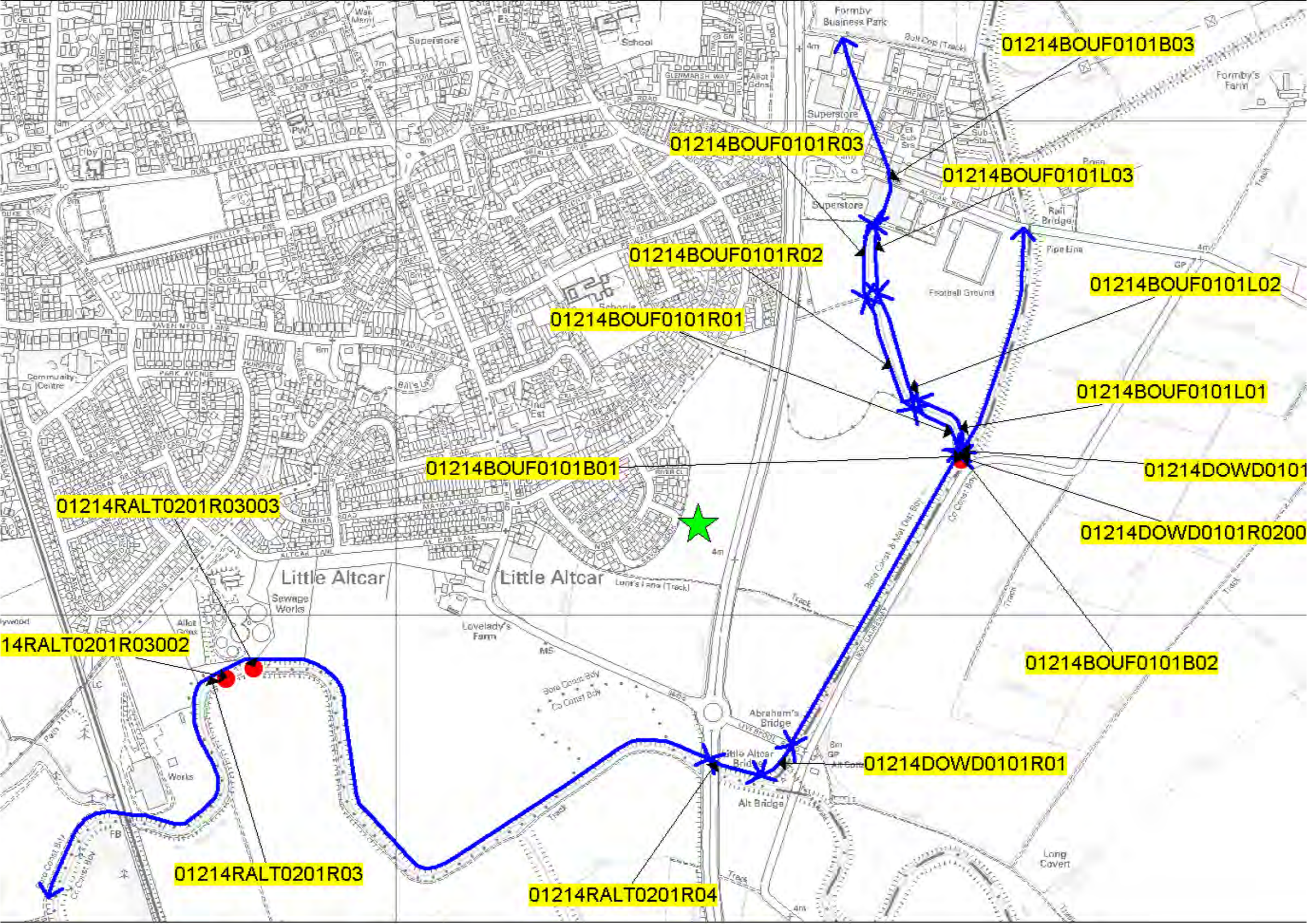
Undefended Level (mAOD) and Flow (m^3/sec) data for Little Altcar

	2		5		10		25		50		75		100		101		200		1000	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214DOWD01_0107o	3.57	5.49	3.57	5.78	3.57	5.88	3.57	6.16	3.57	6.43	3.57	6.56	3.58	6.70	3.66	7.04	3.58	7.02	3.58	8.04
ea01214DOWD01_0115n	3.57	5.49	3.57	5.78	3.57	5.88	3.57	6.16	3.57	6.43	3.57	6.56	3.58	6.70	3.66	7.04	3.58	7.02	3.58	8.04
ea01214DOWD01_0116a	3.57	5.24	3.57	5.44	3.57	5.47	3.57	5.74	3.57	5.92	3.57	5.98	3.58	6.08	3.66	6.29	3.58	6.28	3.58	6.95
ea01214DOWD01_0116b	3.57	5.49	3.57	5.78	3.57	5.88	3.57	6.16	3.57	6.43	3.57	6.56	3.58	6.70	3.66	7.04	3.58	7.02	3.58	8.04
ea01214DOWD01_0405	3.52	5.24	3.52	5.41	3.52	5.46	3.52	5.74	3.52	5.90	3.52	5.96	3.53	6.05	3.60	6.25	3.53	6.25	3.54	6.92
ea01214DOWD01_0663	3.48	5.23	3.49	5.40	3.49	5.46	3.49	5.73	3.49	5.89	3.49	5.95	3.49	6.04	3.57	6.22	3.50	6.23	3.51	6.90
ea01214DOWD01_0786a	3.45	4.61	3.45	4.76	3.45	4.82	3.45	5.09	3.46	5.25	3.46	5.31	3.46	5.40	3.52	5.59	3.46	5.60	3.48	6.28
ea01214DOWD01_0786b	3.45	5.23	3.45	5.39	3.45	5.46	3.45	5.73	3.46	5.89	3.46	5.95	3.46	6.03	3.52	6.21	3.46	6.23	3.48	6.90

Defended Level (mAOD) and Flow (m^3/sec) data for Little Altcar

	2		5		10		25		50		75		100		101		200		1000	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214DOWD01_0107o	2.88	9.95	3.15	13.34	3.26	14.86	3.41	17.24	3.55	19.13	3.62	19.93	3.65	20.48	3.79	21.62	3.72	21.43	3.93	21.15
ea01214DOWD01_0115n	2.88	9.95	3.15	13.34	3.26	14.86	3.41	17.24	3.55	19.13	3.62	19.93	3.66	20.48	3.80	21.62	3.73	21.43	3.94	21.15
ea01214DOWD01_0116a	2.88	9.81	3.15	13.17	3.26	14.65	3.41	17.06	3.55	18.91	3.62	19.70	3.66	20.24	3.80	21.37	3.73	21.16	3.94	20.76
ea01214DOWD01_0116b	2.88	9.95	3.15	13.34	3.26	14.86	3.41	17.24	3.55	19.13	3.62	19.93	3.66	20.48	3.80	21.62	3.73	21.43	3.94	21.15
ea01214DOWD01_0405	2.95	9.78	3.22	13.07	3.33	14.59	3.49	16.96	3.62	18.81	3.68	19.75	3.71	20.42	3.82	22.61	3.76	21.90	3.92	26.57
ea01214DOWD01_0663	2.99	9.76	3.27	13.01	3.38	14.53	3.55	16.90	3.68	18.69	3.73	19.63	3.77	20.30	3.88	22.60	3.83	21.80	4.00	26.58
ea01214DOWD01_0786a	3.00	9.32	3.28	12.49	3.39	14.12	3.57	16.53	3.70	18.27	3.75	19.20	3.78	19.87	3.90	22.26	3.85	21.39	4.02	26.32
ea01214DOWD01_0786b	3.00	9.75	3.28	12.93	3.39	14.51	3.57	16.87	3.70	18.64	3.75	19.58	3.78	20.25	3.90	22.60	3.85	21.75	4.02	26.64

Data taken fron the River Alt Strategy 2010.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01214BOUF0101B02
14RALT0201R03002
01214DOWD0101R01
01214RALT0201R03
01214RALT0201R04
Formby Business Park
Superstore
School
Football Ground
Rail Bridge
Pipe Line
Community Centre
Little Altcar
Sewage Works
Lovelady's Farm
Abraham's Bridge
Alt Bridge
Long Covert
Formby's Farm

Site Location: Little Altcar, Formby, L37 6DP

Reference No: PRE5022

Fluvial Defences

Asset Ref.	National Grid Reference	Asset Type	Protection Type	Maintained By	Design Standard (Return Period)	Overall Condition Grade (Excellent 1- 5 Very Poor)	Effective Crest Level (m)		E.C.L Data Quality (Reliable 1-4 Unreliable)	Length (m)	Height (m)
							UCL (mAOD)	DCL (mAOD)			
01214DOWD0101R02	SD3080005735	raised defence (natural)	fluvial	Environment Agency	100	3	5.97	5.81	2	1,162.60	7.5
01214BOUF0101B03	SD3096306791	culverted channel	fluvial	private	5	3				410.3	
01214BOUF0101R02	SD3104606417	maintained channel	fluvial	Environment Agency	5	3				248.6	
01214BOUF0101L02	SD3105406436	maintained channel	fluvial	Environment Agency	5	3				230.7	
01214BOUF0101R03	SD3095106641	maintained channel	fluvial	Environment Agency	50	3				157.5	
01214BOUF0101L03	SD3097306650	maintained channel	fluvial	Environment Agency	5	3				147.4	
01214BOUF0101B01	SD3114406320	culverted channel	fluvial	Environment Agency	50	3				0.4	
01214BOUF0101B02	SD3113906334	culverted channel	fluvial	Environment Agency	50	3				15.4	
01214BOUF0101L01	SD3113906334	maintained channel	fluvial	Environment Agency	5	3				156.7	2.3
01214BOUF0101R01	SD3113906334	maintained channel	fluvial	Environment Agency	5	3				132.6	2.3
01214DOWD0101R01	SD3073705675	maintained channel	fluvial	Environment Agency	100	3				89.6	5.5
01214RALT0201R04	SD3063405708	maintained channel	fluvial	Environment Agency	100	2				89.6	4.5
01214RALT0201R03	SD2929605428	maintained channel	fluvial	Environment Agency	100	2				2,111.60	4.5

Consent is REQUIRED for any works undertaken within 8 metres of these defences

Flood Level Map - Little Altcar, Formby

Produced: 21 September 2012
Our Ref: PRE5022

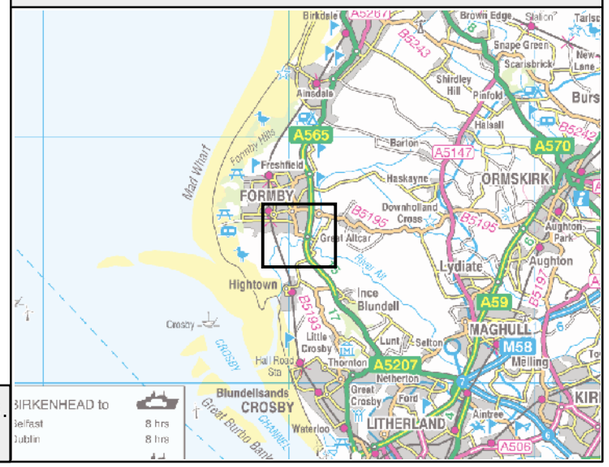
Key

- Main River
- Historic Flooding
- ABDs
- Flood Zone 3
- Flood Zone 2

Flood Zone 3 shows the are that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 1 in 200 tidal, or 1 in 100 fluvial flood event.



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Node Point	UNDEFENDED Modelled Flood Levels (mAOD) and Flows (m^3/s) at Return Period:																			
	Q2		Q5		Q10		Q25		Q50		Q75		Q100		Q200		Q1000		Q100+CC	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
RALT02_3334	3.76	20.23	3.76	20.49	3.76	20.64	3.77	20.80	3.77	20.92	3.77	21.00	3.77	21.08	3.77	21.18	3.79	22.62	4.00	61.67
RALT02_3478	3.75	19.67	3.75	19.80	3.75	19.82	3.76	19.90	3.76	19.93	3.76	19.96	3.76	19.98	3.76	20.09	3.78	20.65	3.98	20.28

Table 01

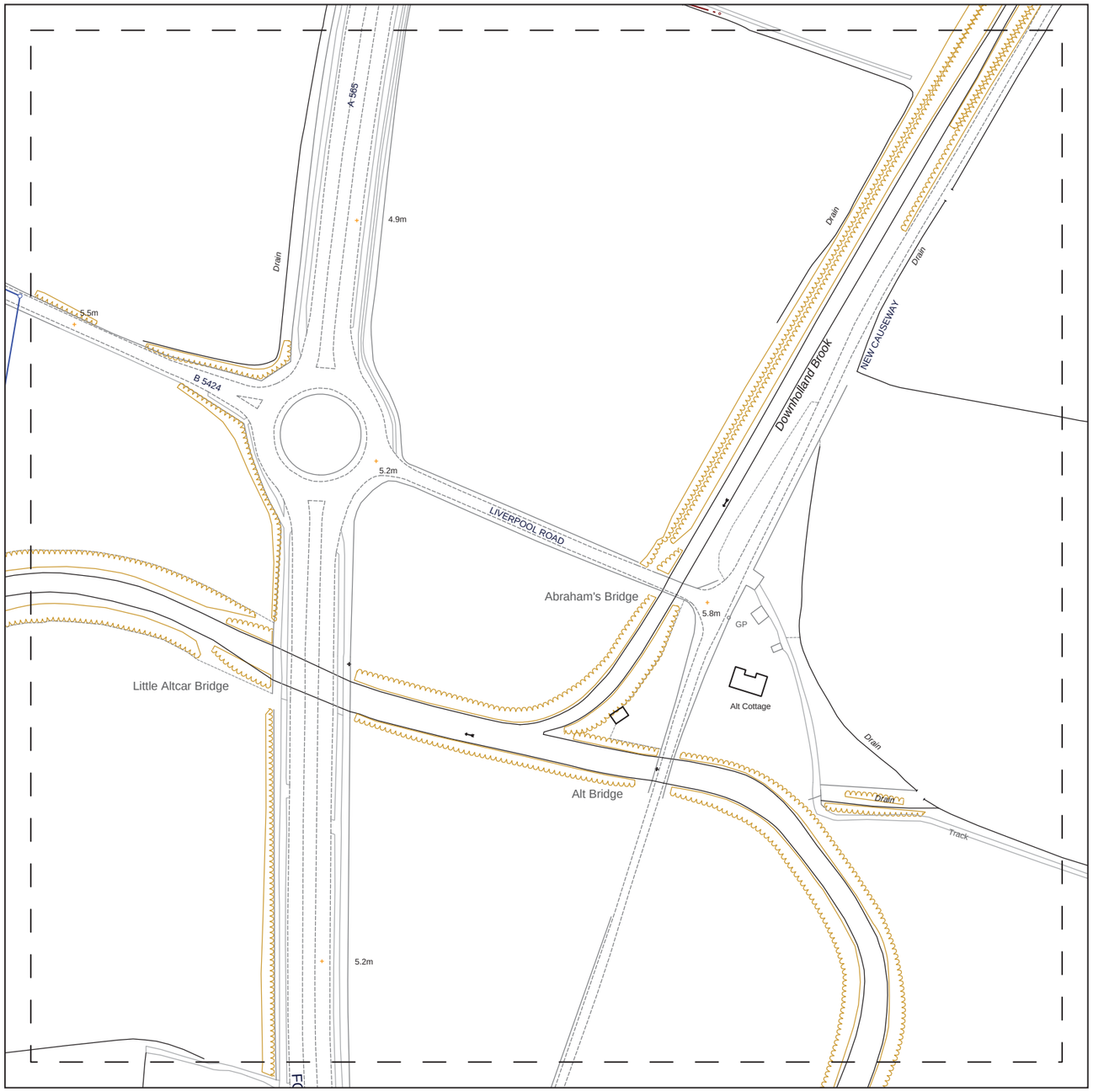
Data from Alt Strategy (2010)

Node Point	DEFENDED Modelled Flood Levels (mAOD) and Flows (m^3/s) at Return Period:																			
	Q2		Q5		Q10		Q25		Q50		Q75		Q100		Q200		Q1000		Q100+CC	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
RALT02_3334	2.79	33.88	3.06	41.07	3.15	45.19	3.30	50.40	3.45	54.19	3.51	55.95	3.55	57.09	3.62	59.58	3.84	66.81	3.70	61.54
RALT02_3478	2.82	33.40	3.09	40.63	3.18	44.72	3.34	49.96	3.48	53.67	3.55	55.46	3.58	56.39	3.65	58.93	3.86	65.92	3.72	60.70

Table 02

Data from Alt Strategy (2010)

Appendix 5



OS Sheet No: SD3005NE

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

There are no nodes in SD3005NE.

WASTE WATER SYMBOLOGY

MANHOLE

FOUL SURFACE COMBINED DUAL SIDE ENTRY MANHOLE

FOUL SURFACE COMBINED

PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED

SITE TERMINATION
AV AIRVALVE
CB CASCADE
CK CONTROL KIOSK
CV CONTROL VALVE
ES EXTENT OF SURVEY
FB FLOW METER
GU GULLEY
HB HATCHBOX
HS HEAD OF SYSTEM
HE HEADWALL
HT HYDROBRAKE
IN INLET
IC INSPECTION CHAMBER
T-JUNCTION (SADDLE)
LH LAMP HOLE
OI OIL INTERCEPTOR
PE PENSTOCK
PU PUMP
RE RODDING EYE
SO SEA OUTFALL
SO SOAKAWAY
SU SUMMIT NODE
TB TUMBLING BAY
UN UNSPECIFIED
VA VALVE
VC VALVE CHAMBER
WO WASHOUT

GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)

BIFURCATION
CATCHPIT
CHAMBER
CONTAMINATED SURFACE WATER
DROPSHAFT
FLOW CONTROL
SCREEN CHAMBER POWERED
SCREEN CHAMBER STATIC
PUMPING STATION
EJECTOR STATION
SLUDGE PUMPING STATION
SHEET EDGE
SEWER OVERFLOW
WASTE WATER TREATMENT WORKS
SEPTIC TANK
TANK
VENT COLUMN
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F	Foul	T	Transition
S	Surface	O	Overflow
C	Combined	U	Unspecified

MANHOLE / NODE TYPE

M	Manhole	Z	Ghost in Rising Main
J	Junction	C	Cascade
L	Lamphole	Y	Gulley
H	Hatchbox	E	Ejector
R	Rodding Eye	O	Oil Injector
F	Outfall	I	Inlet
V	Combined Sewer Overflow	B	Hydrobrake
		T	Vent Column
P	Pumping Station	X	Valve
S	Soakaway	U	Unspecified
D	Dual Function Manhole	Q	Expediency Node
		G	Ghost (to allow pipe bends)
W	Treatment Works		

SEWER SHAPE

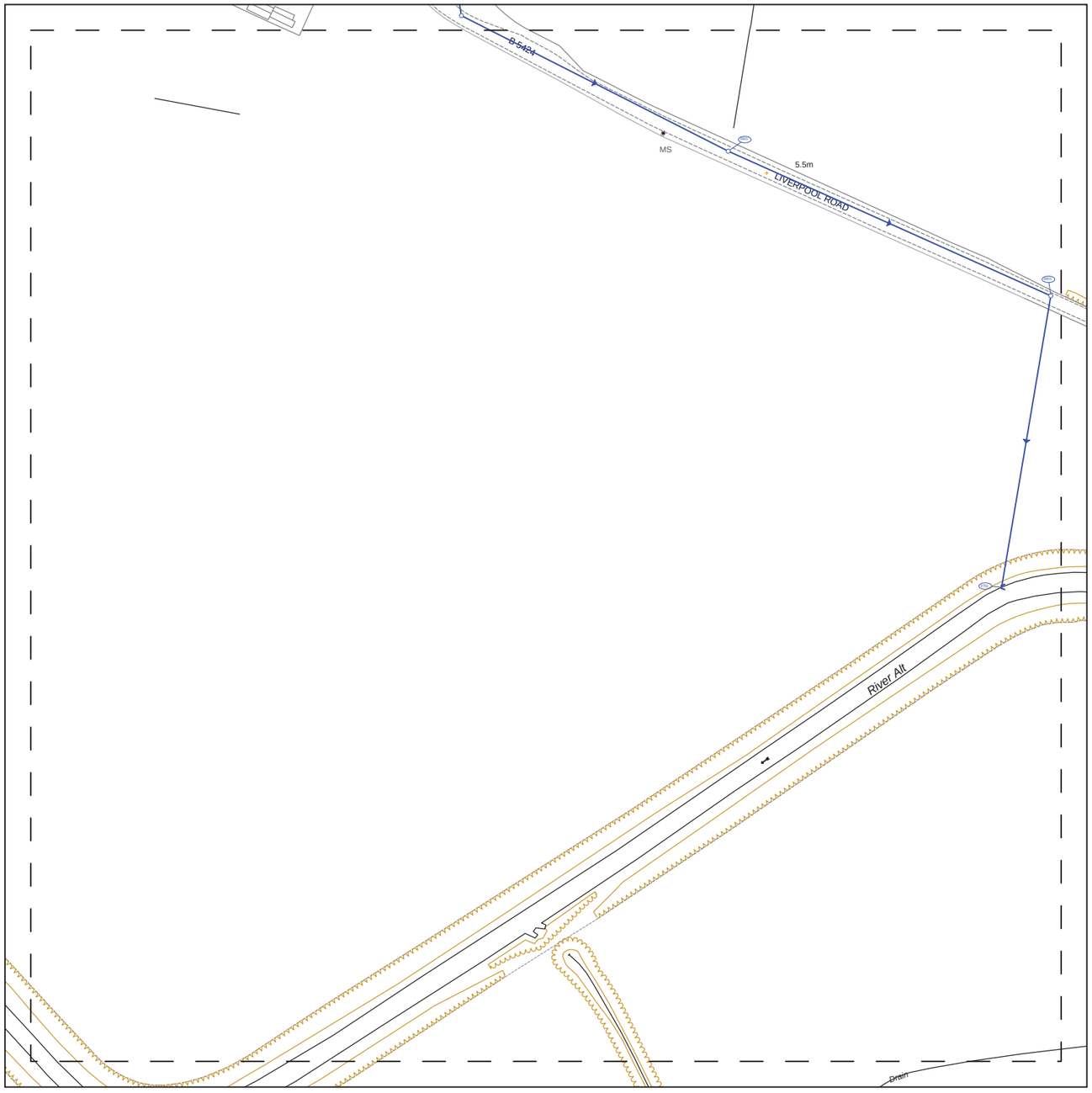
C	Circular	T	Trapezoidal
E	Egg	A	Arch
O	Oval	B	Barrel
F	Flat Top	H	Horseshoe
R	Rectangular	U	Unspecified
S	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
CI	Cast Iron
SI	Spun (Grey) Iron
CO	Concrete
CS	Concrete Segments (Bolted)
CS	Concrete Segments (Unbolted)
CC	Concrete Box Culvert
DI	Ductile Iron
GR	Glass Reinforced Concrete
GR	Glass Reinforced Plastic
PS	Plastic / Steel Composite
PV	Polyvinyl Chloride
PE	Polyethylene
RP	Reinforced Plastic Matrix
ST	Steel
VC	Vitrified Clay (All Clayware)
PP	Polypropylene
PF	Pitch Fibre
MA	Masonry - In Regular Courses
MA	Masonry - Randomly Coursed
U	Unspecified

OS Sheet No: SD3005NE
Scale 1:1250 Date: 24-Sep-2012
No Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
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4701		F	F							
4801		S	M		300			VC		143.13

OS Sheet No: SD3005NW

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

WASTE WATER SYMBOLOGY

MANHOLE

FOUL SURFACE COMBINED DUAL

SIDE ENTRY MANHOLE

FOUL SURFACE COMBINED

PUBLIC MAIN

PRIVATE MAIN

SECTION 104

PUMPING MAIN

HIGHWAY DRAIN

SLUDGE MAIN

ABANDONED

SITE TERMINATION

T-JUNCTION (SADDLE)

AV AIRVALVE

LH LAMP HOLE

CA CASCADE

OI OIL INTERCEPTOR

CK CONTROL KIOSK

PE PENSTOCK

CV CONTROL VALVE

PU PUMP

ES EXTENT OF SURVEY

RE RODDING EYE

FB FLOW METER

SA SEA OUTFALL

GU GULLEY

SO SOAKAWAY

HB HATCHBOX

SU SUMMIT NODE

HS HEAD OF SYSTEM

TB TUMBLING BAY

HE HEADWALL

UN UNSPECIFIED

HT HYDROBRAKE

VA VALVE

IN INLET

VC VALVE CHAMBER

IC INSPECTION CHAMBER

WO WASHOUT

GHOST NODE (inc. GN - Rising Main & GN - Dual Function)

EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)

BIFURCATION

DROPSHAFT

CATCHPIT

FLOW CONTROL

CHAMBER

SCREEN CHAMBER POWERED

CONTAMINATED SURFACE WATER

SCREEN CHAMBER STATIC

PUMPING STATION

WASTE WATER TREATMENT WORKS

EJECTOR STATION

SEPTIC TANK

SLUDGE PUMPING STATION

TANK

SHEET EDGE

VENT COLUMN

SEWER OVERFLOW

DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F Foul
S Surface
C Combined
T Transition
O Overflow
U Unspecified

MANHOLE / NODE TYPE

M Manhole
J Junction
L Lamphole
H Hatchbox
R Rodding Eye
F Outfall
V Combined Sewer Overflow
P Pumping Station
S Soakaway
D Dual Function Manhole
W Treatment Works
Z Ghost in Rising Main
C Cascade
Y Gulley
E Ejector
O Oil Injector
I Inlet
B Hydrobrake
T Vent Column
X Valve
U Unspecified
Q Expediency Node
G Ghost (to allow pipe bends)

SEWER SHAPE

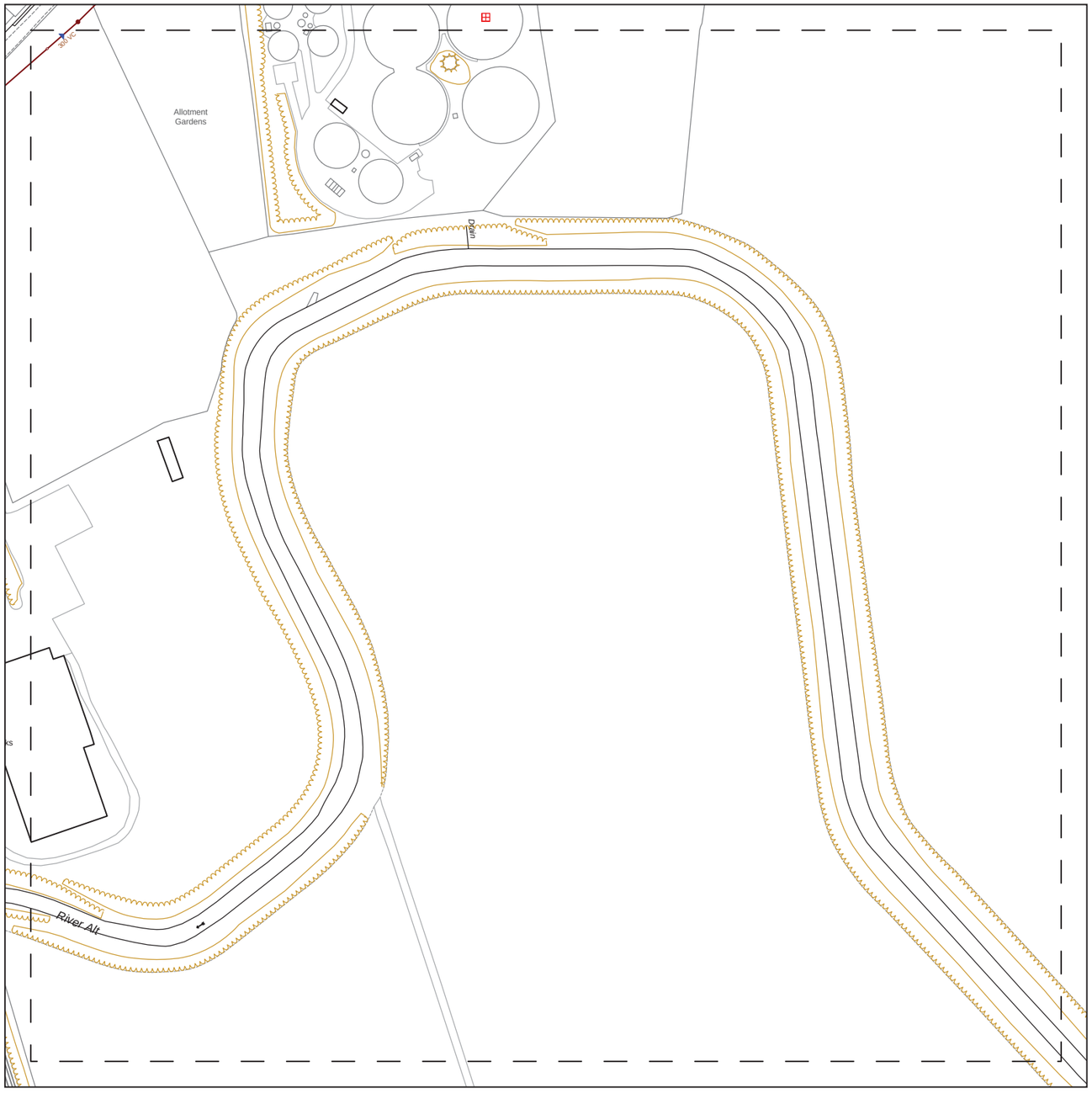
C Circular
E Egg
O Oval
F Flat Top
R Rectangular
S Square
T Trapezoidal
A Arch
B Barrel
H Horseshoe
U Unspecified

SEWER MATERIAL

AC Asbestos Cement
BR Brick
CI Cast Iron
SI Spun (Grey) Iron
CO Concrete
CS Concrete Segments (Bolted)
CS Concrete Segments (Unbolted)
CC Concrete Box Culvert
DI Ductile Iron
GR Glass Reinforced Concrete
GR Glass Reinforced Plastic
PS Plastic / Steel Composite
PV Polyvinyl Chloride
PE Polyethylene
RP Reinforced Plastic Matrix
ST Steel
VC Vitrified Clay (All Clayware)
PP Polypropylene
PF Pitch Fibre
MA Masonry - In Regular Courses
MA Masonry - Randomly Coursed
U Unspecified

OS Sheet No: SD3005NW
Scale 1:1250 Date: 24-Sep-2012
3 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
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OS Sheet No: SD2905NE

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

WASTE WATER SYMBOLOGY

MANHOLE

FOUL SURFACE COMBINED DUAL SIDE ENTRY MANHOLE

FOUL SURFACE COMBINED

PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED

SITE TERMINATION
AV AIRVALVE
CA CASCADE
CK CONTROL KIOSK
CV CONTROL VALVE
ES EXTENT OF SURVEY
FM FLOW METER
GU GULLEY
HB HATCHBOX
HS HEAD OF SYSTEM
HE HEADWALL
HT HYDROBRAKE
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OI OIL INTERCEPTOR
PE PENSTOCK
PU PUMP
RE RODDING EYE
SO SEA OUTFALL
SO SOAKAWAY
SU SUMMIT NODE
TB TUMBLING BAY
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VA VALVE
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WO WASHOUT

GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)

BIFURCATION
CATCHPIT
CHAMBER
CONTAMINATED SURFACE WATER
DROPSHAFT
FLOW CONTROL
SCREEN CHAMBER POWERED
SCREEN CHAMBER STATIC
PUMPING STATION
EJECTOR STATION
SLUDGE PUMPING STATION
SHEET EDGE
SEWER OVERFLOW
WASTE WATER TREATMENT WORKS
SEPTIC TANK
TANK
VENT COLUMN
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F Foul
S Surface
C Combined
T Transition
O Overflow
U Unspecified

MANHOLE / NODE TYPE

M Manhole
J Junction
L Lamphole
H Hatchbox
R Rodding Eye
F Outfall
V Combined Sewer Overflow
P Pumping Station
S Soakaway
D Dual Function Manhole
W Treatment Works
Z Ghost in Rising Main
C Cascade
Y Gulley
E Ejector
O Oil Injector
I Inlet
B Hydrobrake
T Vent Column
X Valve
U Unspecified
Q Expediency Node
G Ghost (to allow pipe bends)

SEWER SHAPE

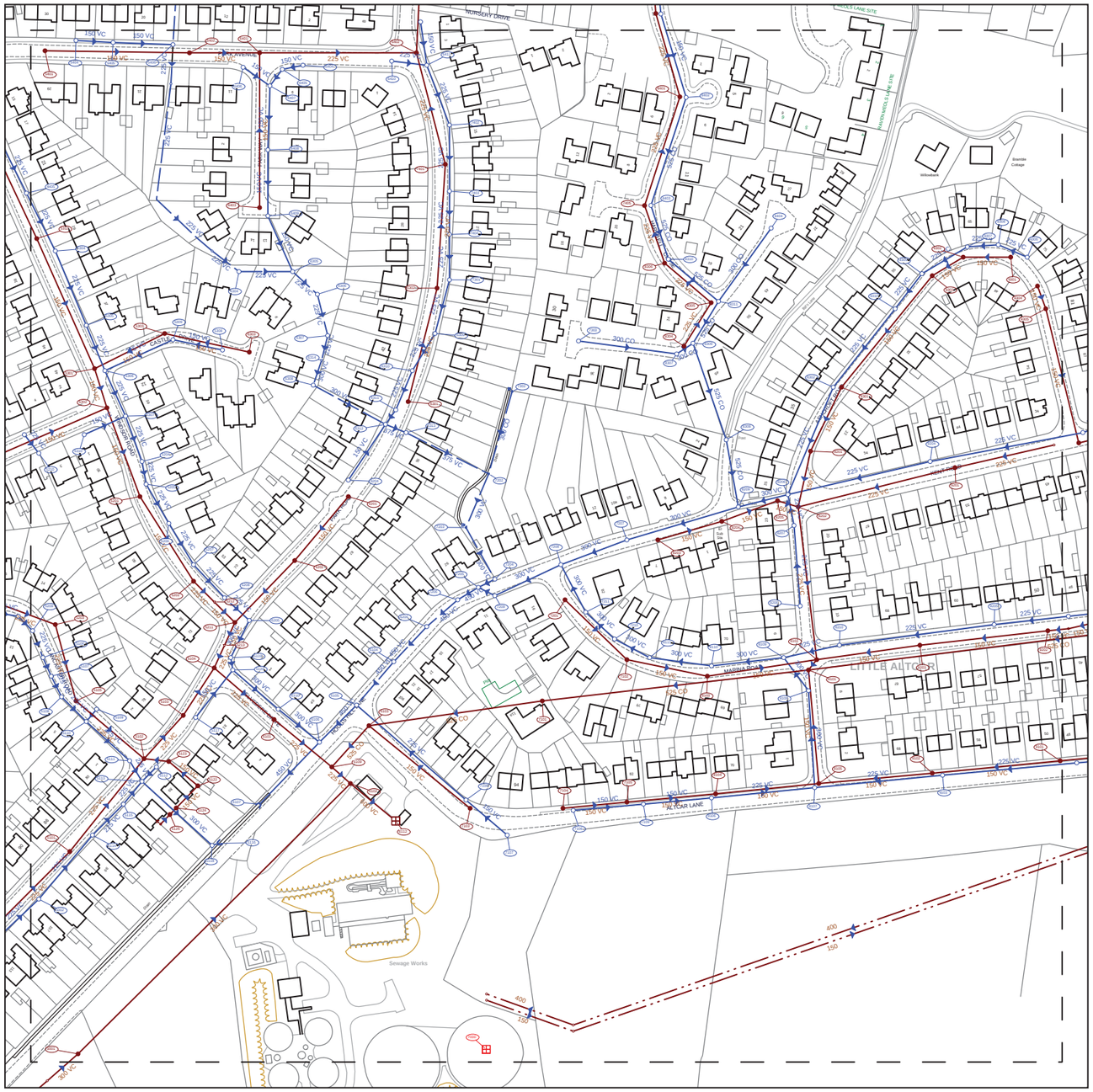
C Circular
E Egg
O Oval
F Flat Top
R Rectangular
S Square
T Trapezoidal
A Arch
B Barrel
H Horseshoe
U Unspecified

SEWER MATERIAL

AC Asbestos Cement
BR Brick
CI Cast Iron
SI Spun (Grey) Iron
CO Concrete
CS Concrete Segments (Bolted)
CS Concrete Segments (Unbolted)
CC Concrete Box Culvert
DI Ductile Iron
GR Glass Reinforced Concrete
GR Glass Reinforced Plastic
PS Plastic / Steel Composite
PV Polyvinyl Chloride
PE Polyethylene
RP Reinforced Plastic Matrix
ST Steel
VC Vitrified Clay (All Clayware)
PP Polypropylene
PF Pitch Fibre
MA Masonry - In Regular Courses
MA Masonry - Randomly Coursed
U Unspecified

OS Sheet No: SD2905NE
Scale 1:1250 Date: 24-Sep-2012
1 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



OS Sheet No: SD2906SE

Scale 1:1250 Date: 24-Sep-2012

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Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
5001	4.97	F	M	1.58	300		C	VC	809	185.97
5002	5.5	S	M	4.74	225		C	VC	253	40.46
5101	5.48	F	M	2.68	225		C	VC	199	57.63
5102	5.46	F	M	2.34	225		C	VC	189	28.32
5103	5.38	F	M	2.16	225		C	VC	137	27.46
5104	5.49	F	M	1.93	225		C	VC	383	38.29
5105	5.57	F	M	2.57	225		C	VC	216	43.28
5106	5.55	S	M	4.71	225		C	VC	493	9.85
5107	5.59	S	M	4.69	225		C	VC	186	11.18
5108	5.59	S	M	4.62	225		C	VC	283	16.97
5109	5.56	S	M	4.61	225		C	VC	156	7.81
5110	5.57	S	M	4.58	225		C	VC	566	28.32
5111	5.49	S	M	4.53	225		C	VC	583	11.66
5112	5.48	S	M	4.61	150		C	VC	141	9.9
5113	5.49	S	M	4.52	300		C	VC		46.01
5114	5.38	S	M	4.57	225		C	VC	1060	21.21
5115	5.37	S	M	4.56	225		C	VC	203	14.21
5116		S	F							
5117	5.5	S	M	4.8	150		C	VC	65	29.21
5118		S	M		300		C	VC		3.16
5119	5.52	S	M	3.95	300		C	VC	-203	6.08
5120	5.46	S	M	4	300		C	VC	-969	29.07
5121		F	Z		150		C	VC		6.47
5122		F	M		150		C	VC		18.36
5123		F	M		150		C	VC		12.05
5124		F	M		150		C	VC		14.99
5125		F	M		150		C	VC		4.41
5201	5.64	F	M	2.87	150		C	VC	116	48.55
5202	5.51	F	M	2.45	225		C	VC	141	14.14
5203	5.63	F	M	2.75	225		C	VC	213	38.33
5204	5.72	S	M	4.44	225		C	VC	70	11.18
5205	5.7	S	M	4.28	225		C	VC	-314	21.95
5206	5.64	S	M	4.3	225		C	VC	-179	23.32
5207	5.52	S	M	4.4	225		C	VC	313	21.93
5208	5.55	S	M	4.34	225		C	VC	102	16.28
5209	5.63	S	M	4.7	225		C	VC	1393	13.93
5210	5.79	S	M							
5211	5.53	F	M	2.18	150		C	VC	110	12.08
5212		F	Q	2.35	150		C	VC	129	14.14
5213		F	Q	2.07	225		C	VC	110	12.08
5301	5.94	F	M	3.3	150		C	VC	498	19.92
5302	5.82	F	M	3.22	150		C	VC	135	45.88
5303	5.83	F	M	3.85	150		C	VC	72	38.01
5304	6.24	S	M	5.15	225		C	VC	118	39
5305	6.09	S	M	4.65	225		C	VC	264	23.77
5306	5.91	S	M	4.45	225		C	VC	1208	24.17
5307	5.84	S	M	4.51	225		C	VC	234	23.41
5308	5.74	S	M	4.73	150		C	VC	306	24.52
5309	5.83	S	M	4.53	225		C	VC	453	36.25
5310	5.82	S	M	5.03	150		C	VC	35	21.93
5312		S	G		225		C	VC		16.4
5313	6.23	F	M	3.97	150		C	VC	108	68.94
5401	6.48	F	M	5.04	150		C	VC	78	70.01
5402	6.27	F	M	4.12	150		C	VC	162	34
5404	6.41	S	M	5.78	150		C	VC	300	18.03
5405	6.39	S	M	5.72	150		C	VC	290	29.02
5406	6.3	S	M	5.6	225		C	VC		19.03
5408		S	G		225		C	VC		93.24
6101	5.3	F	M	2.77	225		C	VC		36.24
6102	5.38	F	M	1.35	600		C	VC		28.49
6103	5.15	F	M	1.24	525		C	CO		26.91
6104	5.03	S	M	4.11	450		C	VC	230	27.66
6105	5.07	S	M	4.03	450		C	VC	283	25.46
6106	5.06	S	M	3.93	450		C	VC	4173	41.73
6107		S	F							
6109		F	M		225		C	VC		12.04
6110	5.34	S	M	4.04	300		C	VC	233	25.61
6112		F	W							
6201	5.6	F	M	4.65	150		C	VC	66	40.46
6202	5.55	F	M	4.01	150		C	VC	23	41.73
6204	5.66	S	M	4.87	150		C	VC	155	32.45
6205	5.54	S	M	4.2	300		C	VC	72	20.12
6206	5.07	S	M	4.04	450		C	VC	-292	23.35
6301	5.62	F	M	4.27	225		C	VC	162	56.75
6302	5.66	F	M	3.91	225		C	VC	301	60.13
6303	5.73	F	M	4.39	150		C	VC	79	41.98
6304	5.75	S	M	5.06	225		C	VC	236	26
6305	5.51	S	M	4.96	225		C	VC		16.28
6306	5.54	S	M	4.96	225		C	VC	412	20.62
6307	5.53	S	M	4.98	225		C	VC	309	12.37
6308	5.58	S	M	4.87	300		C	VC	199	39.82
6309	5.62	S	M	4.86	225		C	VC	211	21.1
6310	5.67	S	M	4.75	225		C	VC	344	20.62
6311	5.69	S	M	4.69	225		C	VC	215	8.6
6312	5.58	S	M	4.67	375		C	VC	-1077	10.77
6313	5.59	S	M	4.63	375		C	VC	4470	44.7
6314		S	Q	4.94	300		C	VC	422	12.65
6401	6.17	F	M	3.92	225		C	VC	165	76
6402	5.96	F	M	3.45	225		C	VC	54	61.07
6403	5.92	F	M	4.43	150		C	VC	150	75
6404	6.13	S	M	5.38	150		C	VC	510	10.2
6405	6.18	S	M	5.34	150		C	VC	500	10
6406	6.22	S	M	5.41	150		C	VC	198	15.81

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
6407	6.18	S	M	5.32	150		C	VC	345	31.02
6408	6.1	S	M	5.21	150		C	VC	457	32
6409	5.95	S	M	5.14	150		C	VC	185	29.55
6410	6.03	S	M	5.36	225		C	VC	156	17.12
6411	6.01	S	M	5.24	225		C	VC	388	31.02
7000		C	W							
7001		F	Z		150		C			44.6
7002		F	Z							
7003		F	Z		150		C			286.84
7004		F	Z		400		C			44.6
7101		F	M		525		C	CO		84.85
7102	5.35	F	M	3.83	150		C	VC	88	39.81
7103	5.04	F	M	3.99	150		C	VC	74	63.25
7104	5.18	F	M	4.52	150		C	VC	142	31.14
7105	5.11	F	M	4.29	150		C	VC	139	43.19
7106	5.09	S	M	4.72	150		C	VC	3413	34.13
7107	5.17	S	M	4.27	150		C	VC	-146	26.25
7108	5.18	S	M	4.46	225		C	VC	292	70.18
7109	5.12	S	M	4.71	150		C	VC	276	33.14
7201	5.25	F	M	4.23	150		C	VC	110	41.73
7202		F	J		300		C	VC		28.28
7203		S	I	4.52	300		C	VC	90	28.65
7204	5.27	S	M	4.18	450		C	VC	56	8.94
7205	5.29	S	M	4.15	450		C	VC	130	11.66
7206	5.18	S	M	4.06	450		C	VC	993	19.85
7207	5.31	S	M	4.19	300		C	VC	427	34.18
7208	5.26	S	M	4.11	300		C	VC	393	35.34
7209	5.34	S	M	3.98	300		C	VC	894	8.94
7210	5.44	S	M	4.12	300		C	VC	-382	19.1
7211	5.42	S	M	4.16	300		C	VC	519	25.94
7301	5.68	S	M	4.91	225		C	VC	539	26.93
7302		F	I	4.84	300		C	CO		41.52
7303		S	M		300		C	CO		48
7401	5.77	F	M	3.7	225		C	VC	232	55.79
7402	5.92	S	M	5.15	225		C	VC	246	32
7403	5.79	S	M	5.02	225		C	VC	525	21
7404	5.77	S	M	4.98	225		C	VC	314	22
7405		F	M		225		C	VC		55.4
8101	5.54	F	M	1.51	525		C	CO		129.87
8102	5.56	F	M	2.87	225		C	VC	7	6.4
8103	5.35	F	M	3.38	150		C	VC	149	53.6
8104	5.23	F	M	3.96	150		C	VC	144	50.25
8105	5.27	F	M	3.56	150		C	VC		55.23
8106	5.19	S	M	4.58	225		C	VC		50.25
8107	5.24	S	M	4.58	300		C	VC	589	47.1
8108	5.59	S	M	4.47	300		C	VC	286	20
8109	5.62	S	M	4.39	300		C	VC	1174	35.23
8110	5.54	S	M	4.36	300		C	VC	336	30.27
8111	5.47	S	M	4.26	300		C	VC	148	19.24
8201	5.52	F	M	3.62	150		C	VC	132	27.66
8202	5.41	F	M	3.4	225		C	VC	219	74.55
8203	5.35	F	M	4.46	150		C	VC	124	32.28
8204	5.3	F	M	4.18	150		C	VC	137	28.79
8205	5.57	F	M	3.93	150		C	VC	45	10.44
8206	5.6	S	M	4.67	225		C	VC	326	39.12
8207	5.46	S	M	4.51	225		C	VC	-306	15.3
8208	5.61	S	M	4.48	300		C	VC	353	24.74
8209	5.41	S	M	4.39	300		C	VC	331	56.32
8210	5.65	S	M	4.51	225		C	VC	251	27.66
8301	5.55	F	M	3.82	150		C	VC	181	34.44
8302	5.64	S	M	4.63	225		C	VC	403	56.46
8304		F	M		225		C	VC		24.84
8305		F	M		225		C	VC		29.6
8306		F	M		225		C	VC		29.53
8307		S	M		300		C	CO		9.43
8308		S	M		525		C	CO		33.05
8309		S	M		525		C	CO		49.47
8310		S	M		525		C	CO		31.75
8311	5.93	S	M		525		C	CO		23.76
8401		F	M		225		C	VC		42.01
8402		S	M		525		C	CO		55.05
8403		S	M		525		C	CO		27.38
8404	5.93	S	M	4.79	300		C	CO	486	43.71
9101	5.63	F	M	4.36	150		C	VC	142	62.29
9102	5.5	F	M	3.9	150		C	VC	251	55.23
9103	5.49	S	M	4.73	225		C	VC	415	62.29
9201	5.5	F	M	3.68	225		C	VC	313	78.34
9202	5.43	F	M	4.45	150		C	VC	133	62.39
9203	5.53	F	M	3.98	150		C	VC	99	50.49
9204	5.54	S	M	4.72	225		C	VC	295	70.83
9205	5.51	S	M	4.73	225		C	VC	378	75.66
9206		F	G		225		C	VC		49.24
9301	5.53	F	M	4.72	150		C	VC	144	23
9302	5.7	F	M	4.55	150		C	VC	135	17.49
9303	5.7	F	M	4.4	150		C	VC	120	69.66
9304	5.59	F	M	4.74	150		C	VC	117	11.7
9305	5.55	F	M	4.65	150		C	VC	120	66.94
9306	5.66	S	M	4.89	225		C	VC		15.23
9307	5.66	S	M	4.86	225		C	VC	639	25.55
9308		S	M		225		C	VC		15.03
9309	5.74	S	M	4.82	225		C	VC	178	21.4
9310	5.69	S	M	4.66	225		C	VC	2420	48.41

WASTE WATER SYMBOLOGY

MANHOLE
FOUL SURFACE COMBINED DUAL
SIDE ENTRY MANHOLE
FOUL SURFACE COMBINED
PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED
SITE TERMINATION
T-JUNCTION (SADDLE)
AIRVALVE
LAMP HOLE
CASCADE
OIL INTERCEPTOR
CONTROL KIOSK
PENSTOCK
CONTROL VALVE
PUMP
EXTENT OF SURVEY
RODDING EYE
FLOW METER
SEA OUTFALL
GULLEY
SOAKAWAY
HATCHBOX
SUMMIT NODE
HEAD OF SYSTEM
TUMBLING BAY
HEADWALL
UNSPECIFIED
HYDROBRAKE
VALVE
INLET
VALVE CHAMBER
INSPECTION CHAMBER
WASHOUT
GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)
BIFURCATION
DROPSHAFT
CATCHPIT
FLOW CONTROL
CHAMBER
SCREEN CHAMBER POWERED
CONTAMINATED SURFACE WATER
SCREEN CHAMBER STATIC
PUMPING STATION
WASTE WATER TREATMENT WORKS
EJECTOR STATION
SEPTIC TANK
SLUDGE PUMPING STATION
TANK
SHEET EDGE
VENT COLUMN
SEWER OVERFLOW
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

- F Foul
- S Surface
- C Combined
- T Transition
- O Overflow
- U Unspecified

MANHOLE / NODE TYPE

- M Manhole
- J Junction
- L Lamphole
- H Hatchbox
- R Rodding Eye
- F Outfall
- V Combined Sewer Overflow
- P Pumping Station
- S Soakaway
- D Dual Function Manhole
- W Treatment Works
- Z Ghost in Rising Main
- C Cascade
- Y Gulley
- E Ejector
- O Oil Injector
- I Inlet
- B Hydrobrake
- T Vent Column
- X Valve
- U Unspecified
- Q Expediency Node
- G Ghost (to allow pipe bends)

SEWER SHAPE

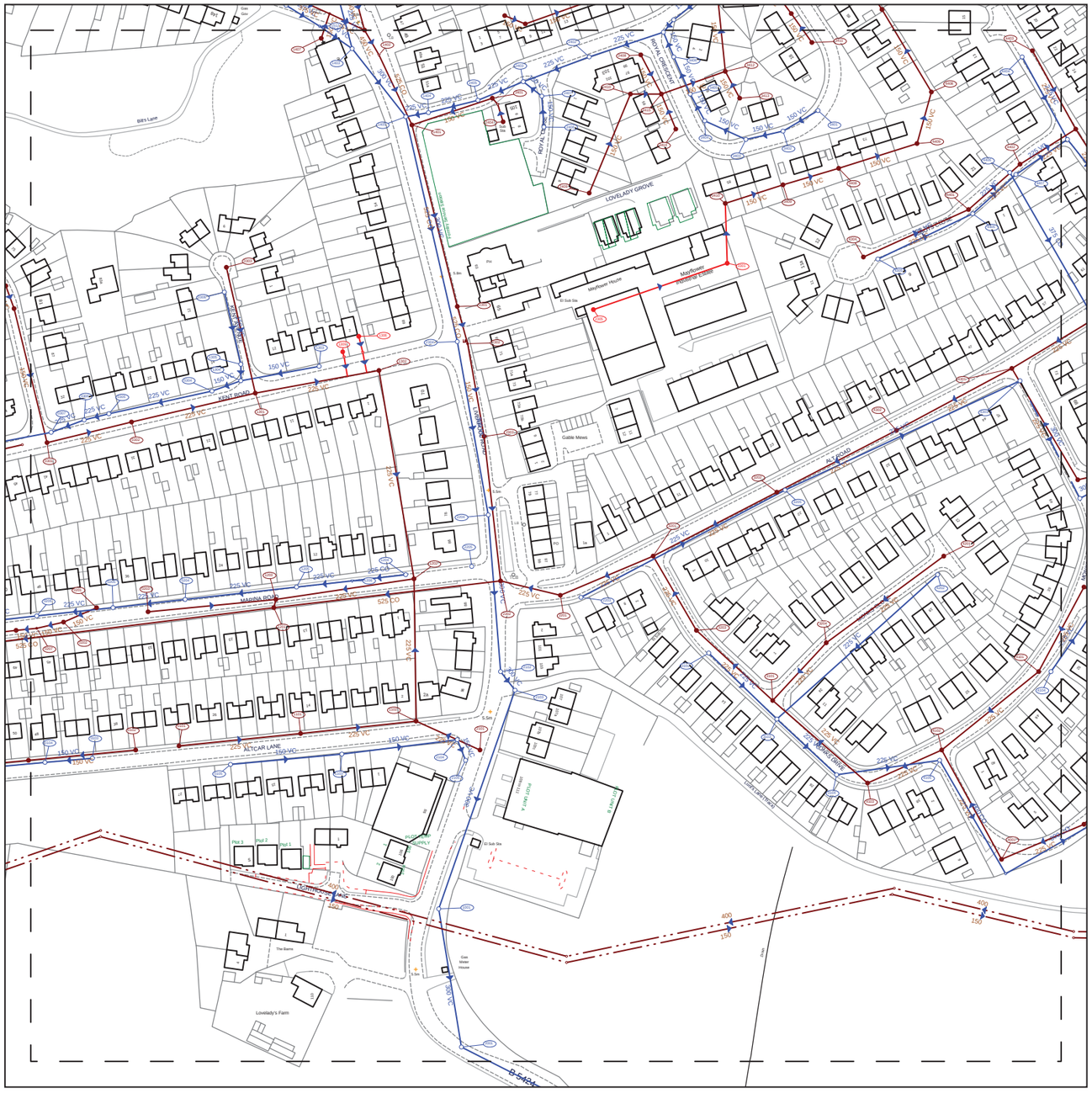
- C Circular
- E Egg
- O Oval
- F Flat Top
- R Rectangular
- S Square
- T Trapezoidal
- A Arch
- B Barrel
- H Horseshoe
- U Unspecified

SEWER MATERIAL

- AC Asbestos Cement
- BR Brick
- CI Cast Iron
- SI Spun (Grey) Iron
- CO Concrete
- CS Concrete Segments (Bolted)
- CS Concrete Segments (Unbolted)
- CC Concrete Box Culvert
- DI Ductile Iron
- GR Glass Reinforced Concrete
- GR Glass Reinforced Plastic
- PS Plastic / Steel Composite
- PV Polyvinyl Chloride
- PE Polyethylene
- RP Reinforced Plastic Matrix
- ST Steel
- VC Vitrified Clay (All Clayware)
- PP Polypropylene
- PF Pitch Fibre
- MA Masonry - In Regular Courses
- MA Masonry - Randomly Coursed
- U Unspecified

OS Sheet No: SD2906SE
Scale 1:1250 Date: 24-Sep-2012
185 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



OS Sheet No: SD3006SW

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
0101	5.59	F	M	4.12	225		C	VC	228	59.3
0102	5.52	F	M	4.72	150		C	VC	149	52.24
0103	5.66	S	M	4.95	150		C	VC		23.09
0104	5.63	S	M		225		C	VC		65.28
0105	5.54	S	M	4.73	150		C	VC	387	54.23
0106		F	Z		400		C			286.84
0107		F	Z		150		C			234.09
0201	5.38	F	M	4.16	150		C	VC	134	17.46
0202	5.38	F	M	4	150		C	VC		13.34
0203	5.39	F	M		225		C	VC		62.29
0204	5.34	S	M	4.39	225		C	VC	-101	35.23
0205	5.4	S	M	4.7	225		C	VC	113	37.22
0206	5.43	S	M	4.47	225		C	VC	-139	36.22
0207		F	J		150		C	VC		10.05
0301	5.54	F	M	4.03	225		C	VC		42.2
0302	5.56	F	M		225		C	VC		61.61
0303	5.73	F	M		225			VC		62.59
0304	5.73	S	M	4.94	225		C	VC	427	51.2
0305	5.59	S	M	4.82	225		C	VC	206	12.37
0306	5.61	S	M	4.88	225		C	VC	-285	17.09
0307	5.45	S	M	4.89	225		C	VC	471	75.31
0308	5.73	S	M	5.11	150		C	VC	1795	35.9
1001	5.38	S	M	3.25	300		C	VC		67.9
1101	5.56	F	M	3.83	225		C	VC	209	56.32
1102	5.49	F	M	3.55	225		C	VC	197	69.01
1103	5.53	S	M	4.56	150		C	VC	202	56.44
1201	5.54	F	M	1.7	525		C	CO	1349	242.86
1202	5.61	F	M	3.19	225		C	VC		67.74
1203	5.53	F	M		225		C	VC		4.12
1204	5.59	S	M	4.61	225		C	CO	1308	26.17
1205	5.6	S	M	4.57	225		C	VC	388	54.33
1206		S	Q	4.59	225		C	VC	2717	27.17
1301	5.78	F	M		225		C	VC		61
1302	5.93	F	M	3.75	225		C	VC	186	102.42
1303	5.89	S	M	5.27	150		C	VC	149	38.64
1304	5.78	S	M	5	150		C	VC	248	14.87
1305	5.76	S	M	5.08	150		C	VC	160	8
1306		C	M				C			8.02
1307		F	Q				C			10.05
1308		F	J							
1309		C	M				C			2.57
1310		F	Q				C			9.6
1311		F	J							
1401	5.85	F	M	2.1	525		C	CO	4535	90.71
1402		F	Q		525		C	CO		37.58
1403	6.08	S	M	3.84	300		C	VC	840	42.01
1404	5.74	S	M	4.1	225		C	VC		11.18
1405	5.83	S	M	3.79	300		C	VC	1017	111.83
1407	6.1	F	M	5.36	150		C	VC		12.65
1502	6.04	F	M	2.1	450		C	VC		13.89
2001	5.04	S	M		300			VC		145.15
2002		F	Z		400		C			234.09
2003		F	Z		150		C			161.41
2101	5.41	F	M	3.66	225		C	VC	309	34.01
2102	5.35	S	M	3.42	300		C	VC	-163	11.4
2103	5.46	S	M	3.49	300		C	VC	488	112.27
2104	5.43	S	M	4.26	150		C	VC		10.77
2105	5.41	S	M							
2201	5.51	F	M	2.18	225		C	VC	43	29.83
2202	5.45	F	M	1.62	525		C	CO	-1385	110.77
2203	5.59	S	M	4.82	225		C	VC	320	111.83
2204	5.62	S	M	3.51	300		C	VC	1271	76.24
2205	5.57	S	M							
2301	5.74	F	M	2.08	525		C	CO		18.68
2302		F	L		150		C	VC		45.71

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
2303	5.66	F	M		150			VC		70.46
2304	5.71	S	M	3.65	300		C	VC	948	85.33
2305		C	M				C			68.7
2401	5.57	F	M	4.88	150		C	VC	36	41.11
2402	5.56	S	M	4.36	225		C	VC	1139	34.18
2403	5.65	S	M	4.33	225		C	VC	198	23.77
2404		F	M		100		C	VC		8.83
2405	5.57	S	M	4.18	225		C	VC	618	24.74
2406	5.8	S	M	4.79	150		C	VC	88	15.03
2407	5.67	S	M	4.57	150		C	VC	67	11.4
2408	5.91	F	M	4.86	150		C	VC		21.47
2409	5.97	F	M		150		C	VC		52
2410		F	M		150			VC		15
2411		F	Q		100		C	VC		4
3101	5.16	F	M	2.62	225		C	VC	296	50.25
3102	5.33	S	M	4.6	225		C	VC	230	45.97
3103	5.17	S	M	4.4	225		C	VC	330	39.62
3104	5.13	S	M	4.28	225		C	VC	210	50.49
3201	5.49	F	M	2.31	225		C	VC	349	48.85
3202	5.48	F	M	2.53	225		C	VC	338	67.54
3203	5.27	F	M	2.44	225		C	VC	321	41.68
3204	5.13	F	M	3.58	225		C	VC	294	38.21
3205	5.59	S	M	4.49	225		C	VC	370	125.72
3301		C	M				C			29.03
3401	5.75	S	M	5.03	150		C	VC	123	19.72
3402	5.7	S	M	4.87	150		C	VC	154	18.44
3403	5.65	S	M	4.75	150		C	VC		21.93
3404	5.62	S	M	4.71	150		C	VC	369	14.76
3405	5.53	S	M	4.67	150		C	VC	394	19.7
3406	5.57	S	M	4.62	150		C	VC	162	13
3407	5.46	S	M	4.54	225		C	VC	211	37.95
3408		F	M		150		C	VC		39.85
3409		F	M		150		C	VC		28.16
3410	5.66	F	M	4.91	150		C	VC		29.41
3411	5.88	F	M	4.67	150		C	VC	42	17.2
3412	5.77	F	M	4.29	150		C	VC		39.2
3413		F	M		150		C	VC		14.76
3414	5.74	F	M	4.99	150		C	VC		18.38
3415		F	M		150		C	VC		32.89
4001	4.72	F	M	3.11	225		C	VC	378	60.42
4002		F	Z		150		C			90.47
4003		S	G		300		C	CO		64.5
4004		F	Z		400		C			162.39
4101	4.96	F	M	3.21	225		C	VC	232	60.44
4102	4.92	F	M	2.95	225		C	VC	303	39.4
4103	5.01	F	M	2.81	225		C	VC	339	60.96
4104	5.05	S	M	4.36	225		C	VC	282	36.62
4105	4.87	S	M	4.02	300		C	CO		63.63
4201	5.22	F	M	3.92	225		C	VC	221	70.8
4202	5.28	S	M	4.61	225		C	VC	499	104.8
4301	5.06	F	M	3.05	225		C	VC	227	63.53
4302	5.36	F	M	2.76	225		C	VC	297	65.3
4303	5.06	S	M	4.09	300		C	VC	914	63.95
4304	5.62	F	M	4.32	225		C	VC	233	55.95
4305	5.55	S	M	4.53	225		C	VC	300	50.99
4401	5.34	F	M	4.07	225		C	VC	139	33.3
4402	5.2	F	M	3.81	225		C	VC	355	31.91
4403	5.03	F	M	3.77	225		C	VC	395	43.42
4404	5.15	S	M	4.3	225		C	VC	285	45.65
4405	5.33	S	M	4.36	225		C	VC	257	28.32
4406	5.23	S	M	4.06	375		C	CO	635	76.16
4407	5.24	S	M	4.25	225		C	VC	275	30.23
4408	5.2	F	M	3.9	150		C	VC	-777	46.65
4409	5.49	F	M	4.2	150		C	VC	90	25.96

WASTE WATER SYMBOLOGY

MANHOLE

FOUL SURFACE COMBINED DUAL — SIDE ENTRY MANHOLE

FOUL SURFACE COMBINED

PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED

SITE TERMINATION
AV AIRVALVE
CA CASCADE
CK CONTROL KIOSK
CV CONTROL VALVE
ES EXTENT OF SURVEY
FM FLOW METER
GU GULLEY
HB HATCHBOX
HS HEAD OF SYSTEM
HE HEADWALL
HT HYDROBRAKE
IN INLET
IC INSPECTION CHAMBER
T-JUNCTION (SADDLE)
LH LAMP HOLE
OI OIL INTERCEPTOR
PK PENSTOCK
PU PUMP
RE RODDING EYE
SO SEA OUTFALL
SO SOAKAWAY
SU SUMMIT NODE
TB TUMBLING BAY
UN UNSPECIFIED
VA VALVE
VC VALVE CHAMBER
WO WASHOUT
GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)

BIFURCATION
CATCHPIT
CHAMBER
CONTAMINATED SURFACE WATER
DROPSHAFT
FLOW CONTROL
SCREEN CHAMBER POWERED
SCREEN CHAMBER STATIC
PUMPING STATION
EJECTOR STATION
SLUDGE PUMPING STATION
SHEET EDGE
SEWER OVERFLOW
WASTE WATER TREATMENT WORKS
SEPTIC TANK
TANK
VENT COLUMN
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F Foul
S Surface
C Combined
T Transition
O Overflow
U Unspecified

MANHOLE / NODE TYPE

M Manhole
J Junction
L Lamphole
H Hatchbox
R Rodding Eye
F Outfall
V Combined Sewer Overflow
P Pumping Station
S Soakaway
D Dual Function Manhole
W Treatment Works
Z Ghost in Rising Main
C Cascade
Y Gulley
E Ejector
O Oil Injector
I Inlet
B Hydrobrake
T Vent Column
X Valve
U Unspecified
Q Expediency Node
G Ghost (to allow pipe bends)

SEWER SHAPE

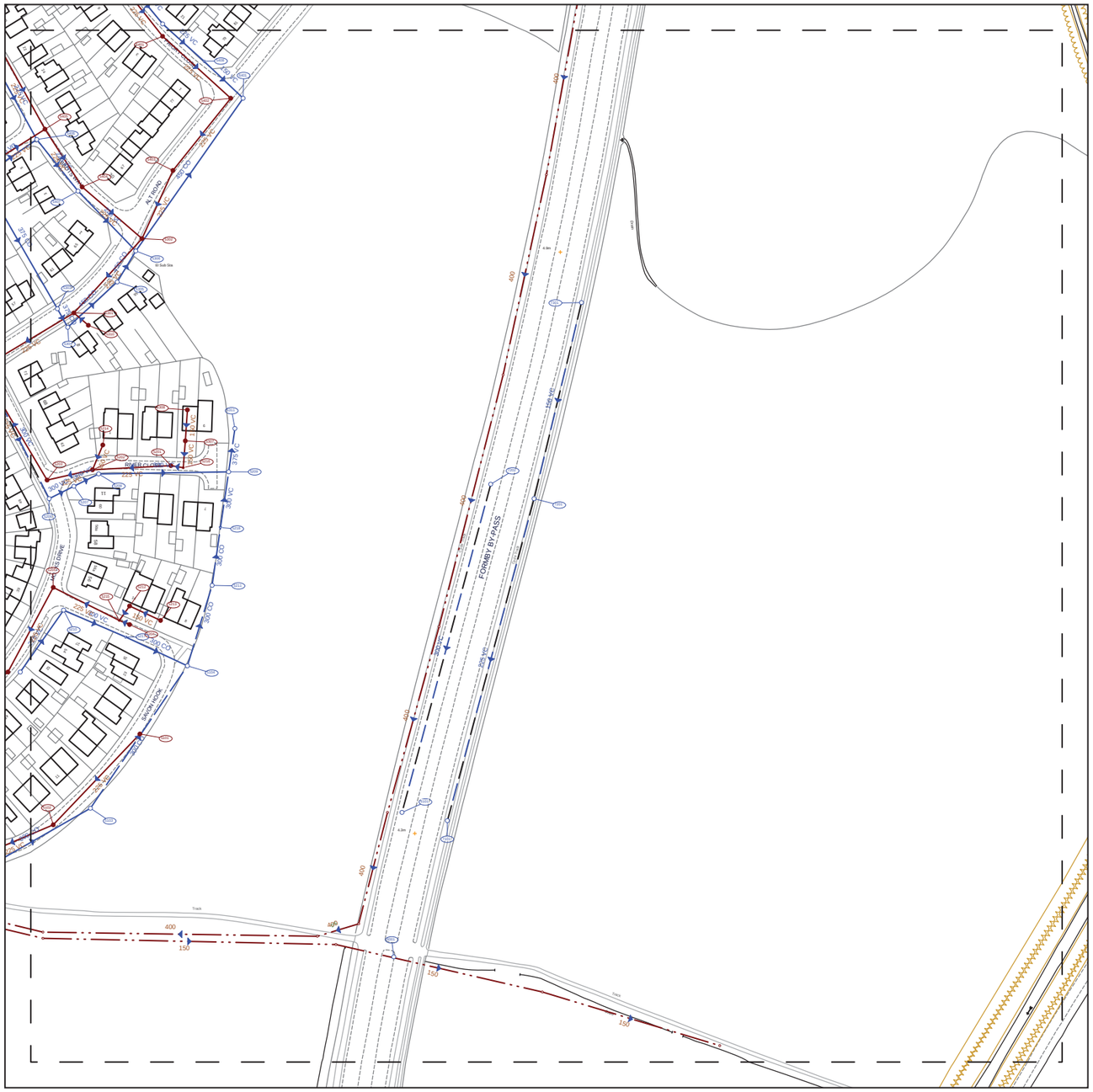
C Circular
E Egg
O Oval
F Flat Top
R Rectangular
S Square
T Trapezoidal
A Arch
B Barrel
H Horseshoe
U Unspecified

SEWER MATERIAL

AC Asbestos Cement
BR Brick
CI Cast Iron
SI Spun (Grey) Iron
CO Concrete
CS Concrete Segments (Bolted)
CS Concrete Segments (Unbolted)
CC Concrete Box Culvert
DI Ductile Iron
GR Glass Reinforced Concrete
GR Glass Reinforced Plastic
PS Plastic / Steel Composite
PV Polyvinyl Chloride
PE Polyethylene
RP Reinforced Plastic Matrix
ST Steel
VC Vitrified Clay (All Clayware)
PP Polypropylene
PF Pitch Fibre
MA Masonry - In Regular Courses
MA Masonry - Randomly Coursed
U Unspecified

OS Sheet No: SD3006SW
Scale 1:1250 Date: 24-Sep-2012
129 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



OS Sheet No: SD3006SE

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
5002		F	Z		150		C			142.03
5003		F	Z		400		C			89.5
5101	4.51	F	M	3.44	225		C	VC	434	60.83
5102	4.47	F	M	3.3	225		C	VC	290	43.46
5103	4.53	S	M	3.79	300		C	CO	-1670	83.49
5104	4.73	S	M	3.79	300		C	CO	1360	40.8
5201	4.91	F	M	3.66	225		C	VC	152	38.05
5202	4.98	F	M	3.41	225		C	VC	188	22.56
5203	4.99	F	M	3.27	225		C	VC	285	62.77
5204	4.82	F	M	3.58	225		C	VC		5.39
5205	5.01	F	M	3.41	225		C	VC	233	46.53
5206	4.98	S	M	4.11	300		C	VC	1342	13.42
5207	5.06	S	M	4.11	300		C	VC	-1342	13.42
5208	5.1	S	M	4.11	300		C	VC	131	63.01
5209	4.97	S	M	3.63	375		C	VC	-23	21.21
5210	4.98	S	M	4.21	300		C	VC	172	32.7
5211	4.87	S	M	3.75	300		C	CO	943	28.28
5212	4.94	F	M	3.84	150		C	VC		8.6
5213	4.98	F	M	4.06	150		C	VC	83	16.55
5214	5.2	F	M	3.85	150		C	VC	37	13
5215		F	J		225		C	VC		35.78
5216		F	J		225		C	VC		6.08
5217		S	Q	4.02	300		C	CO	184	33.11
5218		S	Q	3.72	300		C	VC	910	27.29
5301	4.89	F	M	3.25	225		C	VC	375	52.48
5302	5.06	F	M	3.4	225		C	VC	349	48.84
5303	5.01	S	M	3.95	375		C	CO	206	10.3
5304	4.91	S	M	3.85	450		C	CO	3256	32.56
5305	5.1	S	M	3.77	450		C	CO	-1749	17.49
5306	5.18	S	M	3.77	450		C	CO	323	90.44
5307	5.18	F	M	3.93	150		C	VC		13.04
5308	5.27	F	M	4.29	150		C	VC	44	15.03
5310	5.07	F	M	3.57	150		C	VC	46	9.22
5311	4.9	S	M							
5401	5.01	F	M	3.87	225		C	VC	279	44.6
5402	5.04	F	M	3.69	225		C	VC	373	44.82
5403	4.97	F	M	3.56	225		C	VC	259	36.25
5404	5.02	F	M	3.58	225		C	VC	295	38.29
5405	5.05	F	M	3.64	225		C	VC	555	33.29
5406	5	S	M	4.14	225		C	VC	1067	32.02
5407	5.15	S	M	4.08	225		C	VC	336	40.31
5408		S	Q	3.58	150		C	VC	145	26.17
6001	4.92	S	M							
6002		F	Z		400		C			20.88
6003		F	Z		400		C			133.02
6004		F	Z		150		C			102.61
6101	4.91	S	M							
6102		F	Z		400		C			55.79
6201		F	Z		400		C			93.41
6401	5.19	S	M							
7001		F	Z		150		C			89.84
7101	4.69	S	M							
7201	4.93	S	M	3.93	225		C	VC	702	161.55
7202	4.99	S	M	3.9	300		C	VC	634	164.71
7301	5.1	S	M	4.11	150		C	VC	575	97.74
7302		F	Z		400		C			125.88
7401		F	Z		400		C			99.25
8001		F	Z							

WASTE WATER SYMBOLOGY

MANHOLE

FOUL SURFACE COMBINED DUAL SIDE ENTRY MANHOLE

FOUL SURFACE COMBINED

PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED

SITE TERMINATION
AV AIRVALVE
CA CASCADE
CK CONTROL KIOSK
CV CONTROL VALVE
ES EXTENT OF SURVEY
FM FLOW METER
GU GULLEY
HB HATCHBOX
HS HEAD OF SYSTEM
HE HEADWALL
HT HYDROBRAKE
IN INLET
IC INSPECTION CHAMBER
T-JUNCTION (SADDLE)
LH LAMP HOLE
OI OIL INTERCEPTOR
PE PENSTOCK
PU PUMP
RE RODDING EYE
SO SEA OUTFALL
SO SOAKAWAY
SU SUMMIT NODE
TB TUMBLING BAY
UN UNSPECIFIED
VA VALVE
VC VALVE CHAMBER
WO WASHOUT

GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)

BIFURCATION
CATCHPIT
CHAMBER
CONTAMINATED SURFACE WATER
DROPSHAFT
FLOW CONTROL
SCREEN CHAMBER POWERED
SCREEN CHAMBER STATIC
PUMPING STATION
EJECTOR STATION
SLUDGE PUMPING STATION
SHEET EDGE
SEWER OVERFLOW
WASTE WATER TREATMENT WORKS
SEPTIC TANK
TANK
VENT COLUMN
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F Foul
S Surface
C Combined
T Transition
O Overflow
U Unspecified

MANHOLE / NODE TYPE

M Manhole
J Junction
L Lamphole
H Hatchbox
R Rodding Eye
F Outfall
V Combined Sewer Overflow
P Pumping Station
S Soakaway
D Dual Function Manhole
W Treatment Works
Z Ghost in Rising Main
C Cascade
Y Gulley
E Ejector
O Oil Injector
I Inlet
B Hydrobrake
T Vent Column
X Valve
U Unspecified
Q Expediency Node
G Ghost (to allow pipe bends)

SEWER SHAPE

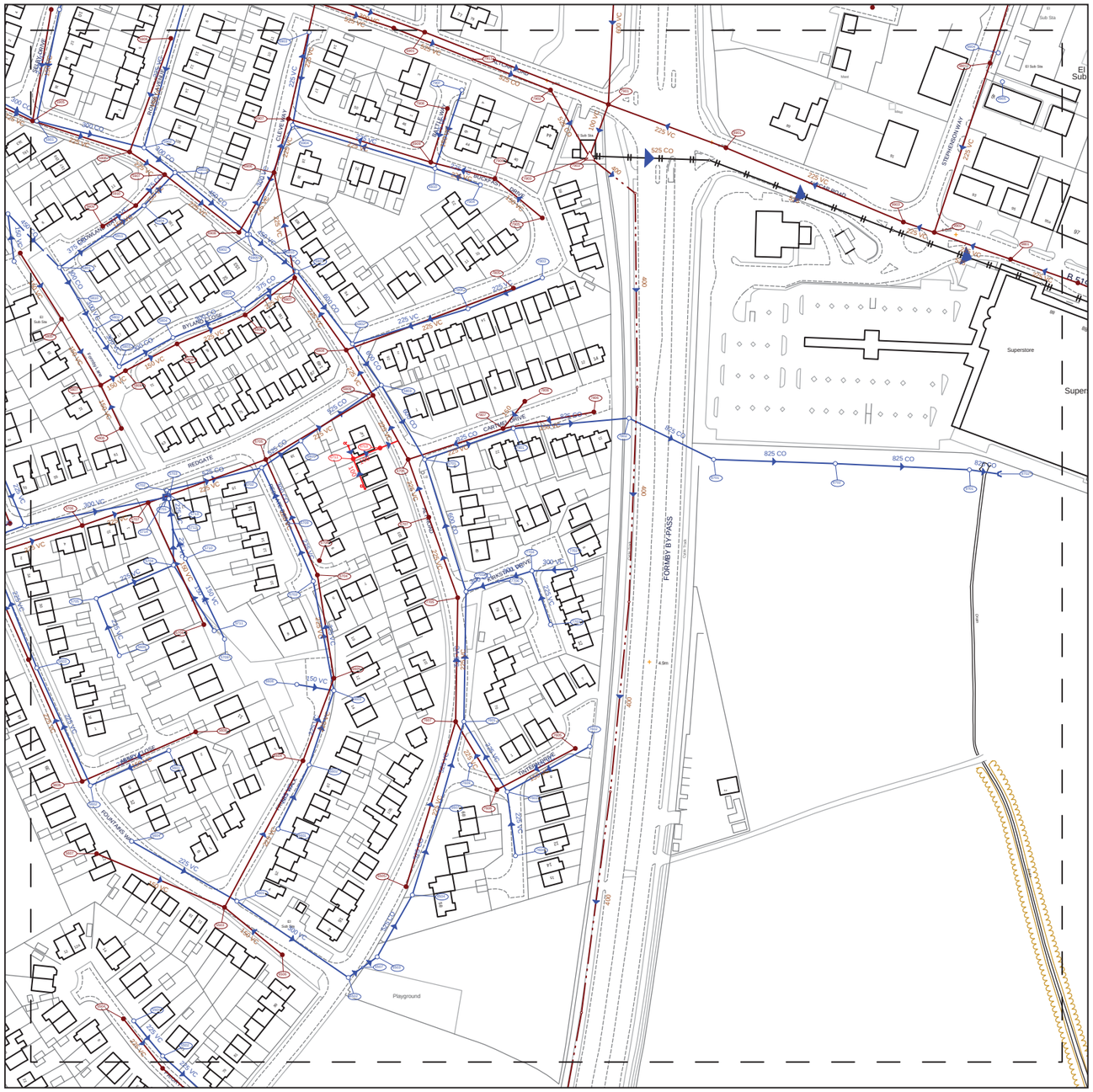
C Circular
E Egg
O Oval
F Flat Top
R Rectangular
S Square
T Trapezoidal
A Arch
B Barrel
H Horseshoe
U Unspecified

SEWER MATERIAL

AC Asbestos Cement
BR Brick
CI Cast Iron
SI Spun (Grey) Iron
CO Concrete
CS Concrete Segments (Bolted)
CS Concrete Segments (Unbolted)
CC Concrete Box Culvert
DI Ductile Iron
GR Glass Reinforced Concrete
GR Glass Reinforced Plastic
PS Plastic / Steel Composite
PV Polyvinyl Chloride
PE Polyethylene
RP Reinforced Plastic Matrix
ST Steel
VC Vitrified Clay (All Clayware)
PP Polypropylene
PF Pitch Fibre
MA Masonry - In Regular Courses
MA Masonry - Randomly Coursed
U Unspecified

OS Sheet No: SD3006SE
Scale 1:1250 Date: 24-Sep-2012
58 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
5501	5.02	S	M	3.88	225		C	VC	200	22.02
5502	5.03	S	M	3.76	225		C	VC	150	26.91
5503	5.03	F	M	3.12	225		C	VC	175	80.53
5504	4.89	F	M	3.9	225		C	VC	1020	30.61
5601	4.75	S	M	4.13	225		C	VC	378	41.63
5602	4.85	S	M	3.99	225		C	VC	202	62.65
5603	5.02	S	M	3.67	225		C	VC	1114	66.85
5604	4.86	S	M	4.02	225		C	VC	489	58.67
5605	4.51	S	M	3.9	225		C	VC	199	29.81
5606	4.84	F	M	3.05	225		C	VC	248	64.47
5607	4.82	F	M	3.69	150		C	VC	160	67.23
5608	4.68	F	M	3.84	150		C	VC	94	60.01
5701		S	V	3.29	300		C	VC	47	2.33
5702	4.66	S	M	3.06	525		C	CO	676	47.3
5703	4.71	S	M	3.11	525		C	CO		2
5704	4.82	S	M	3.57	225		C	VC		17.18
5705	4.42	S	M	3.73	225		C	VC	255	40.79
5706	5.04	F	M	2.35	225		C	VC	169	33.84
5707	4.72	F	M	2.16	225		C	VC	196	60.75
5708	4.91	F	M	3.41	150		C	VC	54	64.88
5709	4.88	S	M	3.64	150		C	VC		43.38
5710	4.76	S	M		150			VC		15.23
5711	4.87	S	M	3.99	150		C	VC	94	37.43
5712		S	J		225		C	VC		15.13
5713		S	Q	3.24	225		C	VC	20	1
5714		S	Q	3.11	300		C	CO	-224	2.24
5801	5.15	S	M	3.61	375		C	CO	287	25.81
5801	5.15	S	M	3.75	300		C	CO	250	17.49
5802	4.88	S	M	3.61	300		C	VC	2163	21.63
5803	4.8	S	M	3.54	300		C	CO	2953	29.53
5804	4.68	S	M	3.53	300		C	CO	409	36.77
5805	5.18	F	M	3.88	150		C	VC	169	37.22
5806	5.05	F	M	3.93	150		C	VC	89	23.26
5807	5.13	F	M	3.64	150		C	VC	43	13.89
5808	4.82	F	M	3.32	150		C	VC	66	28.18
5809	4.65	F	M	2.88	225		C	VC	199	35.85
5810		S	Q	3.68	300		C	VC	243	17
5901	4.93	S	M		300		C	CO		53.6
5902	4.74	S	M	3.49	300		C	CO	213	19.21
5903	4.69	S	M	3.35	450		C	CO	260	46.86
5904	4.78	S	M	3.41	375		C	CO	731	21.93
5905	4.92	F	M	2.82	225		C	VC		49.34
5906	4.72	F	M		225		C	VC		20.25
5907	4.71	F	M	2.53	225		C	VC	111	45.61
5908	4.6	F	M	3.3	150		C	VC		58.52
5909	4.9	F	M	3.13	150		C	VC	59	18.87
5910	4.84	F	M	2.81	150		C	VC	85	20.52
5911		S	Q	3.52	375		C	VC	278	25
6501	5	S	M	3.82	300		C	VC	345	65.46
6502	5.11	S	M	3.56	300		C	VC	430	8.6
6503	5.09	S	M	3.4	525		C	CO	431	34.48
6504	5.01	S	M	3.3	525		C	CO	366	43.97
6505	4.96	F	M	2.93	225		C	VC	139	83.52
6506	5.06	F	M	3.61	150		C	VC	98	36.24
6507		S	Q	3.54	300		C	CO	287	8.6
6601	4.81	S	M	3.89	225		C	VC	1148	34.44
6602	4.71	S	M	3.86	225		C	VC	127	37.95
6603	4.61	S	M	3.55	225		C	VC	450	53.94
6604	4.82	F	M	2.64	225		C	VC	237	42.72
6605	4.55	F	M	2.4	225		C	VC	163	50.64
6606	4.76	S	M	3.78	150		C	VC	166	18.25
6607		S	Q	3.18	525		C	VC	437	43.68
6701	4.3	S	M	2.62	825		C	CO	379	45.54
6702	4.38	S	M	2.9	525		C	CO	-192	23.02
6703	4.54	S	M	3.38	225		C	VC	152	30.46
6704	4.54	F	M	2.1	225		C	VC	236	61.33
6705	4.3	F	M	1.85	225		C	VC	263	60.54
6706	4.27	F	M	1.65	225		C	VC	589	35.36
6707	4.34	F	M	1.8	225		C	VC	198	29.73
6708	4.63	F	M							
6709		S	Q	3.18	300		C	CO	143	29.97
6710		F	Z		100		C			6.72
6711		C	M		100		C			14

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
6712		F	Z		100		C			15.53
6713		C	M		100		C			9.3
6801	4.4	S	M	3.07	600		C	CO	368	44.2
6802	4.32	S	M	2.95	600		C	CO	136	24.41
6803	4.37	S	M	2.73	600		C	CO	-417	41.68
6804	4.53	S	M	3.39	375		C	CO	176	31.62
6805	4.34	S	M	3.01	525		C	CO	395	47.43
6806	4.5	F	M	2.69	225		C	VC	115	30
6807	4.47	F	M	1.24	225		C	VC	400	51.97
6808	4.25	F	M	1.44	225		C	VC	239	43.01
6809	4.25	F	M	1.59	225		C	VC	170	25.55
6810		S	Q	3.1	450		C	CO	474	14.21
6811		F	J							
6901	4.8	F	M	0.52	100		C	VC	342	95.63
6902	4.52	S	M	3.12	450		C	VC	750	15
6903	4.58	S	M	3.7	225		C	VC	143	45.71
6904	4.49	S	M	3.37	300		C	VC	1148	57.38
6905	4.47	S	M	3.26	375		C	VC	25	1
6906	4.46	F	M	1.07	225		C	VC	224	26.93
6907	4.48	F	M	0.89	225		C	VC	250	62.59
6908	4.53	F	M	2.13	225		C	VC	37	33.62
6909	4.43	F	M	2.23	225		C	VC	58	72.12
6910	4.44	S	M	3.76	225		C	VC	212	72.12
7503		F	Z		400		C			95.52
7601	4.69	S	M	3.01	525		C	VC	-6301	63.01
7602	4.64	S	M	3.75	225		C	VC	-1522	45.65
7603	4.78	S	M	3.59	225		C	VC	97	39.96
7604	4.85	S	M	3.77	225		C	VC	240	31.26
7605	4.65	F	M	3.13	150		C	VC	113	42.94
7606	4.77	F	M	2.61	225		C	VC	297	38.59
7607	4.79	F	M	2.32	225		C	VC	162	60.01
7609	4.87	S	M							
7610		F	Z		400		C			107.91
7701	4.49	S	M	3.02	600		C	CO	372	67.05
7702	4.31	S	M	3.47	300		C	VC	175	21.02
7703	4.34	S	M	3.47	225		C	VC	229	27.51
7704	4.38	S	M	3.34	300		C	VC		16.76
7705	4.55	F	M	1.93	225		C	VC	345	41.44
7706		S	Q	3.34	300		C	CO	-1676	16.76
7707		F	Z		400		C			92.44
7801	4.23	S	M	2.49	825		C	CO	-296	56.22
7802	4.26	S	M	2.6	825		C	CO	285	45.62
7803	4.27	S	M	3.43	225		C	VC	557	39
7804	4.3	S	M	3.35	225		C	VC	390	58.52
7805	4.3	F	M	3.13	225		C	VC	102	86.38
7806	4.15	F	M	2.78	150		C	VC	104	44.72
7807	4.21	F	M	2.35	225		C	VC	85	48.38
7808		F	M		150		C			16.84
7809		F	Z		400		C			104.08
7901	4.58	F	M	0.2	100		C	VC	-8	27.06
7902	4.57	F	M	1.81	525		C	CO	537	37.62
7903	4.58	F	P		400		C			28.16
7904	4.41	S	M	3.82	225		C	VC	334	23.41
7905	4.35	F	M	2.74	150		C	VC	119	29.83
7906	4.43	F	M	2.48	225		C	VC	128	32.02
7907	4.54	S	M	3.85	225		C	VC	502	40.16
7908	4.5	F	M	3.21	150		C	VC	29	27.2
7909		F	Z		400		C			94.01
7911		F	Q	1.87	525		C	CO	1021	40.85
8701	4.59	S	M	2.44	825		C	CO	-843	59.03
8702	4.19	S	M	2.5	825		C	CO		65.07
8901	4.64	F	M	0.79	225		C	VC	101	60.75
8902		F	Z							
9701		S	M		825		C	CO		14.14
9702		S	F							
9801	4.04	F	M	1.71	225		C	VC		39.22
9803		F	Z							
9901	3.59	F	M	1.81	225		C	VC		86.33
9902	4.07	F	M		225		C	VC		15.81
9903	4.12	F	M	1.17	225		C	VC	245	93.23
9904	3.5	S	M							
9905	3.57	S	M							
9906		F	Z							

WASTE WATER SYMBOLOGY

MANHOLE
FOUL SURFACE COMBINED DUAL
SIDE ENTRY MANHOLE
FOUL SURFACE COMBINED
PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED

SITE TERMINATION
T-JUNCTION (SADDLE)
AIRVALVE
LAMP HOLE
CASCADE
OIL INTERCEPTOR
CONTROL KIOSK
PENSTOCK
CONTROL VALVE
PUMP
EXTENT OF SURVEY
RODDING EYE
FLOW METER
SEA OUTFALL
GULLEY
SOAKAWAY
HATCHBOX
SUMMIT NODE
HEAD OF SYSTEM
TUMBLING BAY
HEADWALL
UNSPECIFIED
HYDROBRAKE
VALVE
INLET
VALVE CHAMBER
INSPECTION CHAMBER
WASHOUT
GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)
BIFURCATION
DROPSHAFT
CATCHPIT
FLOW CONTROL
CHAMBER
SCREEN CHAMBER POWERED
CONTAMINATED SURFACE WATER
SCREEN CHAMBER STATIC
PUMPING STATION
WASTE WATER TREATMENT WORKS
EJECTOR STATION
SEPTIC TANK
SLUDGE PUMPING STATION
TANK
SHEET EDGE
VENT COLUMN
SEWER OVERFLOW
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

F	Foul	T	Transition
S	Surface	O	Overflow
C	Combined	U	Unspecified

MANHOLE / NODE TYPE

M	Manhole	Z	Ghost in Rising Main
J	Junction	C	Cascade
L	Lamphole	Y	Gulley
H	Hatchbox	E	Ejector
R	Rodding Eye	O	Oil Injector
F	Outfall	I	Inlet
V	Combined Sewer Overflow	B	Hydrobrake
		T	Vent Column
P	Pumping Station	X	Valve
S	Soakaway	U	Unspecified
D	Dual Function Manhole	Q	Expediency Node
		G	Ghost (to allow pipe bends)
W	Treatment Works		

SEWER SHAPE

C	Circular	T	Trapezoidal
E	Egg	A	Arch
O	Oval	B	Barrel
F	Flat Top	H	Horseshoe
R	Rectangular	U	Unspecified
S	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
CI	Cast Iron
SI	Spun (Grey) Iron
CO	Concrete
CS	Concrete Segments (Bolted)
CS	Concrete Segments (Unbolted)
CC	Concrete Box Culvert
DI	Ductile Iron
GR	Glass Reinforced Concrete
GR	Glass Reinforced Plastic
PS	Plastic / Steel Composite
PV	Polyvinyl Chloride
PE	Polyethylene
RP	Reinforced Plastic Matrix
ST	Steel
VC	Vitrified Clay (All Clayware)
PP	Polypropylene
PF	Pitch Fibre
MA	Masonry - In Regular Courses
MA	Masonry - Randomly Coursed
U	Unspecified

OS Sheet No: SD3006NE
Scale 1:1250 Date: 24-Sep-2012
146 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS

OS Sheet No: SD3006NE
Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

OS Sheet No: SD3006NW

Scale 1:1250 Date: 24-Sep-2012

Printed by: Donna Camblin

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
0501	5.84	F	M	2.45	375		C	VC	881	61.68
0502	5.95	F	M	2.38	375		C	VC	740	59.2
0503	5.8	S	M	4.35	225		C	VC		113.6
0601	5.76	S	M	4.11	300		C	VC	1627	81.34
0602		S	Q	4.47	225		C	VC	59	11.18
0701	5.6	F	M	2.33	450		C	CO		27.51
0702	5.54	S	M	4.2	300		C	CO	206	4.12
0703		F	Q	2.92	450		C	CO	1059	42.38
0704	5.61	S	M	4.26	300		C	CO	1930	38.59
0705	5.54	S	M	4.15	450		C	VC	-1487	14.87
0706	5.5	S	M							
0707	5.51	S	M	4.43	300		C	VC	-35	1.41
0708	5.56	S	M	4.16	450		C	CO	224	2.24
0709	5.44	S	M	4.08	300		C	VC	-385	19.24
0710	5.52	S	M	4.17	525		C	CO	1838	55.15
0711	5.61	S	M	4.09	300		C	VC	-1265	25.3
0712		S	Q	4.18	300		C	VC	133	4
0713	5.59	F	M	4.09	150		C	VC	140	30.81
0714	5.6	F	M	3.86	150		C	VC	169	52.43
0715		S	Q	4.16	450		C	CO		14.56
0716	5.59	S	M	4.24	150		C	VC		5.1
0717	5.63	S	M	4.45	150		C	VC	168	26.93
0718	5.61	S	M	4.64	150		C	VC	225	33.73
0719	5.56	S	M	4.26	375		C	CO		6.08
0720		F	J		525		C	CO		50.96
0721		S	J		225		C	VC		5.39
0722		S	Q	4.47	300		C	CO	-112	2.24
0723		S	Q	4.15	450		C	CI	283	2.83
0724		S	Q	4.26	375		C	VC	608	6.08
0725		S	Q	4.39	300		C	CO	95	12.3
0726		S	M		150		C			4.77
0730	5.54	S	M	4.09	225		C	VC		8.54
0730	5.54	S	M	4.08	225		C	VC	-1393	13.93
0731	5.59	S	M	4.14	375		C	VC	-85	4.24
0801	5.64	F	M	2.96	525		C	CO	1045	41.79
0802	5.69	F	M	3.09	525		C	CO	122	15.81
0803	5.84	F	M	3.07	525		C	CO	-5819	58.19
0804	5.91	S	M	4.77	300		C	VC		10.77
0805	5.81	S	M	4.77	300		C	VC		9.22
0806	5.81	S	M	4.76	300		C	VC	166	21.59
0807	5.78	S	M	4.58	450		C	VC	182	74.67
0808	6.01	S	M	5.02	150		C	VC		4
0809	5.49	S	M	4.44	225		C	VC	765	15.3
0810	5.6	S	M	4.46	150		C	VC	-297	14.87
0811		S	Q	4.4	375		C	CO	103	20.62
0812	5.93	S	M	4.6	300		C	VC	99	19.85
0901	5.97	F	M	3.13	525		C	CO	582	34.93
0902		F	L		300		C	CO		27.2
0903	6.35	F	M	3.5	350		C	VC		23.26
0904	5.93	F	M	3.22	525		C	CO	819	65.51
0905	6.03	S	M	5.03	300		C	VC	135	35.17
0906	5.87	S	M	5.07	225		C	VC		20.4
1501	6	F	M	2.3	375		C	VC		19.7
1502	6.04	F	M	2.1	450		C	VC		13.89
1503	6.04	F	M	2.15	525		C	CO		22.14
1504	5.97	F	M		525		C	CO		44.27
1505	5.96	S	M	3.91	300		C	VC	-680	27.2
1506	5.84	S	M	4.35	225		C	VC	-444	39.92
1507	5.94	S	M		225		C	VC		18.87
1508	5.96	S	M	5.21	150		C	VC	127	25.5
1509		F	J		375		C	VC		18.79
1510		F	Q	2.15	450		C	VC	2280	22.8
1511		S	Q	3.95	225		C	VC	-898	26.93
1512		S	Q	4.9	300		C	VC	18	19.42
1513		F	M				C			6.29
1601		F	M				C			15.84
1602	5.95	S	M	4.02	300		C	VC	751	82.64
1603	6.03	S	M	5.03	225		C	VC	971	19.42
1604	6.09	S	M	5.01	225		C	VC	250	32.45
1605	5.98	S	M	4.88	225		C	VC	2247	22.47
1606	5.9	S	M	4.88	225		C	VC	169	27.02
1607	5.7	S	M	4.7	225		C	VC	88	21.02
1608	5.65	S	M	4.65	150		C	VC	61	11.05
1609	5.69	F	M		525			CO		32.76
1610	5.91	F	M							51.11
1611	6	F	M	4.14	150		C	VC	130	36.4
1612	5.92	F	M		150		C	VC		34.21
1613		F	M				C			9.8
1614		F	M				C			4.05
1615	5.82	F	M	2.29	525		C	CO		74.69
1616		F	Q							
1617		F	J							
1701	5.35	S	M	4.14	525		C	CO	1879	18.79
1702	5.39	S	M	4.09	525		C	CO		1.41
1703	5.19	S	M	4.2	150		C	VC	-2404	24.04
1704	6.07	S	M	4.79	150		C	VC	-93	34.48
1705	6.06	S	M	4.6	150			VC	-48	10
1706	6.01	S	M	4.58	525			CO		23.09
1707	6.01	F	M	4.83	150		C	VC	97	67.12
1708		S	M		525		C	CO		27.2
1709	5.63	F	M		525			CO		17.12
1710		S	J		525		C	CO		30
1801	5.12	S	M	3.95	225		C	VC		8.06
1802	5.35	S	M	4.12	525		C	CO	-1020	20.4
1803		S	M		225			CO		22.63
1804	5.5	F	M	3.95	225		C	VC	184	44.15
1805		S	M		525			VC		18.6
1806	5.67	S	M	4.23	225		C	VC		35.23
1807	5.8	S	M	4.75	225		C	VC	603	48.27
1808	5.21	F	M	3.95	225		C	VC	328	45.97
1809	5.43	F	M	3.8	225		C	VC	136	65.15
1810	5.84	F	M	4.44	150		C	VC	112	42.45
1811	5.92	S	M	5.15	150		C	VC	182	14.56
1812	5.8	S	M	5.1	150		C	VC		32.57
1813		S	M		225		C	VC		17.46
1814		S	M		150		C	VC		8.06
1815	5.35	S	M		225			CO		2.24
1816		S	J		225		C	CO		8
1817		S	Q	4.42	150		C	VC	477	14.32
1818		S	Q		150		C	VC		7.07
1819		S	Q		50		C	VC		7
1901	5.92	F	M	3.3	525		C	VC	1346	26.93
1902	6.06	F	M	3.35	525		C	VC	1014	30.41
1903		F	Q	3.28	600		C	CO	449	26.93
1904	5.89	F	M	4.08	150		C	VC	105	36.69
1905	5.96	S	M	5.34	150		C	VC	206	20.62
1906	5.95	S	M	5.2	150		C	VC	214	25.71
1907	5.94	S	M	5.08	150		C	VC	154	27.66
1908	6.12	F	M	2.76	525		C	VC	379	56.89
1909	6.1	S	M	5.08	225		C	VC	183	56.72
1910		S	M		225		C	VC		45.71
1911	6.23	F	M	3.41	525		C	VC	300	18
1911	6.23	F	M	3.41	525		C	VC	40	25.5
1912	6.04	S	M							
2003	5.89	F	M	3.98	225		C	VC	343	61.81
2501	5.92	F	M		300			VC		8.06
2502		F	L		300		C	VC		26.91
2503	5.89	F	M	2.46	300		C	VC	616	67.78

Refno	Cover	Func	Type	Invert	Size.x	Size.y	Shape	Matl	Grad	Length
2504	6	S	M	5.04	225		C	VC	233	16.28
2505	5.89	S	M	4.97	150		C	VC	30	6
2506	5.92	S	M	4.51	225		C	VC	188	30.08
2507	5.91	S	M	5.01	150		C	VC	180	7.21
2508	5.99	F	M	4.49	150		C	VC	100	26
2509	5.79	F	M	4.69	150		C	VC	137	27.31
2510	5.79	F	M	4.9	150		C	VC	149	32.89
2511	5.85	F	M	4.96	150		C	VC	180	10.77
2512		F	L	4.59	300			VC		4.47
2513		S	Q	4.77	225		C	VC	35	7
2514		S	Q	4.97	225		C	VC	583	5.83
2601	5.94	S	M	5.21	150		C	VC	214	30.02
2602	6	S	M	5.48	150		C	VC	125	36.14
2603	6.08	S	M	5.11	225		C	VC	357	25
2604	6.06	S	M	5.03	150		C	VC	265	63.69
2605	6.1	F	M	3.16	225		C	VC	51	9.22
2606	6.06	F	M	2.75	300		C	VC		16.12
2607		F	L		300			VC		19.03
2608	5.98	F	M	3.85	150		C	VC	32	10.3
2609		F	L		300		C	VC		37.8
2610	5.97	S	M	5.35	150		C	VC	157	25.06
2611	6.01	F	M		150		C	VC		20.4
2612		F	Q	3.53	225		C	VC	28	9.43
2613		F	M				C			14.67
2701	5.58	S	M							36.72
2702	5.39	F	M	3.39	225		C	VC	555	55.47
2703	5.59	F	M	3.28	225		C	VC	254	55.9
2704		S	G		525					42.01
2801	5.39	S	M	4.5	150		C	VC	248	27.29
2802	5.26	F	M	3.67	225		C	VC	153	41.23
2803		S	M		525		C	VC		38.48
2804	5.26	S	M	4.23	525		C	VC		15
2805	5.41	S	M	4.54	225		C	VC	84	19.24
2806		S	M		525		C	VC		35
2807		S	M		525			VC		46.96
2808	5.43	F	M	3.83	225		C	VC	177	26.57
2809	5.45	S	M	4.49	225		C	VC		20.88
2810	5.38	S	M	4.68	225		C	VC	177	31.78
2811	5.27	S	M	4.69	225		C	VC		33.3
2812	5.4	F	M	4	225		C	VC	168	26.83
2813	5.28	F	M	4.15	225		C	VC	297	32.65
2901	5.87	S	M	4.74	225		C	VC	226	61
2902	6.1	F	M	3.79	225		C	VC	166	53.15
2903		F	Q	2.61	525		C	CO	334	56.79
3501	5.5	F	M	3.5	225		C	VC	199	43.83
3502	5.74	F	M	4.01	150		C	VC	107	47.17
3503	5.91	F	M	4.25	150		C	VC	95	21.93
3504	5.65	F	M	4.26	150		C	VC	69	25
3505	5.78	F	M	3.9	150		C	VC	189	62.39
3506		F	M		150		C	VC		22.85
3507	5.76	S	M	4.85	150		C	VC	156	21.84
3508	5.63	S	M	4.71	150		C	VC	228	20.52
3509	5.53	S	M	4.62	150		C	VC	960	19.21
3510	5.51	S	M	4.6	150		C	VC	130	7.81
3511		F	Q	3.73	225		C	VC	217	47.71
3601	5.76	F	M	3.04	225		C	VC	626	12.53
3602	5.74	F	M	3	300		C	VC		50.12
3603	5.89	F	M	3.25	225		C	VC	217	45.61
3604	5.77	F	M	3.28	225		C	VC	492	14.76
3605	5.74	S	M	5.05	150		C	VC	126	6.32
3606	5.8	S	M							
3701	5.57	F	M	3.81	225		C	VC	212	55.07
3703	5.59	F	M	3.28	225		C	VC	254	55.95
3705	5.67	S	M							
3706	5.49	S	M							
3801	5.32	S	M	4.39	225		C	VC	460	50.57
3802	5.23	S	M	4.27	225		C	VC	388	31.02
3803	5.17	S	M	4.18	225		C	VC	454	42.38
3804	4.84	S	M	3.84	225		C	VC	224	6.71
3805	4.88	F	M	3.95	225		C	VC	209	46.04
3806	5.09	F	M	3.79	225		C	VC	360	82.86
3807	5.26	F	M	3.55	225		C	VC	439	65.86
3808		S	M		525			CO		39.4
3809		S	M		525			CO		3.16
3810		S	M		525		C	CO		37.34
3811	5.44	F	M	4.25	225		C	VC	490	29.41
3830	5.42	S	M	4.69	225		C	VC		28.16
3901	4.96	S	M	4.02	375		C	CO	137	12.37
3902	4.89	S	M	3.92	375		C	CO	2648	26.48
3903	4.86	S	M	3.88	375		C	CO		10.2
3904	4.82	S	M		375		C	CO		25.5
3905	4.8	S	M	4	225		C	VC	159	23.85
3906	4.84	S	M	3.89	225		C	VC	1070	21.4
3907	4.95	F	M	3.96	225		C	VC	201	52.17
3908	4.89	F	M	3.7	225		C	VC	211	31.58
3909	4.83	F	M	3.73	225		C	VC	568	17.03
3910	5.08	S	M							
3911		S	I	4.22	225		C	VC	158	6.32
3912	4.81	F	M	3.52	225		C	VC	183	34.71
3913		S	Q	3.88	375		C	VC	922	9.22
4501	5.14	F	M	3.94	150		C	VC	227	47.71
4601	5.03	F	M	2.79	225		C	VC	202	54.63
4701	5.27	F	M	3.64	225		C	VC	384	49.98
4702	5.41	F	M	3.52	225		C	VC	381	83.77
4703	5.35	S	M	3.87	225		C	VC	95	30.46
4704	5.29	S	M	3.5	300		C	VC	352	70.37
4705	5.24	S	M	3.49	225		C	VC	-1013	20.25
4706	5.22	F	M	2.52	225		C	VC	335	50.29
4707	5.5	S	M	4.16	225		C	VC	111	70.01
4708		F	Q	3.86	225		C	VC	190	39.92
4709	5.32	F	M	3.94	225		C	VC	298	50.64
4801	5.09	S	M	4.08	225		C	VC	226	33.84
4802	5.16	S	M	3.93	225		C	VC	806	16.12
4803	4.99	S	M	3.84	525		C	CO	1551	62.03
4804	5.16	F	M	4.14	150		C	VC	157	37.74
4805	5.23	S	M	4.1	150		C	VC	258	54.13
4806	5.16	F	M	4.07	150		C	VC	186	39
4807	4.98	S	M	4.3	150		C	VC	80	23.19
4808		S	Q	3.91	225		C	CO	765	15.3
4901	4.82	S	M	3.88	375		C	CO	-912	18.25
4902	4.8	S	M	3.89	375		C	CO	-522	10.44
4903	4.75	S	M	3.92	375		C	CO		15
4904	4.84	S	M	3.89	375		C	CO	471	9.43
4905	4.8	S	M	3.86	375		C	CO	-323	16.16
4906	4.76	S	M	3.84	525		C	CO	-854	8.54
4907	4.92	S	M	3.85	450		C	CO	-707	7.07
4908	5.01	S	M	3.84	450		C	CO	157	36.07
4909	5.08	S	M	3.82	225		C	VC	-39	21.47
4910		S	Q	3.91	375		C	VC	-510	10.2
4911	4.83	F	M	3.33	225		C	VC	121	13.34
4912	4.78	F	M	3.2	225		C	VC	222	40.05
4913	4.97	F	M	3.03	225		C	VC	97	16.55
4914	5.02	F	M	3.39	225		C	VC	59	21.93
4915	4.81	F	M	3.41	225		C	VC	192	36.4
4916		S	M		375		C	CO		21.4
4917		S	Q	3.85	450		C	CO	-854	8.54
4918		S	Q	3.87	450		C	VC	700	7
4919		S	Q	4.37	300		C	CO		21.47

WASTE WATER SYMBOLOGY

MANHOLE
FOUL SURFACE COMBINED DUAL
SIDE ENTRY MANHOLE
FOUL SURFACE COMBINED
PUBLIC MAIN
PRIVATE MAIN
SECTION 104
PUMPING MAIN
HIGHWAY DRAIN
SLUDGE MAIN
ABANDONED
SITE TERMINATION
T-JUNCTION (SADDLE)
AIRVALVE
LAMP HOLE
CASCADE
OIL INTERCEPTOR
CONTROL KIOSK
PENSTOCK
CONTROL VALVE
PUMP
EXTENT OF SURVEY
RODDING EYE
FLOW METER
SEA OUTFALL
GULLEY
SOAKAWAY
HATCHBOX
SUMMIT NODE
HEAD OF SYSTEM
TUMBLING BAY
HEADWALL
UNSPECIFIED
HYDROBRAKE
VALVE
INLET
VALVE CHAMBER
INSPECTION CHAMBER
WASHOUT
GHOST NODE (inc. GN - Rising Main & GN - Dual Function)
EXPEDIENCY NODE (CHANGE OF CHARACTERISTIC)
BIFURCATION
DROPSHAFT
CATCHPIT
FLOW CONTROL
CHAMBER
SCREEN CHAMBER POWERED
CONTAMINATED SURFACE WATER
SCREEN CHAMBER STATIC
PUMPING STATION
WASTE WATER TREATMENT WORKS
EJECTOR STATION
SEPTIC TANK
SLUDGE PUMPING STATION
TANK
SHEET EDGE
VENT COLUMN
SEWER OVERFLOW
DISCHARGE POINT (OUTFALL)

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

- F Foul
- S Surface
- C Combined
- T Transition
- O Overflow
- U Unspecified

MANHOLE / NODE TYPE

- M Manhole
- J Junction
- L Lamphole
- H Hatchbox
- R Rodding Eye
- F Outfall
- V Combined Sewer Overflow
- P Pumping Station
- S Soakaway
- D Dual Function Manhole
- W Treatment Works
- Z Ghost in Rising Main
- C Cascade
- Y Gulley
- E Ejector
- O Oil Injector
- I Inlet
- B Hydrobrake
- T Vent Column
- X Valve
- U Unspecified
- Q Expediency Node
- G Ghost (to allow pipe bends)

SEWER SHAPE

- C Circular
- E Egg
- O Oval
- F Flat Top
- R Rectangular
- S Square
- T Trapezoidal
- A Arch
- B Barrel
- H Horseshoe
- U Unspecified

SEWER MATERIAL

- AC Asbestos Cement
- BR Brick
- CI Cast Iron
- SI Spun (Grey) Iron
- CO Concrete
- CS Concrete Segments (Bolted)
- CS Concrete Segments (Unbolted)
- CC Concrete Box Culvert
- DI Ductile Iron
- GR Glass Reinforced Concrete
- GR Glass Reinforced Plastic
- PS Plastic / Steel Composite
- PV Polyvinyl Chloride
- PE Polyethylene
- RP Reinforced Plastic Matrix
- ST Steel
- VC Vitrified Clay (All Clayware)
- PP Polypropylene
- PF Pitch Fibre
- MA Masonry - In Regular Courses
- MA Masonry - Randomly Coursed
- U Unspecified

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Scale 1:1250 Date: 24-Sep-2012
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Sheet 1 of 1

United Utilities
SEWER RECORDS

Appendix 6

6.0 Ground Conditions

The sequence of the strata encountered during the investigation generally confirms the anticipated geology as interpreted from the geological map.

The sequence and indicative thickness of strata are provided below in Table 6.1. The ground conditions encountered, and summarised below, are presented in full on the exploratory hole logs available in Appendix A3.

Table 6.1 Generalised Geological Succession

Strata Encountered	Depth Encountered (m)		Strata Thickness (m)
	From	To	
Wheat stubble over Topsoil (All locations)	0.00	0.20 to 0.55	0.20 to 0.55
Sand (Northern and western areas of site only)	0.20 to 0.40	0.40 to 0.90	0.15 to 0.70
Clay (All locations)	0.20 to 0.90	0.60 to 1.80	0.20 to 1.20
Peat (Mid-eastern side of site and isolated areas)	0.50 to 1.50	0.60 to 1.60	0.05 to 0.10
Sand (TP1 & WS1 only)	0.90 to 1.10	2.00 to 2.90	1.10 to 1.80
Silty Clay / clayey Silt (Isolated areas)	0.90 to 1.30	1.60 to 2.00	0.70 to 0.90
Silty Sand / sandy Silt (TP1 – TP3 only)	1.00 to 2.00	1.90 to 3.00	0.80 to 2.00
Silt (All locations except TP1 & TP2)	0.80 to 2.90	2.10 to 5.10	0.70 to unproven
Sand (Isolated deep areas)	2.10 to 5.10	3.00 to 8.10	3.00 to unproven
Silt (BH1 only)	8.10	11.45	Unproven

6.1 Natural Strata

Natural strata has been encountered in all exploratory holes and trial pits across the site, with no made ground found at any of the locations on site. These natural strata varied across the site, with sands, clays, silts and peats encountered across the site beneath the topsoil. The strata encountered are described below.

6.1.1 Topsoil

Topsoil was encountered at all exploratory locations across the site and was characteristically described as brown clayey topsoil. It was encountered typically 0.20-0.30m thick across the site with a maximum thickness of 0.55m recorded at WS3.

6.1.2 Recent Deposits (Probably Alluvium, Blown Sand and Downholland Silt)

All the exploratory locations encountered a sequence of loose to medium dense sands, very soft clay, soft or very soft silt and localised thin layers of peat (typically 0.1m thick).

All of the trial pits, window sample holes WS1 to WS5 and boreholes BH2, BH3 and BH4 were terminated within these materials at a maximum depth of 4.00m bgl, without proving any deeper strata. BH1 and WS6 proved the base of these strata at 5.10m and 3.30m bgl respectively.

Atterberg Limits tests carried out on the clay materials confirmed them to be of low or intermediate plasticity.

SPT "N" values for these materials were in the range 1-9.

6.1.3 Possible Tidal Flat Deposits

BH1 and WS6 encountered medium dense silty fine sand with occasional shell fragments beneath the Alluvium, Blown Sand and Downholland Silt at 5.10 and 3.30m bgl respectively. These are considered likely to represent the Tidal Flat Deposits.

In addition, BH2, BH3 and BH4 were continued from 4.00m bgl using dynamic probing techniques. A marked increase in blow count is apparent at approximately 5.50-6.00m bgl, which may indicate the top of the Tidal Flat Deposits in these boreholes also.

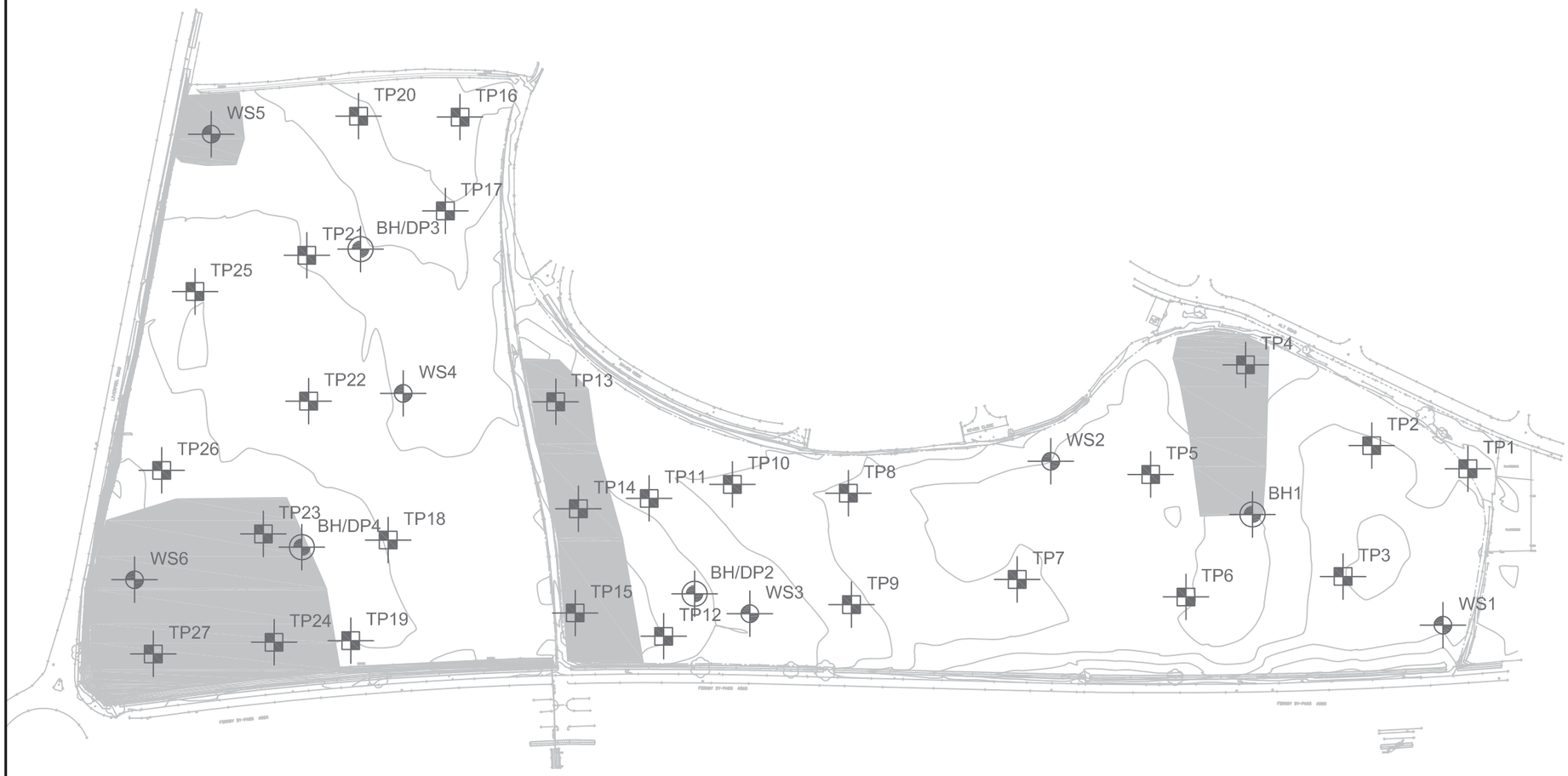
SPT "N" values for the Tidal Flat Deposits were in the range 15-18.

Particle Size Distribution Tests confirmed the visual description of a fine sand.

BH1 and WS6 were terminated within these deposits, without proving any deeper stratum.

6.2 Groundwater

Water strikes were recorded in all the exploratory holes at depths of between 1.00m and 2.50m bgl.



NOTES:

1. This drawing is to be read in conjunction with all relevant Architects and Engineers drawings and specifications.

2. Do not scale this drawing. All details and dimensions are to be checked by the contractor prior to commencement of construction. Any discrepancies to be reported to the engineer.

3. All dimensions are in millimetres unless noted otherwise

BH2 – Indicates location of Curtins Borehole

TP5 – Indicates location of Curtins Trialpit

WS2 – Indicates location of Curtins window sample

Rev:	Description:	Date:	By:	Chkd:

curtins consulting

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Status: INFORMATION

Project: FORMBY ALTCAR

Drg Title: EXPLORATORY HOLE LOCATION PLAN

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	07/11/12	PC	SH

Drg No: 50971/L001

Rev: /

ROTARY TEST DRILLING

Marshes Farm, Coach Road, off Wigan Road,
Hart Common, West Houghton, Bolton BL5 2BT
Tel: 01942 - 810348 Fax: 01942 - 840543

Site Altcar, Formby

Job No. 36/12

Client Curtins Consulting

Borehole **BH1**

Date 11/09/12 - 12/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.	Wheat stubble over brown sandy TOPSOIL. (0.30)				ES	0.20	
			0.30	Soft grey very sandy, silty CLAY/ clayey SAND. (1.10)				ES	0.90	
	▲							BS	0.50 - 1.00	
								J/N	1.20 - 1.65	3
			1.40	Soft grey clayey SILT. Deposit is wet. Rare shell fragments from 2.8m bgl. (3.70)						
	▲							U	2.00 - 2.45	n/r
								B	2.00 - 2.50	
	▽							J/N	2.50 - 2.95	3
								B	3.00 - 3.50	
								J/N	4.00 - 4.45	3
	▽		5.10	Medium dense grey very silty fine SAND. Deposit is wet/running/blowing. Rare shell fragments. (3.00)				J/N	5.50 - 5.95	15
								B	6.50 - 7.00	
								J/N	7.50 - 7.95	17

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.00	slow					12/09	1.00	OPEN
2.30	fast	20	1.00					
5.10	fast	20	2.00					

Remarks

Water entry at 1.0m bgl recorded as slow, water entry at 2.3m bgl recorded as fast rising to 1.0m/20 mins, water entry 5.1m bgl recorded as fast rising to 2.0m bgl after 20 mins.
Standing water level 12/09 1.0m bgl.
Winch rig to location 3hrs due to poor ground.
Re-drill borehole 3.0 to 12m bgl.
Winching rig/recovering bogged rig and support vehicles 9.0am - 3.00pm from BH1 - BH2.
12/09/12 Cable tool drilling abandoned, winch rig & support verhicles off site 4.00pm - 5.40pm.

ROTARY TEST DRILLING

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Site Altcar, Formby

Job No. 36/12

Client Curtins Consulting

Borehole **BH1**

Date 11/09/12 - 12/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			8.00							
			8.10	(Continued) Medium dense grey very silty fine SAND. Deposit is wet/running/blowing. Rare shell fragments. (3.00)				B	8.50 - 9.00	
				Medium dense very sandy (fine) SILT, occasional shell fragments, occasional lenses of very silty peat upto 0.05m in thickness. Deposit is wet. (Strata is blowing up BH/casing to 3.0m bgl) (3.35)				J/N	9.00 - 9.45	16
								B	10.00-10.50	
		11M						J/N	11.00-11.45	18
			11.45	Base of Borehole				J	11.40	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observa-tion Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open

Remarks

Water entry at 1.0m bgl recorded as slow, water entry at 2.3m bgl recorded as fast rising to 1.0m/20 mins, water entry 5.1m bgl recorded as fast rising to 2.0m bgl after 20 mins.
Standing water level 12/09 1.0m bgl.
Winch rig to location 3hrs due to poor ground.
Re-drill borehole 3.0 to 12m bgl.
Winching rig/recovering bogged rig and support vehicles 9.0am - 3.00pm from BH1 - BH2.
12/09/12 Cable tool drilling abandoned, winch rig & support verhicles off site 4.00pm - 5.40pm.

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Job No. 36/12

Client Curtins Consulting

Borehole **WS1**

Date 10/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown very sandy TOPSOIL. (0.20)				ES	0.20	
				Yellow/brown fine SAND. (0.70)				B	0.50 - 0.90	
			0.90					ES	1.00	
			1.10	Firm grey/brown silty sandy CLAY. (0.20)				C	1.00 - 1.45	9
				(Loose) brown/grey very silty fine SAND. Deposit is damp. (0.90)						
	▽		2.00	Loose brown very silty fine SAND. Deposit is wet. (0.90)				J/N	2.00 - 2.45	3
			2.90	Very soft grey (slightly peaty) very sandy (fine) SILT. Deposit is wet. (1.10)				J/N	3.00 - 3.45	2
			4.00	Base of Borehole				J	4.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
2.00	med/fast					10/09	1.10	OPEN

Remarks

Water entry at 2.0m bgl recorded as medium/fast, standing water level 1.1m bgl.

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Job No. 36/12

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Borehole **WS2**

Date 10/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown very sandy TOPSOIL. (0.20)				ES	0.20	
				Yellow/brown fine SAND. (0.65)				B	0.50 - 0.85	
			0.85							
				Soft and firm brown very silty, sandy CLAY. Deposit is damp. (0.65)				ES	1.00	
			1.50							
			1.60	Spongy dark brown fibrous PEAT. (0.10)				J	1.55	
	▽			Very soft grey SILT. Deposit is wet. (2.40)				J/N	1.00 - 1.45	9
								J/N	2.00 - 2.45	4
								J/N	3.00 - 3.45	1
			4.00	Base of Borehole						

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.80	fast					10/09	0.60	OPEN

Remarks

Water entry at 1.8m recorded as fast, standing water level 0.6m bgl.

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Site Altcar, Formby | Job No. 36/12

Client Curtins Consulting | Borehole **WS6**

Date 07/09/12 | O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.25	Wheat stubble over brown sandy, clayey TOPSOIL. (0.25)				ES	0.30	
				Firm/stiff brown/grey sandy, silty CLAY. (0.85)				B	0.50 - 1.00	
								ES	0.90	
			1.10					J/N	1.00 - 1.45	3
				Soft/very soft brown/grey sandy (fine) SILT. Deposit is damp. (0.80)				B	1.50 - 2.00	
	▽		1.90					J/N	2.00 - 2.45	2
				Very soft grey SILT. Deposit is wet. (1.40)						
								J/N	3.00 - 3.45	16
			3.30							
				Medium dense grey silty, fine SAND. Deposit is wet. (0.70)						
			4.00					J	4.00	
				Base of Borehole						

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.90	fast					07/09	1.50	OPEN

Remarks

Water entry at 1.9m bgl recorded as fast, standing water level 1.5m bgl.

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Job No. 36/12

Client Curtins Consulting

Trial Pit **TP1**

Date 10/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.	Wheat stubble over brown very sandy TOPSOIL. (0.30)						
			0.30	Brown fine SAND. (0.30)				ES	0.50	
			0.60	Firm brown very sitly, sandy, peaty CLAY. (0.30)						
			0.90	Yellow/brown very sitly, slightly peaty fine SAND. Deposit is damp. (1.10)				J B	1.00 1.00 - 1.50	
	▽		2.00	Soft grey/brown peaty very sandy SILT/ very silty SAND. Deposit is wet. (1.00)				J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.80	med/fast					10/09	1.60	OPEN

Remarks

Water entry at 1.8m bgl recorded as medium/fast, standing water level 1.6m bgl.

ROTARY TEST DRILLING

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Trial Pit **TP6**

Date 10/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown very sandy TOPSOIL. (0.20)				ES	0.20	
				Brown/grey fine SAND. (0.70)				ES	0.60	
			0.90					J	1.00	
	▽		1.30	Soft and firm grey/brown peaty, very silty CLAY/clayey SILT. Deposit is wet. (0.40)						
				Soft grey sandy, slightly peaty SILT. Deposit is wet. (1.70)				J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.30	med/fast					10/09	1.00	OPEN

Remarks

Water entry at 1.3m bgl recorded as medium/fast, standing water level 1.0m bgl.

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Site Altcar, Formby | Job No. 36/12

Client Curtins Consulting | Trial Pit **TP9**

Date 11/09/12 | O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown sandy, clayey TOPSOIL. (0.20)				ES	0.20	
				Firm brown very sandy, silty CLAY. (0.60)				ES	0.70	
			0.80							
			0.90	Spongy brown fibrous PEAT. (0.10)				J	1.00	
				Silt/very soft grey peaty, sandy SILT. Deposit is wet from 1.9m bgl. (2.10)						
	▽							J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.90	fast					11/09	1.20	OPEN

Remarks

Water entry at 1.9m bgl recorded as fast, standing water level 1.2m bgl.

ROTARY TEST DRILLING

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Site Altcar, Formby

Job No. 36/12

Client Curtins Consulting

Trial Pit **TP14**

Date 11/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.	Wheat stubble over brown very sandy TOPSOIL. (0.30)						
			0.30	Yellow/brown very sandy CLAY/clayey fine SAND. (0.30)				ES	0.50	
			0.60	Firm grey/brown very silty, peaty CLAY. (0.50)				J	1.00	
	▽		1.10	Soft grey peaty, sandy SILT. Deposit is wet. (1.90)				J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.60	fast					11/09	1.20	OPEN

Remarks

Water entry at 1.6m bgl recorded fast, standing water level 1.2m bgl.

ROTARY TEST DRILLING

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Site Altcar, Formby

Job No. 36/12

Client Curtins Consulting

Trial Pit **TP18**

Date 07/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown clayey, sandy TOPSOIL (0.20)						
				Soft and firm brown very sandy, very silty CLAY (0.80)				ES	0.30	
			1.00					ES	0.90	
	▽		1.20	Soft grey/brown peaty very silty CLAY/ clayey SILT (0.20)						
				Soft grey sandy (fine) peaty SILT, deposit is wet (1.80)				J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.20	Medium					07/09	1.10	OPEN

Remarks

ROTARY TEST DRILLING

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Job No. 36/12

Client Curtins Consulting

Trial Pit **TP20**

Date 07/09/12

O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown sandy, clayey TOPSOIL. (0.20)				ES	0.25	
				Firm brown sandy, silty slightly peaty CLAY. (0.80)						
			1.00					ES	1.00	
				Soft grey clayey, slightly peaty, sandy (fine) SILT. (0.80)				J	1.50	
	▽		1.80							
				Very soft grey sandy (fine) SILT. Deposit is wet. (1.20)				J	2.50	
			3.00	Base of Trial Pit						

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
1.80	med/fast					07/09	1.60	OPEN

Remarks

Water entry at 1.8m bgl recorded as medium/fast, standing water level 1.6m bgl.

ROTARY TEST DRILLING

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Site Altcar, Formby | Job No. 36/12

Client Curtins Consulting | Trial Pit **TP22**

Date 11/09/12 | O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown/grey very clayey TOPSOIL. (0.20)				ES	0.20	
				Stiff brown/grey silty, slightly peaty, sandy CLAY. (0.80)						
			1.00					J	1.00	
			1.20	Firm/soft grey very silty CLAY. (0.20)						
	▽			Very soft grey peaty SILT. Deposit is wet from 2.0m bgl. (1.80)				J	2.00	
			3.00	Base of Trial Pit				J	3.00	

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
2.00	med/fast					11/09	2.00	OPEN

Remarks

Water entry at 2.0m bgl recorded as medium/fast, standing water level 2.0m bgl.

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Site Altcar, Formby		Job No. 36/12
Client Curtins Consulting		Trial Pit **TP25**
Date 10/09/12	O.D. Level	Page 1 of 1

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.							
			0.20	Wheat stubble over brown sandy, clayey TOPSOIL. (0.20)						
				Firm brown silty, sandy CLAY. (0.70)				ES	0.30	
								ES	0.50	
			0.90	Soft and firm brown/grey very silty slightly peaty CLAY/very clayey SILT. (0.70)				J	1.00	
			1.60	Very soft grey sandy (fine) SILT. Deposit is wet from 2.0m bgl. (1.30)				J	2.00	
	▽									
			2.90	Grey very silty fine SAND. Deposit is wet. (0.10)				J	3.00	
			3.00	Base of Trial Pit						

Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
2.00	med/fast					10/09	2.30	OPEN

Remarks
Water entry at 2.0m bgl recorded as medium/fast, standing water level 2.3m bgl.

ROTARY TEST DRILLING

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Site Altcar, Formby | Job No. 36/12

Client Curtins Consulting | Trial Pit **TP27**

Date 12/09/12 | O.D. Level

Day	Water Level	Casing Depth	Strata Depth	Description of Strata	Leg-end	Inst.	Reduced Level	Sample Type	Sample Depth	'N' Value
			G.L.	Wheat stubble over brown very clayey TOPSOIL. (0.30)						
			0.30	Firm brown/grey sandy, silty, slightly peaty CLAY. (0.65)				ES	0.50	
			0.95	Soft grey/brown peaty, slightly sandy (fine) SILT. (1.55)				J	1.00	
								J	2.00	
	▽		2.50	Very soft grey sandy SILT. Deposit is wet. (0.50)				B	2.50 - 3.00	
			3.00	Base of Trial Pit				J	3.00	

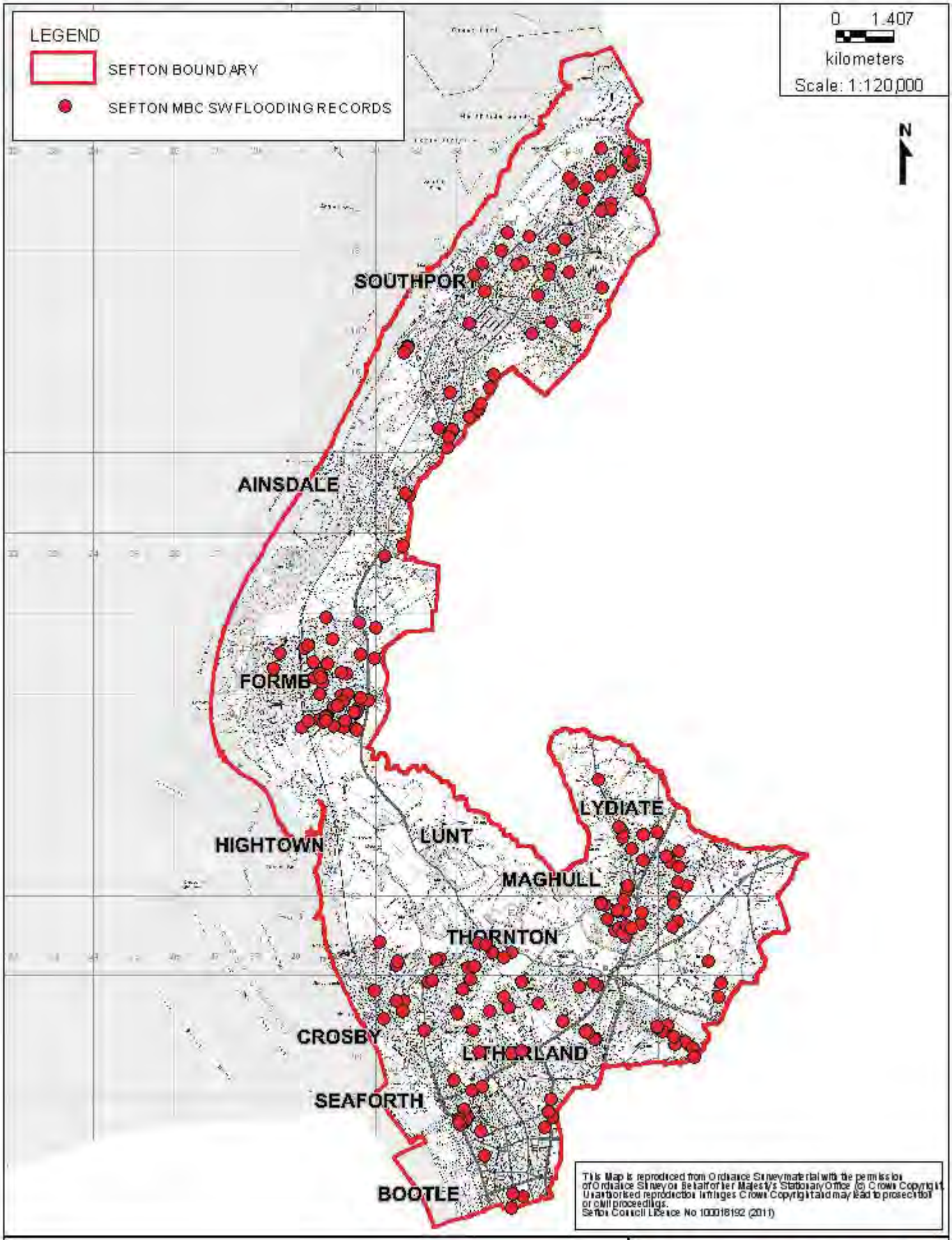
Symbols U - undisturbed sample J - jar sample B - bulk sample W - water sample
N - Standard Penetration Test ▽ - Water entry ▲ - Water level

Ground Water Entry	Estimated Rate of Entry	Observation Time (mins)	Water Level Rising to	Depth of Casing at Entry	Depth of Casing to Seal	Date	Standing Water Level	Condition of Borehole Cased / Open
2.50	med/fast					12/09	2.60	OPEN

Remarks

Water entry at 2.5m bgl recorde as medium/fast, standing water level 2.6m bgl.

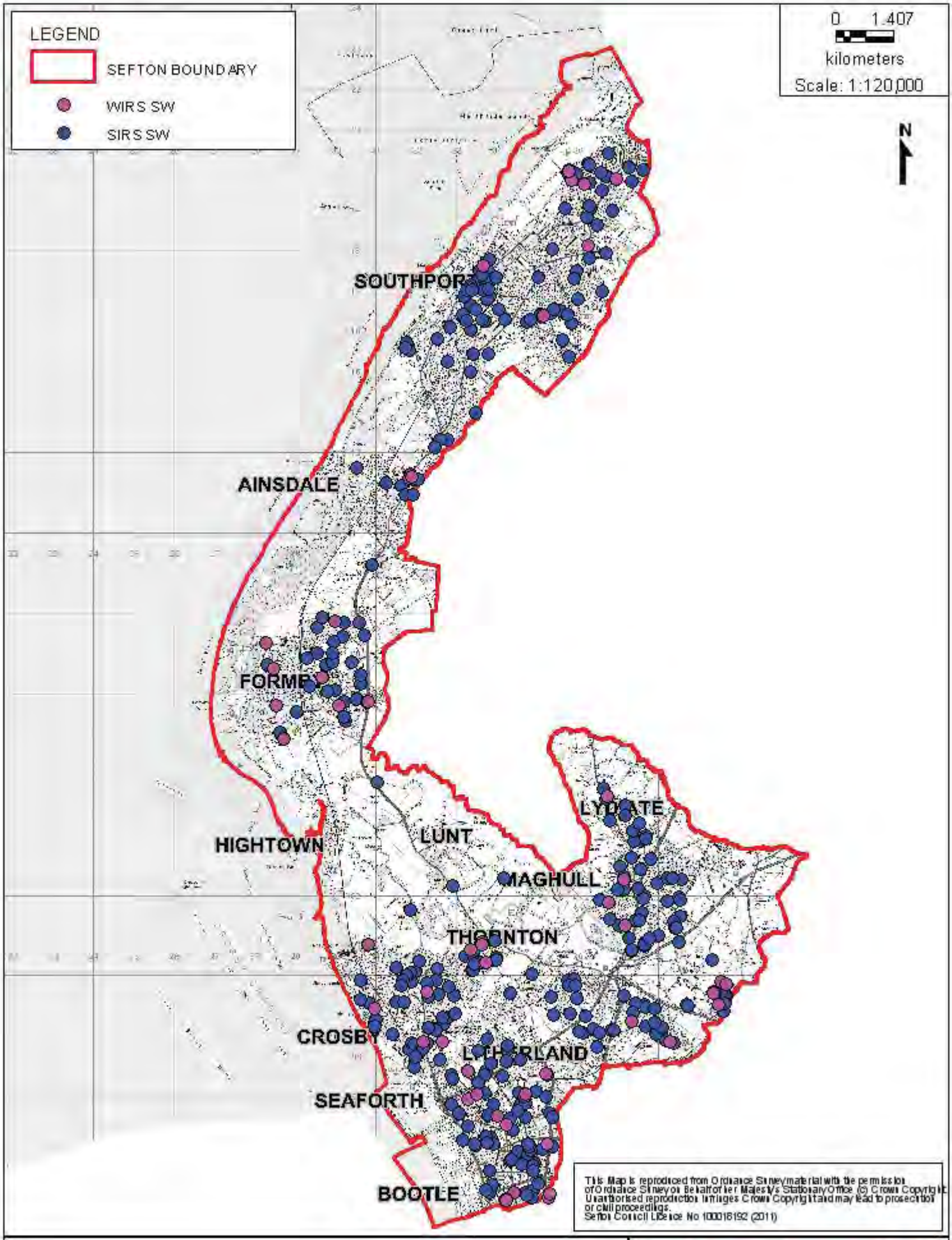
Appendix 7



SEFTON AREA:
SEFTON MBC SURFACE WATER FLOOD RECORDS
FIGURE A-1

Sefton Council

CAPITA SYMONDS



SEFTON AREA:
SEFTON MBC SEWER FLOODING RECORDS
FIGURE A-2

Sefton Council

CAPITA SYMONDS

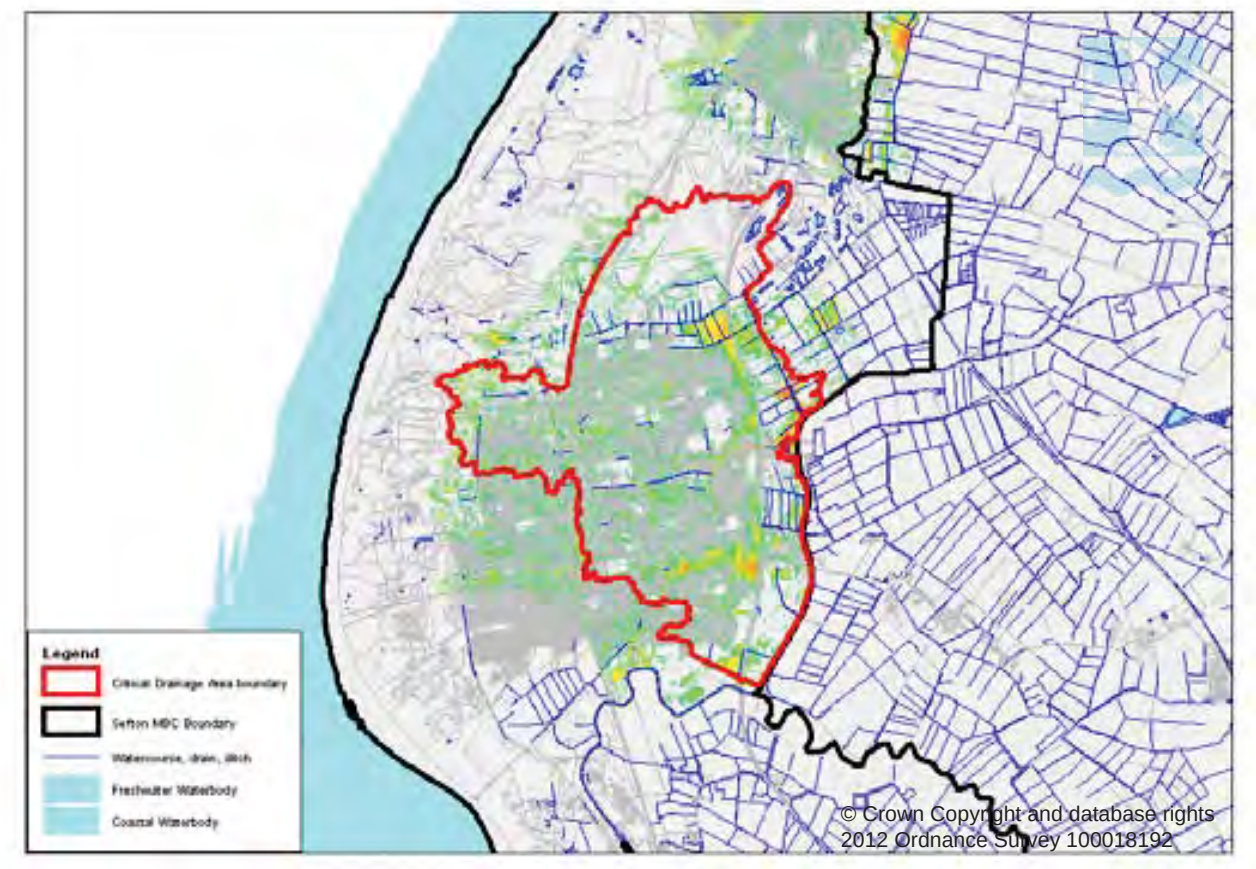


Figure C-23: Critical Drainage Area 17 – Formby: Wham Dyke and Downholland Brook

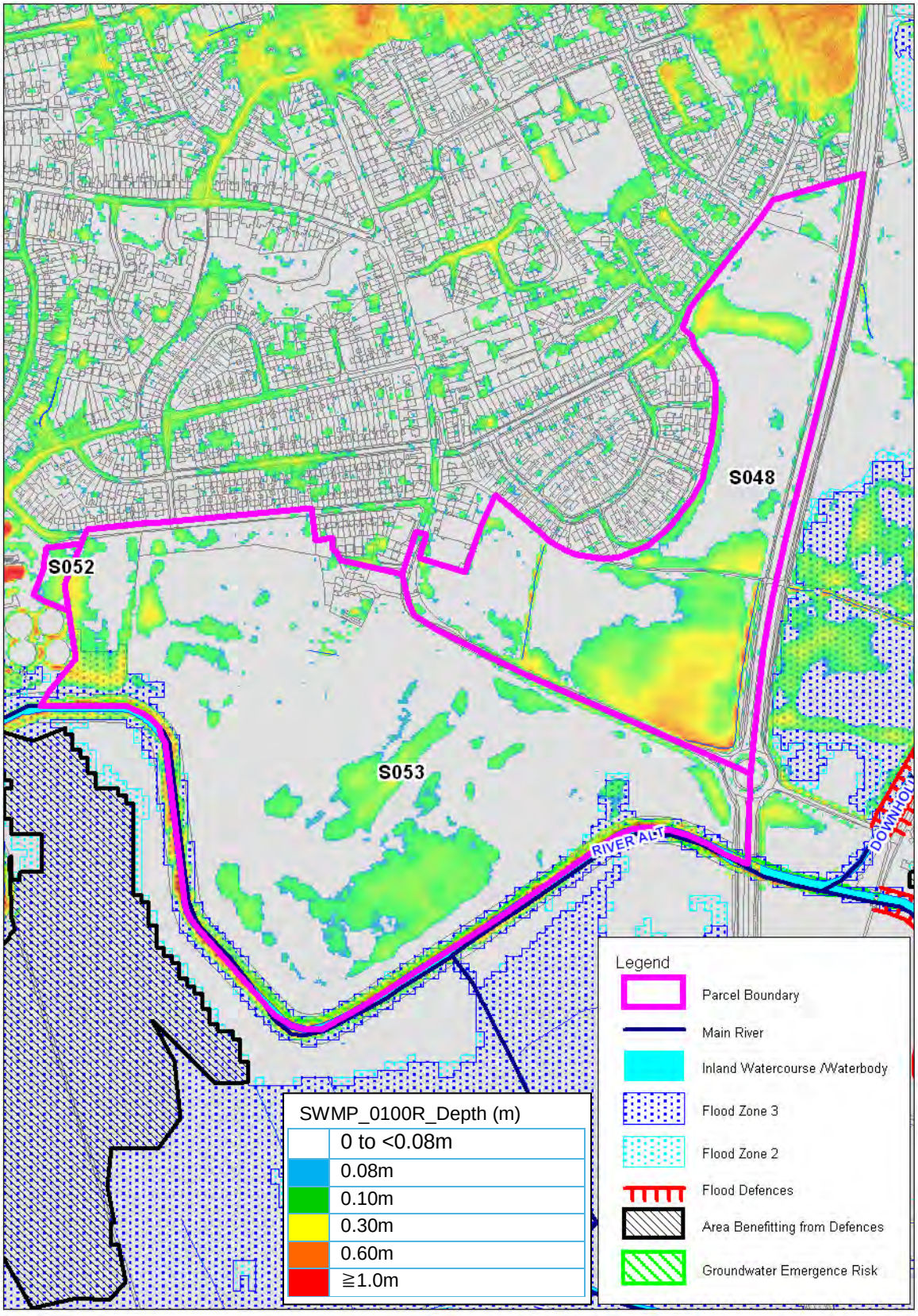


Figure A4 - 7: Parcel S048, S052 and S053

Appendix 8

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	3.429	0.429	40.1	943.6	O K
30 min Summer	3.564	0.564	40.6	1239.8	O K
60 min Summer	3.697	0.697	45.1	1534.0	O K
120 min Summer	3.816	0.816	48.8	1794.3	O K
180 min Summer	3.866	0.866	50.3	1904.8	O K
240 min Summer	3.886	0.886	50.9	1949.8	O K
360 min Summer	3.893	0.893	51.1	1965.0	O K
480 min Summer	3.894	0.894	51.1	1967.3	O K
600 min Summer	3.890	0.890	51.0	1958.0	O K
720 min Summer	3.882	0.882	50.8	1940.0	O K
960 min Summer	3.858	0.858	50.1	1888.0	O K
1440 min Summer	3.799	0.799	48.3	1758.7	O K
2160 min Summer	3.709	0.709	45.5	1560.1	O K
2880 min Summer	3.628	0.628	42.8	1382.4	O K
4320 min Summer	3.492	0.492	40.1	1082.3	O K
5760 min Summer	3.384	0.384	39.9	844.6	O K
7200 min Summer	3.331	0.331	36.7	728.3	O K
8640 min Summer	3.297	0.297	33.3	653.0	O K
10080 min Summer	3.272	0.272	30.3	597.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	115.675	26
30 min Summer	76.715	40
60 min Summer	48.563	68
120 min Summer	29.745	126
180 min Summer	22.042	184
240 min Summer	17.717	240
360 min Summer	12.921	306
480 min Summer	10.335	366
600 min Summer	8.685	432
720 min Summer	7.531	500
960 min Summer	6.008	638
1440 min Summer	4.363	912
2160 min Summer	3.163	1308
2880 min Summer	2.515	1704
4320 min Summer	1.817	2464
5760 min Summer	1.442	3112
7200 min Summer	1.204	3816
8640 min Summer	1.039	4504
10080 min Summer	0.917	5240

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	3.482	0.482	40.1	1059.9	O K
30 min Winter	3.633	0.633	43.0	1392.3	O K
60 min Winter	3.784	0.784	47.9	1724.7	O K
120 min Winter	3.920	0.920	51.8	2023.3	O K
180 min Winter	3.980	0.980	53.5	2154.9	O K
240 min Winter	4.006	1.006	54.2	2213.5	O K
360 min Winter	4.013	1.013	54.4	2229.0	O K
480 min Winter	4.008	1.008	54.3	2216.5	O K
600 min Winter	3.998	0.998	54.0	2196.2	O K
720 min Winter	3.983	0.983	53.6	2163.4	O K
960 min Winter	3.944	0.944	52.5	2076.9	O K
1440 min Winter	3.853	0.853	49.9	1876.1	O K
2160 min Winter	3.720	0.720	45.9	1585.0	O K
2880 min Winter	3.606	0.606	42.1	1332.4	O K
4320 min Winter	3.400	0.400	40.1	880.9	O K
5760 min Winter	3.317	0.317	35.4	697.2	O K
7200 min Winter	3.273	0.273	30.5	601.2	O K
8640 min Winter	3.245	0.245	26.7	538.0	O K
10080 min Winter	3.224	0.224	23.8	492.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	115.675	26
30 min Winter	76.715	40
60 min Winter	48.563	68
120 min Winter	29.745	124
180 min Winter	22.042	180
240 min Winter	17.717	236
360 min Winter	12.921	340
480 min Winter	10.335	386
600 min Winter	8.685	462
720 min Winter	7.531	538
960 min Winter	6.008	690
1440 min Winter	4.363	982
2160 min Winter	3.163	1404
2880 min Winter	2.515	1796
4320 min Winter	1.817	2468
5760 min Winter	1.442	3120
7200 min Winter	1.204	3824
8640 min Winter	1.039	4512
10080 min Winter	0.917	5248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Shortest Storm (mins)	15
Ratio R	0.380	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 4.500

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.500	4-8	1.500	8-12	1.500

Model Details

Storage is Online Cover Level (m) 4.500

Tank or Pond Structure

Invert Level (m) 3.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2200.0	1.400	2200.0	2.800	2200.0	4.200	2200.0
0.200	2200.0	1.600	2200.0	3.000	2200.0	4.400	2200.0
0.400	2200.0	1.800	2200.0	3.200	2200.0	4.600	2200.0
0.600	2200.0	2.000	2200.0	3.400	2200.0	4.800	2200.0
0.800	2200.0	2.200	2200.0	3.600	2200.0	5.000	2200.0
1.000	2200.0	2.400	2200.0	3.800	2200.0		
1.200	2200.0	2.600	2200.0	4.000	2200.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.000 Hydro-Brake® Type Md7 Invert Level (m) 3.000
Design Flow (l/s) 54.0 Diameter (mm) 283

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.4	1.200	59.1	3.000	93.5	7.000	142.8
0.200	20.2	1.400	63.9	3.500	101.0	7.500	147.8
0.300	33.6	1.600	68.3	4.000	108.0	8.000	152.7
0.400	40.1	1.800	72.4	4.500	114.5	8.500	157.4
0.500	38.5	2.000	76.3	5.000	120.7	9.000	161.9
0.600	41.8	2.200	80.1	5.500	126.6	9.500	166.4
0.800	48.3	2.400	83.6	6.000	132.2		
1.000	54.0	2.600	87.0	6.500	137.6		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	12.100	Urban	0.000
SAAR (mm)	800	Region Number	Region 10

Results l/s

QBAR Rural	25.8
QBAR Urban	25.8
Q100 years	53.6
Q1 year	22.4
Q30 years	43.7
Q100 years	53.6

Existing Network Details for 3556-SW NETWORK-07.02.2013.SWS

* - Indicates pipe has been modified outside of System 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	n	HYD SECT	DIA (mm)
1.000	42.000	0.084	500.0	0.143	5.00		0.035	\/	-2
1.001	11.000	0.022	500.0	0.083	0.00		0.035	\/	-2
1.002	16.972	0.034	499.2	0.000	0.00	0.600		o	300
1.003	41.028	0.082	500.3	0.262	0.00		0.035	\/	-2
1.004	14.000	0.028	500.0	0.000	0.00	0.600		o	300
1.005	15.972	0.032	499.1	0.000	0.00		0.035	\/	-2
2.000	95.747	0.191	501.3	0.197	5.00		0.035	\/	-2
2.001	39.253	0.079	496.9	0.060	0.00		0.035	\/	-2
1.006	78.042	0.156	500.3	0.126	0.00		0.035	\/	-2
1.007	63.483	0.127	499.9	0.106	0.00		0.035	\/	-2
1.008	63.517	0.127	500.1	0.086	0.00		0.035	\/	-2
1.009	25.000	0.050	500.0	0.077	0.00		0.035	\/	-2
1.010	24.986	0.050	499.7	0.000	0.00	0.600		o	300
3.000	40.000	0.080	500.0	0.130	5.00		0.035	\/	-1
3.001	7.974	0.016	501.5	0.000	0.00	0.600		o	300
3.002	16.088	0.032	502.8	0.105	0.00		0.035	\/	-1

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
1.000	1	5.100	4.650	-0.550	5.100	4.566	-0.466		3000
1.001	2	5.100	4.566	-0.466	5.100	4.544	-0.444		3000
1.002	3	5.100	4.544	0.256	5.000	4.510	0.190		3000
1.003	4	5.000	4.510	-0.510	5.000	4.428	-0.428		3000
1.004	5	5.000	4.428	0.272	5.000	4.400	0.300		3000
1.005	6	5.000	4.400	-0.400	5.000	4.368	-0.368		3000
2.000	32	5.415	4.650	-0.235	5.172	4.459	-0.287		3000
2.001	33	5.172	4.459	-0.287	5.000	4.380	-0.380		3000
1.006	7	5.000	4.368	-0.368	5.131	4.212	-0.081		3000
1.007	8	5.131	4.212	-0.081	4.700	4.085	-0.385		3000
1.008	9	4.700	4.085	-0.385	4.700	3.958	-0.258		3000
1.009	10	4.700	3.958	-0.258	4.800	3.908	-0.108		3000
1.010	11	4.800	3.908	0.592	4.650	3.858	0.492		3000
3.000	34	4.800	4.400	-0.600	4.855	4.320	-0.465		3000
3.001	35	4.855	4.320	0.235	4.895	4.304	0.291		3000
3.002	36	4.895	4.304	-0.409	4.927	4.272	-0.345		3000

Existing Network Details for 3556-SW NETWORK-07.02.2013.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	n	HYD SECT	DIA (mm)
3.003	7.912	0.016	494.5	0.056	0.00		0.035	\/	-1
3.004	7.000	0.014	500.0	0.000	0.00	0.600		o	300
3.005	32.000	0.064	500.0	0.070	0.00		0.035	\/	-1
3.006	12.996	0.026	499.8	0.000	0.00		0.035	\/	-1
4.000	23.000	0.046	500.0	0.040	5.00		0.035	\/	-2
5.000	46.917	0.094	499.1	0.092	5.00		0.035	\/	-2
5.001	14.083	0.028	499.4	0.000	0.00	0.600		o	300
3.007	21.998	0.044	500.0	0.000	0.00	0.600		o	300
3.008	30.000	0.060	500.0	0.073	0.00		0.035	\/	-1
3.009	7.000	0.014	500.0	0.000	0.00	0.600		o	300
3.010	33.000	0.066	500.0	0.103	0.00		0.035	\/	-1
3.011	10.000	0.020	500.0	0.000	0.00	0.600		o	300
3.012	21.968	0.044	499.3	0.049	0.00		0.035	\/	-2
1.011	8.056	0.016	503.5	0.000	0.00	0.600		o	300
1.012	47.000	0.094	500.0	0.290	0.00		0.035	\/	-2
1.013	15.998	0.032	499.9	0.000	0.00	0.600		o	300

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
3.003	37	4.927	4.272	-0.345	4.942	4.256	-0.314		3000
3.004	38	4.942	4.256	0.386	4.954	4.242	0.412		3000
3.005	39	4.954	4.242	-0.288	4.912	4.178	-0.266		3000
3.006	40	4.912	4.178	-0.266	4.846	4.152	-0.306		3000
4.000	47	4.633	4.200	-0.567	4.846	4.154	-0.308		3000
5.000	48	4.762	4.250	-0.488	4.866	4.156	-0.290		3000
5.001	49	4.866	4.156	0.410	4.846	4.128	0.418		3000
3.007	41	4.846	4.128	0.418	4.854	4.084	0.470		3000
3.008	42	4.854	4.084	-0.230	4.764	4.024	-0.260		3000
3.009	43	4.764	4.024	0.440	4.746	4.010	0.436		3000
3.010	44	4.746	4.010	-0.264	4.583	3.944	-0.361		3000
3.011	45	4.583	3.944	0.339	4.555	3.924	0.331		3000
3.012	46	4.555	3.924	-0.369	4.650	3.880	-0.230		3000
1.011	12	4.650	3.858	0.492	4.650	3.842	0.508		3000
1.012	13	4.650	3.842	-0.192	4.600	3.748	-0.148		3000
1.013	14	4.600	3.748	0.552	4.600	3.716	0.584		3000

Existing Network Details for 3556-SW NETWORK-07.02.2013.SWS

	PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	n	HYD SECT	DIA (mm)
	1.014	28.000	0.056	500.0	0.220	0.00		0.035	\/	-2
	1.015	26.999	0.054	500.0	0.000	0.00	0.600		o	300
	1.016	33.654	0.067	502.3	0.221	0.00		0.035	\/	-2
	1.017	21.655	0.043	503.6	0.066	0.00		0.035	\/	-2
	6.000	19.372	0.073	265.4	0.101	5.00		0.035	\/	-1
	7.000	27.720	0.058	477.9	0.151	5.00		0.035	\/	-1
	7.001	40.199	0.080	502.5	0.105	0.00		0.035	\/	-1
	7.002	12.613	0.030	420.4	0.000	0.00	0.600		o	300
	6.001	42.534	0.085	500.4	0.075	0.00		0.035	\/	-1
	6.002	20.001	0.040	500.0	0.000	0.00	0.600		o	300
	1.018	18.204	0.019	958.1	0.000	0.00		0.035	\/	-2
	8.000	54.445	0.092	591.8	0.064	5.00		0.035	\/	-2
	1.019	8.552	0.017	503.1	0.000	0.00	0.600		o	300
*	1.020	19.931	0.040	498.3	0.073	0.00		0.035	\/	-2

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
	1.014	15	4.600	3.716	-0.116	4.600	3.660	-0.060		3000
	1.015	16	4.600	3.660	0.640	4.600	3.606	0.694		3000
	1.016	17	4.600	3.606	-0.006	4.600	3.539	0.061		3000
	1.017	18	4.600	3.539	0.061	4.500	3.496	0.004		3000
	6.000	50	4.500	3.850	-0.350	4.500	3.777	-0.277		3000
	7.000	53	4.500	3.800	-0.300	4.500	3.742	-0.242		3000
	7.001	54	4.500	3.742	-0.242	4.500	3.662	-0.162		3000
	7.002	55	4.500	3.662	0.538	4.500	3.632	0.568		3000
	6.001	51	4.500	3.632	-0.132	4.500	3.547	-0.047		3000
	6.002	52	4.500	3.547	0.653	4.500	3.507	0.693		3000
	1.018	19	4.500	3.496	0.004	4.500	3.477	0.023		3000
	8.000	56	4.500	3.550	-0.050	4.500	3.458	0.042		3000
	1.019	20	4.500	3.458	0.742	4.500	3.441	0.759		3000
*	1.020	21	4.500	3.441	0.059	4.500	3.401	0.099		3000

Existing Network Details for 3556-SW NETWORK-07.02.2013.SWS

	PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	n	HYD SECT	DIA (mm)
	1.021	16.000	0.032	500.0	0.000	0.00		0.035	\/	-2
	1.022	16.000	0.032	500.0	0.107	0.00		0.035	\/	-2
	9.000	82.196	0.164	501.2	0.440	5.00		0.035	\/	-1
*	9.001	10.841	0.022	492.8	0.000	0.00	0.600		o	300
	1.023	11.524	0.023	501.0	0.000	0.00	0.600		o	450
	10.000	48.000	0.096	500.0	0.190	5.00		0.035	\/	-1
	10.001	19.000	0.038	500.0	0.000	0.00	0.600		o	300
*	1.024	11.477	0.023	499.0	0.000	0.00	0.600		o	450
	1.025	44.000	0.088	500.0	0.132	0.00		0.035	\/	-2
	11.000	92.000	0.184	500.0	0.134	5.00		0.035	\/	-2
	1.026	24.000	0.048	500.0	0.000	0.00	0.600		o	450
	1.027	45.000	0.090	500.0	0.185	0.00		0.035	\/	-4
*	1.028	75.751	0.151	501.7	0.000	0.00	0.600		o	300
*	1.029	70.139	0.141	497.4	0.000	0.00	0.600		o	450

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
	1.021	22	4.500	3.401	0.099	4.500	3.369	0.131		3000
	1.022	23	4.500	3.369	0.131	4.500	3.337	0.163		3000
	9.000	57	4.500	3.600	-0.100	4.500	3.436	0.064		3000
*	9.001	58	4.500	3.436	0.764	4.500	3.414	0.786		3000
	1.023	24	4.500	3.337	0.713	4.500	3.314	0.736		3000
	10.000	59	4.500	3.600	-0.100	4.500	3.504	-0.004		3000
	10.001	60	4.500	3.504	0.696	4.500	3.466	0.734		3000
*	1.024	25	4.500	3.314	0.736	4.500	3.291	0.759		3000
	1.025	26	4.500	3.291	0.209	4.500	3.203	0.297		3000
	11.000	61	4.500	3.500	0.000	4.500	3.316	0.184		3000
	1.026	27	4.500	3.203	0.847	4.500	3.155	0.895		3000
	1.027	28	4.500	3.155	-0.155	4.500	3.065	-0.065		3000
*	1.028	29	4.500	3.065	1.135	4.500	2.914	1.286	Orifice	3000
*	1.029	30	4.500	2.914	1.136	4.400	2.773	1.177		3000

Conduit Sections for 3556-SW NETWORK-07.02.2013.SWS

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m^2)
-1	\/	500	1000	18.0		2.053	3.578
-2	\/	2000	1000	18.0		2.397	5.078
-4	\/	7000	1500			2.199	4.525

Simulation Criteria for 3556-SW NETWORK-07.02.2013.SWS

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * $10m^3$/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	720
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	6

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	360
Ratio R	0.400		

Online Controls for 3556-SW NETWORK-07.02.2013.SWS

Orifice Manhole: 29, DS/PN: 1.028, Volume (m^3): 200.2

Diameter (m) 0.300 Discharge Coefficient 0.600 Invert Level (m) 3.065

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	2	0%					
1.001	30 Winter	2	0%					
1.002	30 Winter	2	0%	100/15 Summer				
1.003	30 Winter	2	0%					
1.004	30 Winter	2	0%	30/15 Summer				
1.005	30 Winter	2	0%					
2.000	15 Winter	2	0%					
2.001	15 Winter	2	0%					
1.006	15 Winter	2	0%					
1.007	30 Winter	2	0%					
1.008	60 Winter	2	0%					
1.009	60 Winter	2	0%					
1.010	60 Winter	2	0%	2/30 Summer				
3.000	15 Winter	2	0%					
3.001	15 Winter	2	0%	100/15 Summer				
3.002	15 Winter	2	0%					
3.003	15 Winter	2	0%					
3.004	15 Winter	2	0%	100/15 Summer				
3.005	30 Winter	2	0%					
3.006	30 Winter	2	0%					
4.000	30 Winter	2	0%					
5.000	30 Winter	2	0%					
5.001	30 Winter	2	0%	100/15 Winter				
3.007	30 Winter	2	0%	100/15 Summer				
3.008	60 Winter	2	0%					
3.009	60 Winter	2	0%	30/30 Winter				
3.010	60 Winter	2	0%					
3.011	60 Winter	2	0%	5/60 Winter				
3.012	60 Winter	2	0%					
1.011	60 Winter	2	0%	2/15 Winter				
1.012	120 Winter	2	0%					
1.013	120 Winter	2	0%	2/15 Winter				
1.014	1440 Winter	2	0%					
1.015	1440 Winter	2	0%	2/30 Summer				
1.016	1440 Winter	2	0%					
1.017	1440 Winter	2	0%					
6.000	1440 Winter	2	0%					

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
7.000	1440 Winter	2	0%					
7.001	1440 Winter	2	0%					
7.002	1440 Winter	2	0%	2/240 Winter				
6.001	1440 Winter	2	0%					
6.002	1440 Winter	2	0%	2/60 Winter				
1.018	1440 Winter	2	0%					
8.000	1440 Winter	2	0%					
1.019	1440 Winter	2	0%	2/30 Summer				
1.020	1440 Winter	2	0%					
1.021	1440 Winter	2	0%					
1.022	1440 Winter	2	0%					
9.000	1440 Winter	2	0%					
9.001	1440 Winter	2	0%	2/60 Summer				
1.023	1440 Winter	2	0%	2/60 Summer				
10.000	1440 Winter	2	0%					
10.001	1440 Winter	2	0%	2/60 Summer				
1.024	1440 Winter	2	0%	2/60 Summer				
1.025	1440 Winter	2	0%	100/360 Winter				
11.000	1440 Winter	2	0%					
1.026	1440 Winter	2	0%	2/30 Summer				
1.027	1440 Winter	2	0%					
1.028	1440 Winter	2	0%	2/15 Summer				
1.029	1440 Winter	2	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	4.728	-0.922	0.000	0.01	0.0	23.3	OK
1.001	2	4.709	-0.857	0.000	0.01	0.0	19.1	OK
1.002	3	4.708	-0.136	0.000	0.51	0.0	17.7	OK
1.003	4	4.667	-0.843	0.000	0.01	0.0	44.5	OK
1.004	5	4.661	-0.067	0.000	0.96	0.0	30.4	OK
1.005	6	4.498	-0.902	0.000	0.01	0.0	30.6	OK
2.000	32	4.712	-0.938	0.000	0.01	0.0	35.2	OK
2.001	33	4.545	-0.914	0.000	0.01	0.0	35.2	OK
1.006	7	4.483	-0.885	0.000	0.02	0.0	65.6	OK
1.007	8	4.335	-0.877	0.000	0.02	0.0	66.9	OK
1.008	9	4.253	-0.832	0.000	0.01	0.0	55.1	OK
1.009	10	4.241	-0.717	0.000	0.01	0.0	41.7	OK
1.010	11	4.240	0.032	0.000	0.91	0.0	40.2	SURCHARGED
3.000	34	4.523	-0.877	0.000	0.01	0.0	21.0	FLOOD RISK
3.001	35	4.478	-0.142	0.000	0.41	0.0	14.8	OK
3.002	36	4.465	-0.839	0.000	0.01	0.0	25.8	OK
3.003	37	4.455	-0.817	0.000	0.01	0.0	29.8	OK
3.004	38	4.450	-0.106	0.000	0.74	0.0	29.4	OK
3.005	39	4.388	-0.854	0.000	0.01	0.0	34.4	OK
3.006	40	4.334	-0.844	0.000	0.02	0.0	32.3	OK

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.000	47	4.320	-0.880	0.000	0.00	0.0	3.7	OK
5.000	48	4.321	-0.929	0.000	0.00	0.0	11.9	OK
5.001	49	4.320	-0.136	0.000	0.19	0.0	6.1	OK
3.007	41	4.320	-0.108	0.000	0.74	0.0	29.9	OK
3.008	42	4.257	-0.827	0.000	0.01	0.0	30.8	OK
3.009	43	4.239	-0.085	0.000	0.74	0.0	29.2	OK
3.010	44	4.226	-0.784	0.000	0.01	0.0	33.8	OK
3.011	45	4.219	-0.025	0.000	1.00	0.0	29.8	OK
3.012	46	4.195	-0.729	0.000	0.01	0.0	31.5	OK
1.011	12	4.195	0.037	0.000	1.84	0.0	65.1	SURCHARGED
1.012	13	4.102	-0.740	0.000	0.02	0.0	69.1	OK
1.013	14	4.095	0.047	0.000	1.94	0.0	64.7	SURCHARGED
1.014	15	4.073	-0.643	0.000	0.01	0.0	19.7	OK
1.015	16	4.074	0.114	0.000	0.41	0.0	18.2	SURCHARGED
1.016	17	4.065	-0.541	0.000	0.00	0.0	20.0	OK
1.017	18	4.065	-0.474	0.000	0.01	0.0	18.5	OK
6.000	50	4.066	-0.784	0.000	0.00	0.0	0.9	OK
7.000	53	4.066	-0.734	0.000	0.00	0.0	1.2	OK
7.001	54	4.066	-0.676	0.000	0.00	0.0	1.7	OK
7.002	55	4.067	0.105	0.000	0.04	0.0	1.4	SURCHARGED
6.001	51	4.066	-0.566	0.000	0.00	0.0	2.4	OK
6.002	52	4.066	0.219	0.000	0.04	0.0	1.6	SURCHARGED
1.018	19	4.065	-0.431	0.000	0.01	0.0	17.1	OK
8.000	56	4.065	-0.485	0.000	0.00	0.0	0.4	OK
1.019	20	4.065	0.307	0.000	0.38	0.0	12.8	SURCHARGED
1.020	21	4.060	-0.381	0.000	0.00	0.0	13.3	OK
1.021	22	4.060	-0.341	0.000	0.00	0.0	11.9	OK
1.022	23	4.060	-0.309	0.000	0.00	0.0	11.6	OK
9.000	57	4.060	-0.540	0.000	0.00	0.0	3.7	OK
9.001	58	4.060	0.324	0.000	0.04	0.0	1.1	SURCHARGED
1.023	24	4.060	0.273	0.000	0.14	0.0	11.0	SURCHARGED
10.000	59	4.057	-0.543	0.000	0.00	0.0	1.5	OK
10.001	60	4.057	0.253	0.000	0.01	0.0	0.5	SURCHARGED
1.024	25	4.057	0.293	0.000	0.14	0.0	11.3	SURCHARGED
1.025	26	4.054	-0.237	0.000	0.00	0.0	11.8	OK
11.000	61	4.053	-0.447	0.000	0.00	0.0	1.1	OK
1.026	27	4.053	0.400	0.000	0.10	0.0	11.5	SURCHARGED
1.027	28	4.048	-0.607	0.000	0.00	0.0	12.0	OK
1.028	29	4.048	0.683	0.000	0.25	0.0	11.9	SURCHARGED
1.029	30	4.007	0.643	0.000	0.09	0.0	11.9	SURCHARGED

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	5	0%					
1.001	30 Winter	5	0%					
1.002	30 Winter	5	0%	100/15 Summer				
1.003	30 Winter	5	0%					
1.004	30 Winter	5	0%	30/15 Summer				
1.005	15 Winter	5	0%					
2.000	15 Winter	5	0%					
2.001	15 Winter	5	0%					
1.006	15 Winter	5	0%					
1.007	30 Winter	5	0%					
1.008	60 Winter	5	0%					
1.009	60 Winter	5	0%					
1.010	60 Winter	5	0%	2/30 Summer				
3.000	15 Winter	5	0%					
3.001	15 Winter	5	0%	100/15 Summer				
3.002	15 Winter	5	0%					
3.003	15 Winter	5	0%					
3.004	15 Winter	5	0%	100/15 Summer				
3.005	30 Winter	5	0%					
3.006	30 Winter	5	0%					
4.000	30 Winter	5	0%					
5.000	30 Winter	5	0%					
5.001	30 Winter	5	0%	100/15 Winter				
3.007	30 Winter	5	0%	100/15 Summer				
3.008	30 Winter	5	0%					
3.009	30 Winter	5	0%	30/30 Winter				
3.010	60 Winter	5	0%					
3.011	60 Winter	5	0%	5/60 Winter				
3.012	60 Winter	5	0%					
1.011	60 Winter	5	0%	2/15 Winter				
1.012	120 Winter	5	0%					
1.013	120 Winter	5	0%	2/15 Winter				
1.014	1440 Winter	5	0%					
1.015	1440 Winter	5	0%	2/30 Summer				
1.016	1440 Winter	5	0%					
1.017	1440 Winter	5	0%					
6.000	1440 Winter	5	0%					

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
7.000	1440 Winter	5	0%					
7.001	1440 Winter	5	0%					
7.002	1440 Winter	5	0%	2/240 Winter				
6.001	1440 Winter	5	0%					
6.002	1440 Winter	5	0%	2/60 Winter				
1.018	1440 Winter	5	0%					
8.000	1440 Winter	5	0%					
1.019	1440 Winter	5	0%	2/30 Summer				
1.020	1440 Winter	5	0%					
1.021	1440 Winter	5	0%					
1.022	1440 Winter	5	0%					
9.000	1440 Winter	5	0%					
9.001	1440 Winter	5	0%	2/60 Summer				
1.023	1440 Winter	5	0%	2/60 Summer				
10.000	1440 Winter	5	0%					
10.001	1440 Winter	5	0%	2/60 Summer				
1.024	1440 Winter	5	0%	2/60 Summer				
1.025	1440 Winter	5	0%	100/360 Winter				
11.000	1440 Winter	5	0%					
1.026	1440 Winter	5	0%	2/30 Summer				
1.027	1440 Winter	5	0%					
1.028	1440 Winter	5	0%	2/15 Summer				
1.029	1440 Winter	5	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	4.748	-0.902	0.000	0.01	0.0	29.9	OK
1.001	2	4.736	-0.830	0.000	0.01	0.0	23.6	OK
1.002	3	4.735	-0.109	0.000	0.62	0.0	21.4	OK
1.003	4	4.707	-0.803	0.000	0.01	0.0	56.0	FLOOD RISK
1.004	5	4.704	-0.024	0.000	1.00	0.0	31.7	FLOOD RISK
1.005	6	4.508	-0.892	0.000	0.01	0.0	32.2	OK
2.000	32	4.730	-0.920	0.000	0.01	0.0	44.4	OK
2.001	33	4.562	-0.897	0.000	0.01	0.0	44.0	OK
1.006	7	4.496	-0.872	0.000	0.02	0.0	80.8	OK
1.007	8	4.351	-0.861	0.000	0.02	0.0	82.1	OK
1.008	9	4.293	-0.792	0.000	0.02	0.0	67.7	OK
1.009	10	4.286	-0.672	0.000	0.01	0.0	46.5	OK
1.010	11	4.285	0.077	0.000	1.04	0.0	45.8	SURCHARGED
3.000	34	4.541	-0.859	0.000	0.01	0.0	27.2	FLOOD RISK
3.001	35	4.509	-0.111	0.000	0.52	0.0	18.7	OK
3.002	36	4.497	-0.807	0.000	0.02	0.0	33.1	OK
3.003	37	4.489	-0.783	0.000	0.02	0.0	37.6	OK
3.004	38	4.485	-0.071	0.000	0.94	0.0	37.0	OK
3.005	39	4.408	-0.834	0.000	0.02	0.0	43.3	OK
3.006	40	4.361	-0.817	0.000	0.02	0.0	40.8	OK

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.000	47	4.350	-0.850	0.000	0.00	0.0	5.0	FLOOD RISK
5.000	48	4.351	-0.899	0.000	0.00	0.0	15.1	OK
5.001	49	4.351	-0.105	0.000	0.25	0.0	7.9	OK
3.007	41	4.350	-0.078	0.000	0.89	0.0	36.3	OK
3.008	42	4.293	-0.791	0.000	0.02	0.0	39.4	OK
3.009	43	4.277	-0.047	0.000	0.95	0.0	37.5	OK
3.010	44	4.259	-0.751	0.000	0.02	0.0	40.7	OK
3.011	45	4.253	0.009	0.000	1.36	0.0	40.7	SURCHARGED
3.012	46	4.234	-0.690	0.000	0.01	0.0	41.7	OK
1.011	12	4.234	0.076	0.000	2.12	0.0	75.0	SURCHARGED
1.012	13	4.155	-0.687	0.000	0.02	0.0	78.1	OK
1.013	14	4.151	0.103	0.000	2.15	0.0	71.8	SURCHARGED
1.014	15	4.118	-0.598	0.000	0.01	0.0	22.4	OK
1.015	16	4.118	0.158	0.000	0.46	0.0	20.6	SURCHARGED
1.016	17	4.105	-0.501	0.000	0.01	0.0	22.8	OK
1.017	18	4.104	-0.435	0.000	0.01	0.0	21.1	OK
6.000	50	4.106	-0.744	0.000	0.00	0.0	0.9	OK
7.000	53	4.107	-0.693	0.000	0.00	0.0	1.5	OK
7.001	54	4.107	-0.635	0.000	0.00	0.0	1.9	OK
7.002	55	4.107	0.145	0.000	0.04	0.0	1.5	SURCHARGED
6.001	51	4.106	-0.526	0.000	0.00	0.0	2.5	OK
6.002	52	4.106	0.259	0.000	0.05	0.0	1.8	SURCHARGED
1.018	19	4.104	-0.392	0.000	0.01	0.0	19.6	OK
8.000	56	4.104	-0.446	0.000	0.00	0.0	0.6	OK
1.019	20	4.104	0.346	0.000	0.45	0.0	15.3	SURCHARGED
1.020	21	4.096	-0.345	0.000	0.00	0.0	15.7	OK
1.021	22	4.096	-0.305	0.000	0.01	0.0	15.3	OK
1.022	23	4.095	-0.274	0.000	0.01	0.0	15.6	OK
9.000	57	4.096	-0.504	0.000	0.00	0.0	4.6	OK
9.001	58	4.096	0.360	0.000	0.05	0.0	1.7	SURCHARGED
1.023	24	4.095	0.308	0.000	0.21	0.0	17.0	SURCHARGED
10.000	59	4.091	-0.509	0.000	0.00	0.0	1.9	OK
10.001	60	4.091	0.287	0.000	0.02	0.0	0.7	SURCHARGED
1.024	25	4.090	0.326	0.000	0.22	0.0	17.6	SURCHARGED
1.025	26	4.086	-0.205	0.000	0.00	0.0	18.3	OK
11.000	61	4.084	-0.416	0.000	0.00	0.0	1.3	OK
1.026	27	4.084	0.431	0.000	0.15	0.0	18.1	SURCHARGED
1.027	28	4.076	-0.579	0.000	0.01	0.0	18.8	OK
1.028	29	4.075	0.710	0.000	0.40	0.0	18.7	SURCHARGED
1.029	30	4.012	0.648	0.000	0.14	0.0	18.7	SURCHARGED

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	10	0%					
1.001	30 Winter	10	0%					
1.002	30 Winter	10	0%	100/15 Summer				
1.003	30 Winter	10	0%					
1.004	30 Winter	10	0%	30/15 Summer				
1.005	30 Winter	10	0%					
2.000	15 Winter	10	0%					
2.001	15 Winter	10	0%					
1.006	30 Winter	10	0%					
1.007	30 Winter	10	0%					
1.008	60 Winter	10	0%					
1.009	60 Winter	10	0%					
1.010	60 Winter	10	0%	2/30 Summer				
3.000	15 Winter	10	0%					
3.001	15 Winter	10	0%	100/15 Summer				
3.002	15 Winter	10	0%					
3.003	15 Winter	10	0%					
3.004	15 Winter	10	0%	100/15 Summer				
3.005	30 Winter	10	0%					
3.006	30 Winter	10	0%					
4.000	30 Winter	10	0%					
5.000	30 Winter	10	0%					
5.001	30 Winter	10	0%	100/15 Winter				
3.007	30 Winter	10	0%	100/15 Summer				
3.008	30 Winter	10	0%					
3.009	60 Winter	10	0%	30/30 Winter				
3.010	60 Winter	10	0%					
3.011	60 Winter	10	0%	5/60 Winter				
3.012	60 Winter	10	0%					
1.011	60 Winter	10	0%	2/15 Winter				
1.012	120 Winter	10	0%					
1.013	120 Winter	10	0%	2/15 Winter				
1.014	960 Winter	10	0%					
1.015	960 Winter	10	0%	2/30 Summer				
1.016	1440 Winter	10	0%					
1.017	1440 Winter	10	0%					
6.000	1440 Winter	10	0%					

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
7.000	1440 Winter	10	0%					
7.001	1440 Winter	10	0%					
7.002	1440 Winter	10	0%	2/240 Winter				
6.001	1440 Winter	10	0%					
6.002	1440 Winter	10	0%	2/60 Winter				
1.018	1440 Winter	10	0%					
8.000	1440 Winter	10	0%					
1.019	1440 Winter	10	0%	2/30 Summer				
1.020	1440 Winter	10	0%					
1.021	1440 Winter	10	0%					
1.022	1440 Winter	10	0%					
9.000	1440 Winter	10	0%					
9.001	1440 Winter	10	0%	2/60 Summer				
1.023	1440 Winter	10	0%	2/60 Summer				
10.000	1440 Winter	10	0%					
10.001	1440 Winter	10	0%	2/60 Summer				
1.024	1440 Winter	10	0%	2/60 Summer				
1.025	1440 Winter	10	0%	100/360 Winter				
11.000	1440 Winter	10	0%					
1.026	1440 Winter	10	0%	2/30 Summer				
1.027	1440 Winter	10	0%					
1.028	1440 Winter	10	0%	2/15 Summer				
1.029	1440 Winter	10	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	4.768	-0.882	0.000	0.01	0.0	34.9	OK
1.001	2	4.762	-0.804	0.000	0.01	0.0	27.0	OK
1.002	3	4.762	-0.082	0.000	0.67	0.0	23.3	OK
1.003	4	4.732	-0.778	0.000	0.02	0.0	66.9	FLOOD RISK
1.004	5	4.728	0.000	0.000	1.41	0.0	44.7	FLOOD RISK
1.005	6	4.520	-0.880	0.000	0.02	0.0	44.5	OK
2.000	32	4.744	-0.906	0.000	0.01	0.0	49.8	OK
2.001	33	4.570	-0.889	0.000	0.01	0.0	51.0	OK
1.006	7	4.504	-0.864	0.000	0.02	0.0	89.9	OK
1.007	8	4.362	-0.850	0.000	0.02	0.0	91.4	OK
1.008	9	4.323	-0.762	0.000	0.02	0.0	74.0	OK
1.009	10	4.319	-0.639	0.000	0.01	0.0	48.5	OK
1.010	11	4.318	0.110	0.000	1.06	0.0	46.8	SURCHARGED
3.000	34	4.561	-0.839	0.000	0.01	0.0	31.0	FLOOD RISK
3.001	35	4.536	-0.084	0.000	0.65	0.0	23.1	OK
3.002	36	4.522	-0.782	0.000	0.02	0.0	38.2	OK
3.003	37	4.515	-0.757	0.000	0.02	0.0	42.5	OK
3.004	38	4.511	-0.045	0.000	1.00	0.0	39.5	OK
3.005	39	4.421	-0.821	0.000	0.02	0.0	49.4	OK
3.006	40	4.380	-0.798	0.000	0.03	0.0	45.8	OK

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.000	47	4.371	-0.829	0.000	0.00	0.0	5.7	FLOOD RISK
5.000	48	4.373	-0.877	0.000	0.00	0.0	17.4	OK
5.001	49	4.372	-0.084	0.000	0.30	0.0	9.5	OK
3.007	41	4.371	-0.057	0.000	0.99	0.0	40.4	OK
3.008	42	4.317	-0.767	0.000	0.02	0.0	43.6	OK
3.009	43	4.306	-0.018	0.000	1.00	0.0	39.5	OK
3.010	44	4.291	-0.719	0.000	0.02	0.0	46.9	OK
3.011	45	4.287	0.043	0.000	1.56	0.0	46.4	FLOOD RISK
3.012	46	4.268	-0.656	0.000	0.01	0.0	47.8	FLOOD RISK
1.011	12	4.267	0.109	0.000	2.13	0.0	75.6	SURCHARGED
1.012	13	4.195	-0.647	0.000	0.02	0.0	84.9	OK
1.013	14	4.193	0.145	0.000	2.19	0.0	73.2	SURCHARGED
1.014	15	4.156	-0.560	0.000	0.01	0.0	35.1	OK
1.015	16	4.156	0.196	0.000	0.72	0.0	32.1	SURCHARGED
1.016	17	4.138	-0.468	0.000	0.01	0.0	24.4	OK
1.017	18	4.137	-0.402	0.000	0.01	0.0	22.6	OK
6.000	50	4.139	-0.711	0.000	0.00	0.0	1.1	OK
7.000	53	4.140	-0.660	0.000	0.00	0.0	1.7	OK
7.001	54	4.140	-0.602	0.000	0.00	0.0	2.1	OK
7.002	55	4.140	0.178	0.000	0.04	0.0	1.5	SURCHARGED
6.001	51	4.139	-0.493	0.000	0.00	0.0	2.5	OK
6.002	52	4.139	0.292	0.000	0.07	0.0	2.7	SURCHARGED
1.018	19	4.137	-0.359	0.000	0.01	0.0	21.0	OK
8.000	56	4.137	-0.413	0.000	0.00	0.0	0.7	OK
1.019	20	4.137	0.379	0.000	0.58	0.0	19.7	SURCHARGED
1.020	21	4.126	-0.315	0.000	0.01	0.0	20.2	OK
1.021	22	4.125	-0.276	0.000	0.01	0.0	19.8	OK
1.022	23	4.125	-0.244	0.000	0.01	0.0	20.3	OK
9.000	57	4.126	-0.474	0.000	0.00	0.0	5.3	OK
9.001	58	4.126	0.390	0.000	0.08	0.0	2.4	SURCHARGED
1.023	24	4.125	0.338	0.000	0.28	0.0	22.1	SURCHARGED
10.000	59	4.119	-0.481	0.000	0.00	0.0	2.2	OK
10.001	60	4.119	0.315	0.000	0.03	0.0	1.1	SURCHARGED
1.024	25	4.118	0.354	0.000	0.28	0.0	22.9	SURCHARGED
1.025	26	4.112	-0.179	0.000	0.01	0.0	23.7	OK
11.000	61	4.109	-0.391	0.000	0.00	0.0	1.5	OK
1.026	27	4.109	0.456	0.000	0.20	0.0	23.5	SURCHARGED
1.027	28	4.099	-0.556	0.000	0.01	0.0	24.4	OK
1.028	29	4.098	0.733	0.000	0.52	0.0	24.4	SURCHARGED
1.029	30	4.015	0.651	0.000	0.18	0.0	24.4	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	30 Winter	30	0%					
1.001	30 Winter	30	0%					
1.002	30 Winter	30	0%	100/15 Summer				
1.003	30 Winter	30	0%					
1.004	30 Winter	30	0%	30/15 Summer				
1.005	30 Winter	30	0%					
2.000	15 Winter	30	0%					
2.001	15 Winter	30	0%					
1.006	30 Winter	30	0%					
1.007	60 Winter	30	0%					
1.008	60 Winter	30	0%					
1.009	60 Winter	30	0%					
1.010	60 Winter	30	0%	2/30 Summer				
3.000	15 Winter	30	0%					
3.001	15 Winter	30	0%	100/15 Summer				
3.002	15 Winter	30	0%					
3.003	15 Winter	30	0%					
3.004	30 Winter	30	0%	100/15 Summer				
3.005	60 Winter	30	0%					
3.006	60 Winter	30	0%					
4.000	60 Winter	30	0%					
5.000	60 Winter	30	0%					
5.001	60 Winter	30	0%	100/15 Winter				
3.007	60 Winter	30	0%	100/15 Summer				
3.008	60 Winter	30	0%					
3.009	60 Winter	30	0%	30/30 Winter				
3.010	60 Winter	30	0%					
3.011	60 Winter	30	0%	5/60 Winter				
3.012	120 Winter	30	0%					
1.011	120 Winter	30	0%	2/15 Winter				
1.012	240 Winter	30	0%					
1.013	240 Winter	30	0%	2/15 Winter				
1.014	960 Winter	30	0%					
1.015	960 Winter	30	0%	2/30 Summer				
1.016	960 Winter	30	0%					
1.017	960 Winter	30	0%					
6.000	960 Winter	30	0%					

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
7.000	960 Winter	30	0%					
7.001	960 Winter	30	0%					
7.002	960 Winter	30	0%	2/240 Winter				
6.001	960 Winter	30	0%					
6.002	960 Winter	30	0%	2/60 Winter				
1.018	960 Winter	30	0%					
8.000	960 Winter	30	0%					
1.019	960 Winter	30	0%	2/30 Summer				
1.020	960 Winter	30	0%					
1.021	960 Winter	30	0%					
1.022	960 Winter	30	0%					
9.000	960 Winter	30	0%					
9.001	960 Winter	30	0%	2/60 Summer				
1.023	960 Winter	30	0%	2/60 Summer				
10.000	960 Winter	30	0%					
10.001	960 Winter	30	0%	2/60 Summer				
1.024	960 Winter	30	0%	2/60 Summer				
1.025	960 Winter	30	0%	100/360 Winter				
11.000	960 Winter	30	0%					
1.026	960 Winter	30	0%	2/30 Summer				
1.027	960 Winter	30	0%					
1.028	960 Winter	30	0%	2/15 Summer				
1.029	960 Winter	30	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	4.800	-0.850	0.000	0.01	0.0	34.8	FLOOD RISK
1.001	2	4.797	-0.769	0.000	0.01	0.0	31.9	OK
1.002	3	4.796	-0.048	0.000	0.86	0.0	29.7	OK
1.003	4	4.758	-0.752	0.000	0.02	0.0	83.4	FLOOD RISK
1.004	5	4.752	0.024	0.000	1.99	0.0	63.1	FLOOD RISK
1.005	6	4.545	-0.855	0.000	0.02	0.0	63.0	OK
2.000	32	4.759	-0.891	0.000	0.01	0.0	62.6	OK
2.001	33	4.583	-0.876	0.000	0.01	0.0	61.4	OK
1.006	7	4.530	-0.838	0.000	0.03	0.0	123.7	OK
1.007	8	4.406	-0.806	0.000	0.03	0.0	106.9	OK
1.008	9	4.396	-0.689	0.000	0.02	0.0	86.2	OK
1.009	10	4.394	-0.564	0.000	0.01	0.0	56.6	OK
1.010	11	4.393	0.185	0.000	1.10	0.0	48.2	SURCHARGED
3.000	34	4.596	-0.804	0.000	0.01	0.0	39.3	FLOOD RISK
3.001	35	4.581	-0.039	0.000	0.79	0.0	28.3	FLOOD RISK
3.002	36	4.565	-0.739	0.000	0.02	0.0	43.1	OK
3.003	37	4.559	-0.713	0.000	0.02	0.0	47.7	OK
3.004	38	4.556	0.000	0.000	1.18	0.0	46.7	OK
3.005	39	4.443	-0.799	0.000	0.02	0.0	49.9	OK
3.006	40	4.419	-0.759	0.000	0.03	0.0	45.5	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.000	47	4.415	-0.785	0.000	0.00	0.0	5.5	FLOOD RISK
5.000	48	4.418	-0.832	0.000	0.00	0.0	14.4	OK
5.001	49	4.418	-0.039	0.000	0.21	0.0	6.7	OK
3.007	41	4.415	-0.013	0.000	1.00	0.0	40.7	OK
3.008	42	4.375	-0.709	0.000	0.02	0.0	46.9	OK
3.009	43	4.372	0.048	0.000	1.17	0.0	46.3	SURCHARGED
3.010	44	4.358	-0.652	0.000	0.02	0.0	54.8	OK
3.011	45	4.357	0.113	0.000	1.72	0.0	51.2	FLOOD RISK
3.012	46	4.338	-0.586	0.000	0.01	0.0	42.8	FLOOD RISK
1.011	12	4.338	0.180	0.000	1.96	0.0	69.6	SURCHARGED
1.012	13	4.273	-0.569	0.000	0.02	0.0	81.0	OK
1.013	14	4.271	0.223	0.000	2.03	0.0	67.7	SURCHARGED
1.014	15	4.224	-0.492	0.000	0.01	0.0	38.5	OK
1.015	16	4.223	0.263	0.000	0.80	0.0	35.6	SURCHARGED
1.016	17	4.197	-0.409	0.000	0.01	0.0	40.0	OK
1.017	18	4.196	-0.343	0.000	0.01	0.0	36.8	OK
6.000	50	4.199	-0.651	0.000	0.00	0.0	1.9	OK
7.000	53	4.200	-0.600	0.000	0.00	0.0	3.0	OK
7.001	54	4.200	-0.542	0.000	0.00	0.0	3.6	OK
7.002	55	4.200	0.238	0.000	0.06	0.0	2.2	SURCHARGED
6.001	51	4.199	-0.433	0.000	0.00	0.0	3.9	OK
6.002	52	4.199	0.352	0.000	0.09	0.0	3.4	SURCHARGED
1.018	19	4.196	-0.300	0.000	0.02	0.0	33.5	OK
8.000	56	4.195	-0.355	0.000	0.00	0.0	1.1	OK
1.019	20	4.196	0.438	0.000	0.84	0.0	28.5	SURCHARGED
1.020	21	4.180	-0.261	0.000	0.01	0.0	29.4	OK
1.021	22	4.180	-0.221	0.000	0.01	0.0	28.5	OK
1.022	23	4.179	-0.190	0.000	0.01	0.0	29.2	OK
9.000	57	4.180	-0.420	0.000	0.00	0.0	9.1	OK
9.001	58	4.180	0.444	0.000	0.09	0.0	2.9	SURCHARGED
1.023	24	4.178	0.391	0.000	0.39	0.0	31.3	SURCHARGED
10.000	59	4.171	-0.429	0.000	0.00	0.0	3.8	OK
10.001	60	4.171	0.367	0.000	0.04	0.0	1.3	SURCHARGED
1.024	25	4.170	0.406	0.000	0.40	0.0	32.2	SURCHARGED
1.025	26	4.161	-0.130	0.000	0.01	0.0	33.8	OK
11.000	61	4.156	-0.344	0.000	0.00	0.0	2.7	OK
1.026	27	4.156	0.503	0.000	0.27	0.0	31.7	SURCHARGED
1.027	28	4.143	-0.512	0.000	0.01	0.0	32.8	OK
1.028	29	4.142	0.777	0.000	0.69	0.0	32.8	SURCHARGED
1.029	30	4.021	0.657	0.000	0.24	0.0	32.8	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	30 Winter	100	+30%					
1.001	30 Winter	100	+30%					
1.002	30 Winter	100	+30%	100/15 Summer				
1.003	30 Winter	100	+30%					
1.004	30 Winter	100	+30%	30/15 Summer				
1.005	120 Winter	100	+30%					
2.000	15 Winter	100	+30%					
2.001	15 Winter	100	+30%					
1.006	120 Winter	100	+30%					
1.007	120 Winter	100	+30%					
1.008	120 Winter	100	+30%					
1.009	120 Winter	100	+30%					
1.010	120 Winter	100	+30%	2/30 Summer				
3.000	15 Winter	100	+30%					
3.001	15 Winter	100	+30%	100/15 Summer				
3.002	15 Winter	100	+30%					
3.003	30 Winter	100	+30%					
3.004	30 Winter	100	+30%	100/15 Summer				
3.005	120 Winter	100	+30%					
3.006	120 Winter	100	+30%					
4.000	120 Winter	100	+30%					
5.000	120 Winter	100	+30%					
5.001	120 Winter	100	+30%	100/15 Winter				
3.007	120 Winter	100	+30%	100/15 Summer				
3.008	120 Winter	100	+30%					
3.009	120 Winter	100	+30%	30/30 Winter				
3.010	120 Winter	100	+30%					
3.011	120 Winter	100	+30%	5/60 Winter				
3.012	120 Winter	100	+30%					
1.011	120 Winter	100	+30%	2/15 Winter				
1.012	240 Winter	100	+30%					
1.013	240 Winter	100	+30%	2/15 Winter				
1.014	360 Winter	100	+30%					
1.015	360 Winter	100	+30%	2/30 Summer				
1.016	480 Winter	100	+30%					
1.017	480 Winter	100	+30%					
6.000	480 Winter	100	+30%					

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
7.000	480 Winter	100	+30%					
7.001	480 Winter	100	+30%					
7.002	480 Winter	100	+30%	2/240 Winter				
6.001	480 Winter	100	+30%					
6.002	480 Winter	100	+30%	2/60 Winter				
1.018	480 Winter	100	+30%					
8.000	480 Winter	100	+30%					
1.019	480 Winter	100	+30%	2/30 Summer				
1.020	480 Winter	100	+30%					
1.021	480 Winter	100	+30%					
1.022	480 Winter	100	+30%					
9.000	960 Winter	100	+30%					
9.001	480 Winter	100	+30%	2/60 Summer				
1.023	480 Winter	100	+30%	2/60 Summer				
10.000	960 Winter	100	+30%					
10.001	960 Winter	100	+30%	2/60 Summer				
1.024	480 Winter	100	+30%	2/60 Summer				
1.025	960 Winter	100	+30%	100/360 Winter				
11.000	480 Winter	100	+30%					
1.026	960 Winter	100	+30%	2/30 Summer				
1.027	960 Winter	100	+30%					
1.028	960 Winter	100	+30%	2/15 Summer				
1.029	960 Winter	100	+30%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	4.905	-0.745	0.000	0.01	0.0	58.4	FLOOD RISK
1.001	2	4.904	-0.662	0.000	0.02	0.0	48.8	FLOOD RISK
1.002	3	4.903	0.059	0.000	1.40	0.0	48.4	FLOOD RISK
1.003	4	4.857	-0.653	0.000	0.03	0.0	136.2	FLOOD RISK
1.004	5	4.853	0.125	0.000	3.16	0.0	100.0	FLOOD RISK
1.005	6	4.603	-0.797	0.000	0.02	0.0	71.6	OK
2.000	32	4.793	-0.857	0.000	0.02	0.0	100.7	OK
2.001	33	4.628	-0.831	0.000	0.02	0.0	97.4	OK
1.006	7	4.601	-0.767	0.000	0.03	0.0	127.5	OK
1.007	8	4.598	-0.614	0.000	0.03	0.0	115.9	OK
1.008	9	4.596	-0.489	0.000	0.02	0.0	90.8	FLOOD RISK
1.009	10	4.594	-0.364	0.000	0.01	0.0	56.1	FLOOD RISK
1.010	11	4.593	0.385	0.000	1.06	0.0	46.9	FLOOD RISK
3.000	34	4.693	-0.707	0.000	0.02	0.0	65.3	FLOOD RISK
3.001	35	4.682	0.062	0.000	1.35	0.0	48.3	FLOOD RISK
3.002	36	4.655	-0.649	0.000	0.04	0.0	73.0	FLOOD RISK
3.003	37	4.650	-0.622	0.000	0.04	0.0	84.2	FLOOD RISK
3.004	38	4.648	0.092	0.000	2.09	0.0	82.5	FLOOD RISK
3.005	39	4.576	-0.666	0.000	0.02	0.0	56.2	OK
3.006	40	4.576	-0.602	0.000	0.03	0.0	48.5	OK

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 3556-SW NETWORK-07.02.2013.SWS

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.000	47	4.576	-0.624	0.000	0.00	0.0	6.2	FLOOD RISK
5.000	48	4.578	-0.672	0.000	0.00	0.0	15.4	FLOOD RISK
5.001	49	4.578	0.122	0.000	0.14	0.0	4.5	FLOOD RISK
3.007	41	4.576	0.148	0.000	0.95	0.0	38.6	FLOOD RISK
3.008	42	4.561	-0.523	0.000	0.02	0.0	49.8	FLOOD RISK
3.009	43	4.561	0.237	0.000	0.98	0.0	38.6	FLOOD RISK
3.010	44	4.553	-0.457	0.000	0.02	0.0	55.1	FLOOD RISK
3.011	45	4.553	0.309	0.000	1.40	0.0	41.7	FLOOD RISK
3.012	46	4.541	-0.383	0.000	0.01	0.0	48.7	FLOOD RISK
1.011	12	4.540	0.382	0.000	1.90	0.0	67.5	FLOOD RISK
1.012	13	4.485	-0.357	0.000	0.02	0.0	91.3	FLOOD RISK
1.013	14	4.483	0.435	0.000	2.04	0.0	67.9	FLOOD RISK
1.014	15	4.428	-0.288	0.000	0.02	0.0	77.8	FLOOD RISK
1.015	16	4.426	0.466	0.000	1.51	0.0	67.0	FLOOD RISK
1.016	17	4.381	-0.225	0.000	0.02	0.0	73.2	FLOOD RISK
1.017	18	4.379	-0.160	0.000	0.02	0.0	67.2	FLOOD RISK
6.000	50	4.381	-0.469	0.000	0.00	0.0	5.7	FLOOD RISK
7.000	53	4.383	-0.417	0.000	0.00	0.0	8.8	FLOOD RISK
7.001	54	4.383	-0.359	0.000	0.00	0.0	11.1	FLOOD RISK
7.002	55	4.383	0.421	0.000	0.13	0.0	5.0	FLOOD RISK
6.001	51	4.381	-0.251	0.000	0.00	0.0	11.9	FLOOD RISK
6.002	52	4.381	0.534	0.000	0.14	0.0	5.5	FLOOD RISK
1.018	19	4.377	-0.119	0.000	0.04	0.0	64.2	FLOOD RISK
8.000	56	4.377	-0.173	0.000	0.00	0.0	3.5	FLOOD RISK
1.019	20	4.377	0.619	0.000	1.48	0.0	50.2	FLOOD RISK
1.020	21	4.352	-0.089	0.000	0.02	0.0	52.2	FLOOD RISK
1.021	22	4.350	-0.051	0.000	0.02	0.0	50.8	FLOOD RISK
1.022	23	4.347	-0.022	0.000	0.02	0.0	52.1	FLOOD RISK
9.000	57	4.346	-0.254	0.000	0.01	0.0	15.5	FLOOD RISK
9.001	58	4.346	0.610	0.000	0.25	0.0	7.6	FLOOD RISK
1.023	24	4.343	0.556	0.000	0.72	0.0	57.7	FLOOD RISK
10.000	59	4.331	-0.269	0.000	0.00	0.0	6.6	FLOOD RISK
10.001	60	4.331	0.527	0.000	0.09	0.0	3.4	FLOOD RISK
1.024	25	4.329	0.565	0.000	0.75	0.0	60.4	FLOOD RISK
1.025	26	4.315	0.024	0.000	0.01	0.0	60.0	FLOOD RISK
11.000	61	4.315	-0.185	0.000	0.00	0.0	7.9	FLOOD RISK
1.026	27	4.315	0.662	0.000	0.43	0.0	50.9	FLOOD RISK
1.027	28	4.295	-0.360	0.000	0.02	0.0	53.1	FLOOD RISK
1.028	29	4.293	0.928	0.000	1.12	0.0	52.7	FLOOD RISK
1.029	30	4.033	0.669	0.000	0.39	0.0	52.7	SURCHARGED

Appendix 9

Key

- Site boundary
- Existing contours
- Existing 1:200 Year (100 year + Climate Change) Floodplain (3.76mAOD)
- Existing 1:100 Year Floodplain (3.71mAOD)
- Existing area of standing water at time of survey
- Public surface water sewer
- Public foul water sewer
- Highway Drain
- Overland flow route

Notes:

1. Topographical Survey based on Plan No. SDL 1959/3 Sheet 1 and 2 dated 23.10.2012 by Survey and Design Limited.
2. All levels are in metres above Ordnance Datum.
3. All dimensions are in millimetres unless stated otherwise.

N

Standing Water Area 1

Problem: It would appear that this is an area of localised standing water due to landform (natural low lying area).

Solution: Localised land raising or recontouring will eleiminate ponding in this area.

Standing Water Area 2

Problem: It would appear that the existing track is slightly raised to form a barrier to runoff.

Solution: Land raising will eliminate ponding in this area.

WL: 2.92 BL: 2.63 IL of Culvert: 2.71

WL: 2.92 BL: 2.66

225 diameter culvert under highway linking Ditch 2 to Ditch 3

Standing Water Area 3

Problem: Localised low lying area leading to ponding of water.

Solution: Localised land raising.

Standing Water Area 4

Problem: Area of standing water. Land naturally falls to ditch. Ditch water level as surveyed is 3.04mAOD, well below adjacent ground level. Lip along the ditch is preventing surface water runoff from entering the ditch.

Solution: Land raising/regrading, lip removal and ditch clearance to ensure free flow to and within the ditch.

A	NP	31.01.13	Notes and Key amended, Floodplains, flow routes added

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Client: Barrett Homes, Manchester

Job Title: Land North of Liverpool Road Formby

Drawing Title: Existing Site Layout

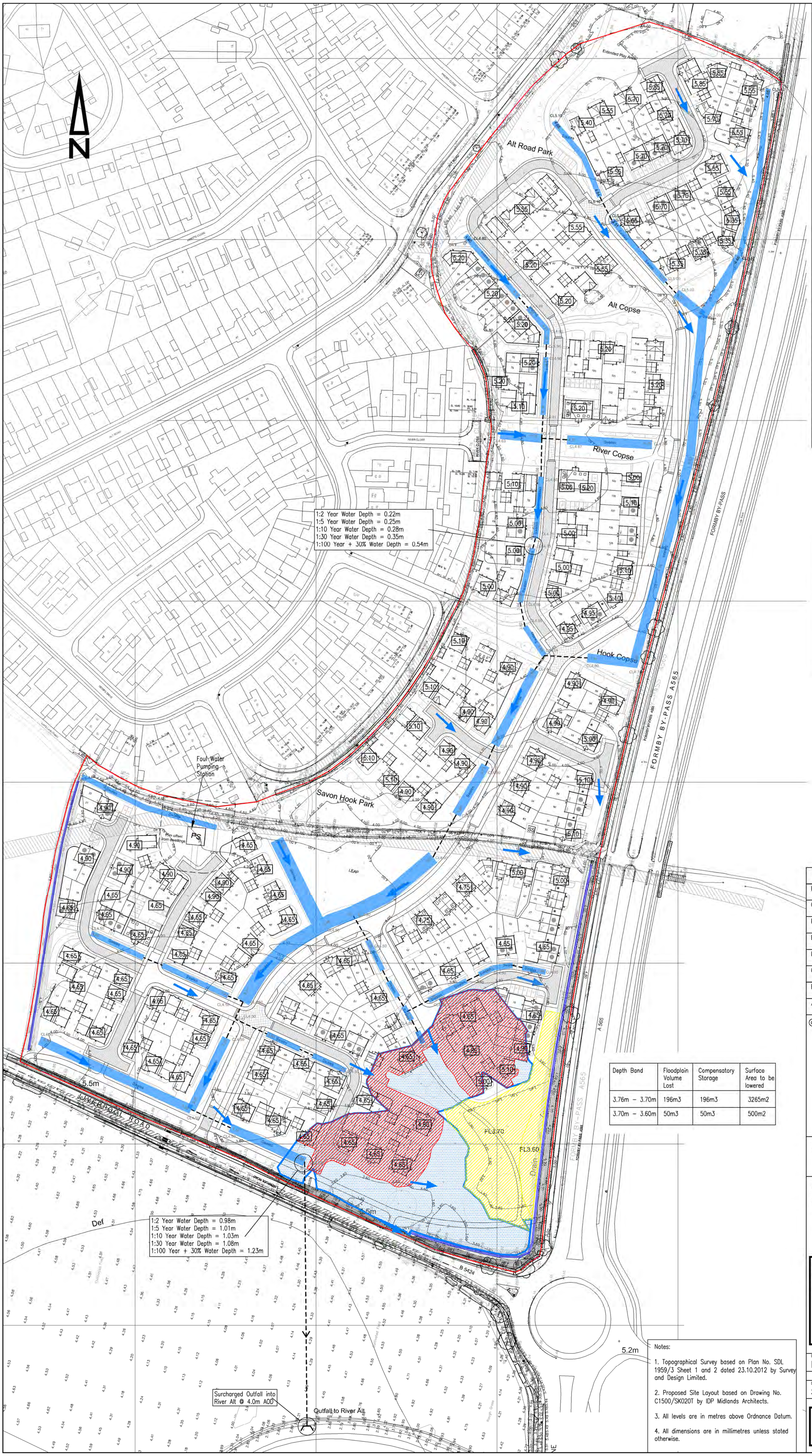
Designed by:	Drawn by:	Checked by:
DF	NP	DF

Date: November 2012

Scale: 1:1,000 @ A1

Drg. No.: 3556/500

Rev.: A



KEY

- Site Boundary (≈ 12.1ha)
- Existing 1:200 Year (100 Year + Climate Change) Floodplain 3.76mAOD
- Floodplain Lost due to the development
- Compensatory Floodplain provided
- Proposed Swale System
- 4.90 — Indicative Finished Ground Level (FL)
  FL = Swale IL + Pipe Fall (@ 1:100) + 0.6m or 300mm above 1:100yr+30% WL, whichever greater (Note: Add 150mm for Finished Floor Level (FFL)
- 4.00 — Existing Site Contour
- +4.12 — Existing Spot Level
- 3.91/CL4.80 — Indicative Invert Level/Bank Level of Swale
- Overland flow route

Drainage Strategy Notes:

1. Proposed Impermeable Area ≈ 4.50 ha

2. Onsite Storage designed to accommodate the 1:100 year plus 30% climate change event.

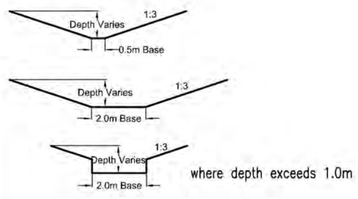
3. Storage to be provided within swales with 0.5m and 2.0m wide base and 1 in 3 side slopes, depth varies. Storage swales are to be linked by pipeworks beneath roads and footpaths.

4. Runoff from the site to be limited to the existing 1:100 year greenfield runoff rate of 54l/s using hydrobrake, orifice plate or similar flow control device.

5. Controlled outfall into the River Alt via a piped culvert.

5. Network designed for surcharged outfall at the River Alt at 4.0m AOD.

Swale Detail
(Not to scale)



Depth Band	Floodplain Volume Lost	Compensatory Storage	Surface Area to be lowered
3.76m – 3.70m	196m3	196m3	3265m2
3.70m – 3.60m	50m3	50m3	500m2

Notes:

1. Topographical Survey based on Plan No. SDL 1959/3 Sheet 1 and 2 dated 23.10.2012 by Survey and Design Limited.

2. Proposed Site Layout based on Drawing No. C1500/SK020T by IDP Midlands Architects.

3. All levels are in metres above Ordnance Datum.

4. All dimensions are in millimetres unless stated otherwise.

I	NP	03.07.13	New Layout added (C1500/SK020T),FLs, ILs & Comp storage revised, Notes added
H	NP	23.01.13	Compensatory storage revised to suit new layout (C1500/SK020H)
G	NP	17.01.13	Compensatory storage revised to suit new layout
F	PN	10.12.12	Revised layout. Inset added.
E	NP	14.11.12	SW Drainage design revised to suit new layout, compensatory storage amended
D	NP	09.11.12	SW Drainage design revised to suit new layout
C	NP	11.10.12	SW Drainage design revised to suit new layout
B	NP	03.10.12	SW Drainage design revised
A	NP	24.09.12	Spot Levels and ILs added, Storage information table added

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Client: Barrett Homes, Manchester

Job Title: Land at Liverpool Road Formby

Drawing Title: Schematic Surface Water Drainage Strategy

Designed by:	Drawn by:	Checked by:
NP	NP	DF

Date	Scale
Sept 2012	1:1,000 @ A1

Drg. No.	Rev.
3556/500/SK01	I