



Land West of Hemel Hempstead

Flooding and Drainage Assessment





## Land off Fields End Lane

### Flooding and Drainage Assessment

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## Land West of Hemel Hempstead

### Flooding and Drainage Assessment

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# 1 Introduction

- 1.1 JMP has been commissioned by Vincent and Corbing on behalf of Taylor Wimpey (UK), Barratt Homes and Hertfordshire County Council to undertake a Flooding and Drainage Constraints Assessment for Land West of Hemel Hempstead. This document identifies the flooding and drainage issues that affect the potential allocation area, LA3, and will influence its future development. This document will support the allocation proposal within the Dacorum Borough Council Core Strategy.
- 1.2 This report is based on information obtained from discussions with Dacorum Borough Council, Hertfordshire County Council, Thames Water and the Environment Agency, and a range of publicly available sources.
- 1.3 The assessments made in this document are based on current Environment Agency policy and requirements, the National Planning Policy Framework (NPPF) and associated Technical Guidance, Sewers for Adoption (6<sup>th</sup> Edition) and best practice guidance such as CIRIA C697 *The SUDS Manual*.

## 2 Background Information

2.1 This section summarises the outcome of discussions regarding the potential allocation area with the following organisations:

- Environment Agency
- Dacorum Borough Council
- Hertfordshire County Council
- Thames Water

2.2 Copies of any correspondence received are included in **Appendix A**. The information received, where appropriate, has been incorporated into this document.

### Environment Agency

2.3 The Environment Agency has provided the following comments related to the potential allocation area and its future development. A copy of the full response received is included in **Appendix A**:

- The potential allocation area is located within Flood Zone 1 hence the probability of river flooding is less than 0.1% in any given year.
- There are no modelled flood levels available for the River Bulbourne adjacent to the potential allocation area.
- There are no records of river or groundwater flooding relating to the potential allocation area.
- The maximum permitted surface water discharge rate for the potential allocation area, post-development, will be 5l/s/ha.
- The surface water drainage strategy will need to incorporate sustainable drainage features (SUDS). The selection of SUDS techniques should follow the hierarchy outlined in *SUDS – A Practical Guide* (Development Control, Thames Region, October 2006).
- The drainage design must seek to protect groundwater in accordance with Environment Agency guidelines. A Preliminary Risk Assessment to assess whether land contamination is present within the potential area of the allocation should be submitted prior to any planning applications being made.
- Deep bored soakaways will not be acceptable due to the potential impact on groundwater; however, shallow infiltration methods would be supported.
- The development proposals for the potential area of the allocation should provide a green link between the Local Nature Reserve (Shrub Hill Common) and open countryside.
- The potential allocation area is located within an area of *serious* water stress; therefore, any future development should seek to maximise water efficiency in accordance with the *Code for Sustainable Homes* Levels 3/4.
- Thames Water should be consulted to confirm whether there is adequate sewerage capacity for the potential area of the allocation.
- Surface water flood maps and groundwater level information have been supplied.

## Dacorum Borough Council

2.4 Following an enquiry, Dacorum Borough Council has provided information, which is summarised below. A full copy is included in **Appendix A**:

- The depression at the southern end of the potential area of the allocation is believed to be a storage basin intended to serve any future development. It is not known how this interacts with the drainage in the wider area.
- Members of the public have previously reported surface water flooding within the potential allocation area but there is no evidence of this in recent years.
- A Flood Risk Assessment and Preliminary Drainage Strategy were previously produced for the potential allocation area. Copies of these documents were supplied.

## Hertfordshire County Council

2.5 Hertfordshire County Council has provided the following information. A copy of this is included in **Appendix A**:

- Hertfordshire County is the Lead Local Flood Authority for the area.
- Currently they do not have the drainage approval and SUDS adoption powers but local policy with regard to these matters will be developed to align with national standards.
- Until full Lead Local Flood Authorities powers are in place, the Local Authority (Dacorum Borough Council), the Environment Agency and Thames Water should be consulted with regard to maximum permitted flow rates leaving any future development.
- The Strategic Flood Risk Assessment shows all the information held regarding historic flooding in the area.
- The proposed surface water drainage strategy should incorporate SUDS in order to control flow rates and improve water quality in local rivers.

## Thames Water

2.6 The response received from Thames Water is summarised below with a full copy included in **Appendix A**:

- There are concerns regarding the capacity available in the local sewerage network for any future development.
- In order to establish potential connection points and where upgrades to the existing network are required, a developer funded impact study will need to be undertaken.

2.7 The developer funded impact study process has commenced. The results will be incorporated into this document when they are received.

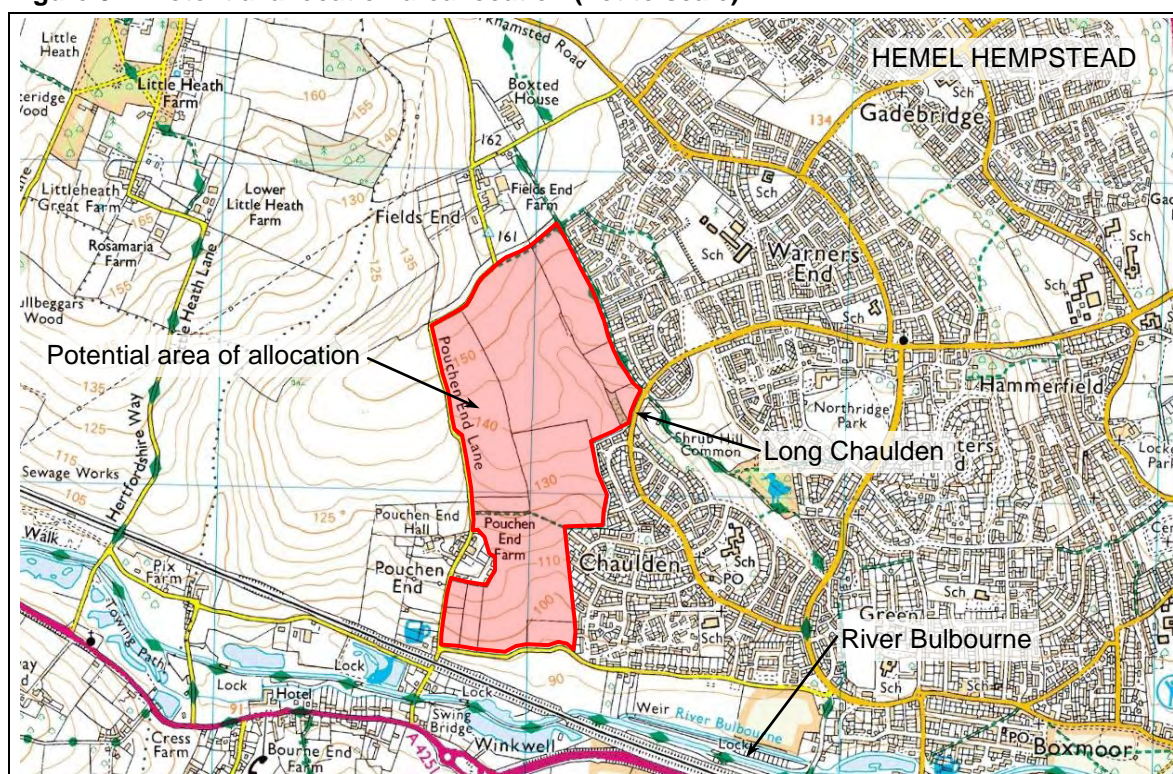
2.8 Responses to other enquiries are still awaited. These will be incorporated into this report once received.

### 3 Potential Allocation Area Description

#### Location

- 3.1 The potential area of the allocation is located immediately south of Fields End, on the western side of Hemel Hempstead, Hertfordshire. The detailed boundaries of the allocation will be considered through future masterplanning and the Site Allocations Development Planning Document. The allocation area considered within this document is bounded to the west by Pouchen End Lane and Pouchen End Farm. The northern boundary comprises Pouchen End Lane and fields adjacent to Fields End Farm. To the north-east and south-east are existing residential areas which are separated from the allocation area by mature hedgerows. The eastern boundary is formed by a road named Long Chaulden. Chaulden Lane forms the southern boundary.
- 3.2 The potential allocation area is illustrated in Figure 3.1.

**Figure 3.1 Potential allocation area location (not to scale)**



Source: Based upon the Ordnance Survey Map with the sanction of the Controller of Her Majesty's Stationery Office. Crown copyright reserved.

#### Topography

- 3.3 The potential allocation area has a total area of approximately 53.9ha. A topographical survey of the area is shown on drawing number MID3160/001 in **Appendix B**.
- 3.4 The topography of the potential allocation area generally comprises two valleys running from north to south. The western valley is indistinct in the northern section of the potential allocation area but becomes increasingly defined with distance further south. The southern section of the valley generally follows the eastern boundary. The high point in this section, off Pouchen End Lane, has a level of approximately 157.20m AOD before falling to the low point with a level of approximately 94.75m AOD adjacent to Chaulden Lane.

- 3.5 The eastern valley runs from the field boundary close to Fields End Farm to Long Chaulden. A ditch runs approximately in the bottom of the valley. The high point within this area has a level of approximately 158.0m AOD and is located adjacent to Pouchen End Lane. The valley falls towards a large, shallow depression located immediately adjacent to Long Chaulden which has a level of approximately 127.00m AOD. The aforementioned ditch flows into the depression suggesting that it has a land drainage function. Further details of this are provided later in this section.

## Land Use

### Historic

- 3.6 Old Ordnance Survey maps dating back to the late 19<sup>th</sup> Century show that the potential area of the allocation has been wholly undeveloped up to the present day.
- 3.7 The residential developments to the north-east and south-east are first shown on maps dating from 1960. These areas are shown to have reached their present form by 1982.

### Current

- 3.8 According to Ordnance Survey mapping and aerial photographs, the potential allocation area is predominantly open agricultural land.
- 3.9 Within the north-eastern section of the potential allocation area, a number of the existing mature hedgerows forming the boundaries and also, within the area, have been supplemented by 30 metre wide belts of advance strategic planting in advance of any development being undertaken.

## Ground Conditions

- 3.10 Intrusive site investigations have been undertaken in the north-eastern section of the potential allocation area by Delta Simons. The results are presented in the *Combined Phase I and Phase II Geo-environmental Assessment* (14 June 2011). These show that this section generally comprises clay overlying chalk. The thickness of the clay varies with a greater thickness encountered to the west. To the east, the depth to the chalk stratum is generally approximately 1.5m, increasing to approximately 2.5m to the west.
- 3.11 The topsoil is clay with sandy and gravelly fractions. A site visit identified several areas in the south-western quadrant of this part of the potential allocation area where chalk fragments could be seen on the surface.
- 3.12 Information obtained from the British Geological Survey suggests that the ground conditions identified during the intrusive investigations continue beneath the remainder of the potential allocation area. The clay stratum identified as superficial deposits and described as Clay with Flints Formation comprising clay, silt, sand and gravel. The underlying chalk bedrock is the Lewes Nodular Chalk Formation and the Seaford Chalk Formation.
- 3.13 Based on these soil and geological conditions, it can be concluded that infiltration may be a viable means of surface water disposal. Infiltration testing in accordance with BRE Digest 365 *Soakaway Design* should be undertaken to confirm this.
- 3.14 The site investigation identified no evidence of ground contamination within the potential area of the allocation.

## Water Environment

### Sewerage

- 3.15 Sewer records obtained from Thames Water, shown in **Appendix A**, show that there are no sewers of any type within the potential allocation area.
- 3.16 The residential areas to the north and south east of the potential area of the allocation are served by separate surface and foul water drainage system. The pipe sizes for both systems are small, generally varying between 150mm and 300mm.
- 3.17 The surface water sewerage network in the area drains towards the River Bulbourne where it discharges at three locations:
- 525mm diameter from the residential area immediately adjacent to the southern section of the potential allocation area.
  - 600mm diameter conveying flows from the residential area to the south of Long Chaulden.
  - 1200mm diameter discharging flows from a large urban area including the residential area to the east of the potential allocation area.
- 3.18 The foul water sewerage network flows in a south-easterly direction. Primary sewers flow along Chaulden Lane, Long Chaulden and through Shrub Hill Common before discharging into a further large sewer (450mm diameter) within Northridge Way.
- 3.19 Shrub Hill Common is an important route for both surface and foul water sewers in the area as it is a continuation of the natural valley that starts within the eastern section of the potential area of the allocation. The surface water sewers through this area increase in size substantially up to 1050mm diameter. In addition, the depth of both sewers increases substantially when compared to those serving the residential areas to approximately 4.5m and 6.0m for the foul and surface water respectively. There is no apparent reason for this sudden increase in depth.

### Watercourses

- 3.20 There is a single watercourse within the potential allocation area. This is a ditch, previous referred to in paragraph 3.5, which passes through the eastern section of the potential allocation area from north to south, ending in the depression in the south east corner. The ditch enters the potential allocation area across the northern boundary. Based on Ordnance Survey mapping, the start of the ditch is in the vicinity of Fields End Farm approximately 200m from the northern boundary. The farm is at a high point within the local area; therefore, the majority of the catchment of the ditch comprises the eastern section of the potential area of the allocation.
- 3.21 The ditch follows a substantial hedgerow running north to south dividing this part of the potential allocation area into two sections. The channel is well defined but shows little evidence of frequent flow based on vegetation growth and the degree of sedimentation at two culverted crossing points. A photograph of a typical section of the ditch is shown in Figure 3.2.
- 3.22 The ditch terminates at a headwall at the southern end of the eastern part of the potential allocation area. Site investigations have shown that this headwall has two pipes, both 375mm diameter, running from it. A photograph of this headwall is shown in Figure 3.3. One pipe runs in a south-easterly direction into the large, shallow depression located adjacent to Long Chaulden described in paragraph 3.5. Further details regarding this feature are given later in this section. The second pipe flows in an easterly direction; however, the outlet of this pipe could not be located.

- 3.23 Beyond the potential allocation area boundary, the nearest watercourse is the River Bulbourne approximately 700m to the south-west of the potential allocation area. This is designated Main River by the Environment Agency.

**Figure 3.2 Typical view of the ditch running through the potential allocation area**



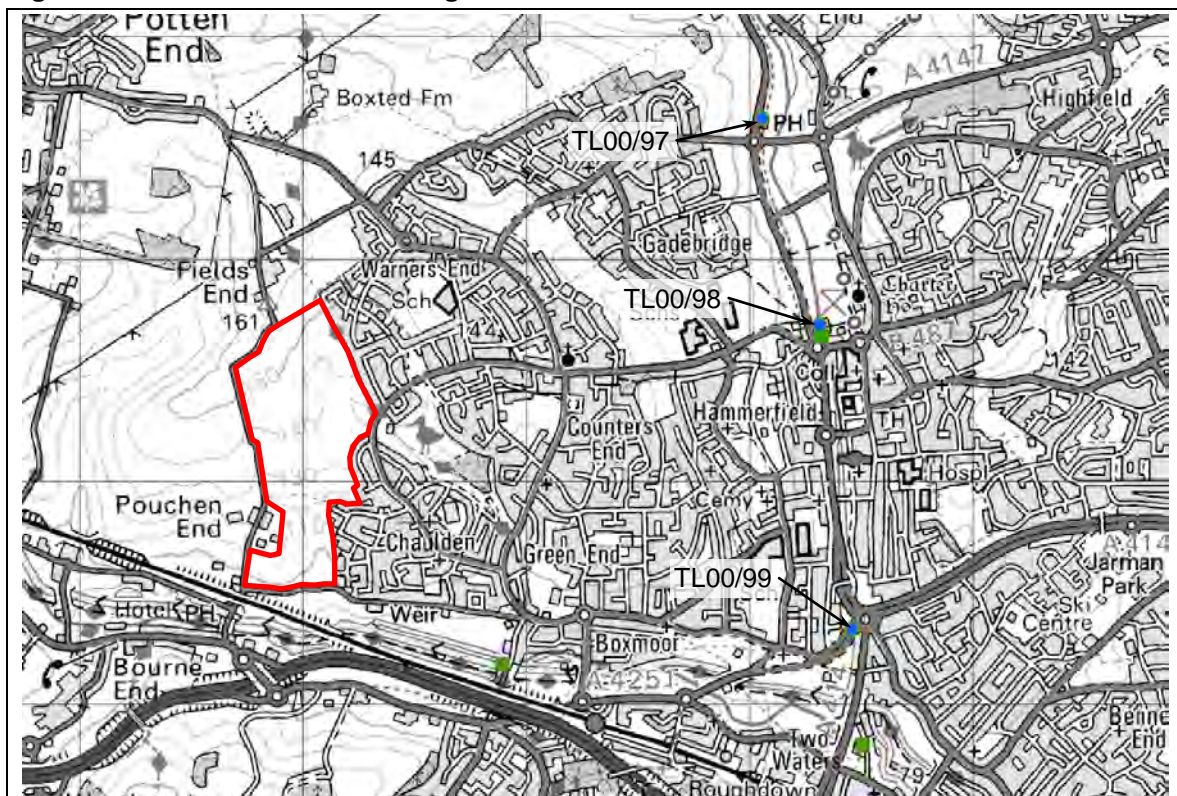
**Figure 3.3 Headwall at the downstream end of the ditch**



## Groundwater

- 3.24 Groundwater was not observed within the potential allocation area during any of the intrusive ground investigations within the north-eastern section.
- 3.25 According to the Environment Agency website, the potential allocation area is wholly located within Source Protection Zone 3 (Total Catchment). This may present some constraints with regard to the use of infiltration for surface water disposal. This is discussed further in Section 6 of this document.
- 3.26 The bedrock beneath the potential allocation area (Chalk) is designated a *Principal Aquifer*. These are layers of rock that have high inter-granular and/or fracture permeability such that they are capable of providing a high level of water storage. They may support water supply and/or river base flow on a strategic scale. This aquifer is classified as being at *Intermediate* risk of pollution.
- 3.27 The Environment Agency has provided groundwater level monitoring results for three locations all adjacent to the River Gade, a tributary of the River Bulbourne, to the east of the potential area of the allocation. The location of each is indicated on Figure 3.4 with a graph showing the levels shown in Figure 3.5.

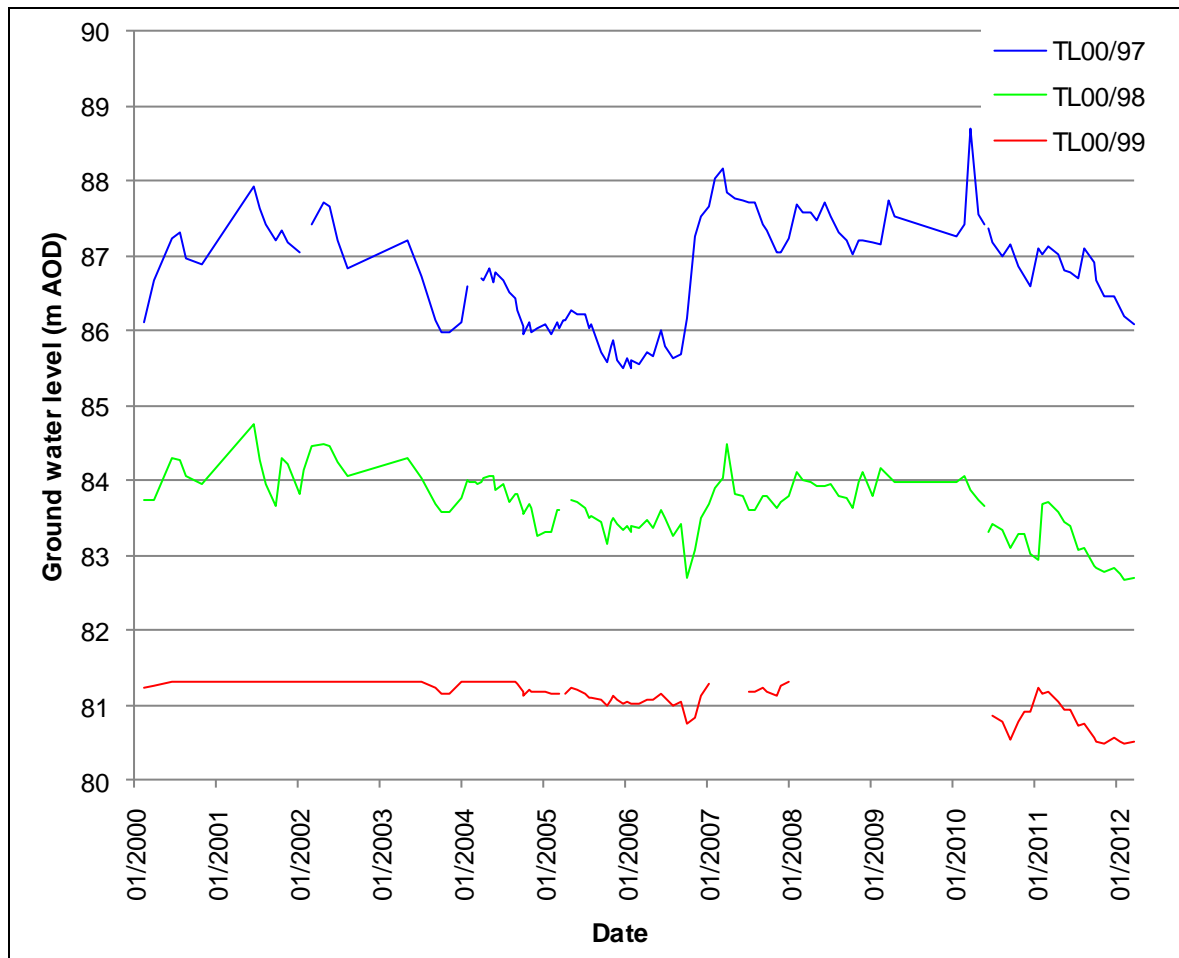
**Figure 3.4 Groundwater monitoring locations**



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**Figure 3.5 Groundwater levels**



Source: Environment Agency.

- 3.28 A comparison between ground levels at each monitoring location and the recorded water levels show that groundwater at TL00/97 and TL00/98 has risen to within 2m of the surface on a number of occasions. The data shows that groundwater levels at TL00/99 have regularly been at or above the ground surface. It is unclear whether this results in groundwater flooding or whether the overlying geology is sufficiently impermeable to contain the water under pressure.
- 3.29 While these monitoring locations are remote from the potential area of the allocation, from the results obtained, it can be inferred that groundwater levels are likely to be close to the surface towards the River Bulbourne. Furthermore, as ground levels rise within the potential allocation area, groundwater levels will also tend to rise but at a lower rate; therefore, the separation between the surface and the groundwater will increase with distance north.

#### Water Features

- 3.30 The only water feature within the potential allocation area is the large, shallow dry depression mentioned previously in paragraph 3.22. This feature provides an outfall for the ditch described in paragraphs 3.20 and 3.21. The flows from the ditch enter the depression via one of the 375mm diameter pipes running from the headwall described in paragraph 3.22. A photograph of the depression is shown in Figure 3.6.

**Figure 3.6 Depression located adjacent to Long Chaulden**



- 3.31 The function of the depression is uncertain. Investigations with Dacorum Borough Council have established that the area of land within which the depression is located was transferred from Council to private ownership between 10 and 15-years ago. Part of the transfer agreement was the construction of the depression although the reasons for this are unknown. Council officers believe that it was constructed to provide storage and flow control for the future development of the land; however, it is not believed that it was connected to the local surface water sewerage system. The depth of the depression, based on the intrusive site investigations is almost sufficient to reach the underlying chalk; therefore, it is possible that this feature could provide an infiltration facility for any run-off.
- 3.32 Analysis of the storage area has shown that it is capable of storing a maximum volume of approximately 1,500m<sup>3</sup>. The maximum water level that can be contained is 127.55m AOD which equates to a maximum depth within the storage area of approximately 0.50m. It should be noted that the effective storage volume is limited by the gradient of the base of the depression which is sufficiently steep that it is not entirely covered by water when the maximum water level is reached. The volume of the depression could be enhanced by further excavation of the base.
- 3.33 If a water level exceeding 127.55m AOD occurs, water will overflow from the depression, flow across Long Chaulden and down the valley in a south-easterly direction towards Shrub Hill Common.
- 3.34 The outlet from the depression is a second headwall located on its south-eastern boundary. A CCTV survey of the outlet was undertaken by OnSite in May 2012. A copy of the report is included in **Appendix C**.

- 3.35 The outlet pipe running from the headwall within the depression is 300mm diameter. The pipe connects into an adjacent manhole. The survey has shown that this chamber is approximately 6.05m deep with a diameter of 2.1m and contains a vortex flow control suggesting that the depression has a storage and flow control function. A photograph of the inside of this chamber is shown in Figure 3.7. The depth of the chamber precluded any attempts to read the manufacturer's label on the flow control device to obtain details of its performance. Discussions with a number of flow control suppliers have been inconclusive with regard to obtaining a specification for this flow control device.

**Figure 3.7 Flow control chamber adjacent to existing depression**



- 3.36 The outlet pipe from this manhole is also 300mm diameter and runs in a south-easterly direction towards a second manhole, not shown on the topographical survey. This manhole is an older structure than the first with internal dimensions of 0.75m by 0.75m increasing to 1.2m by 1.2m at the bottom. The overall depth of the manhole is 5.90m. The outgoing pipe from this manhole has a diameter of 675mm and connects to a manhole on the public surface water system within Long Chaulden.
- 3.37 The manhole on the public surface water sewerage system has an overall depth of 6.50m and forms the junction between the outfall from the potential allocation area, surface water sewers flowing from the north and south along Long Chaulden and a single gully connection. From this manhole, flows are directed in a south-easterly direction through Shrub Hill Common as described in paragraph 3.19.

3.38 Beyond the potential allocation area, further to the south-east, a second depression was located within Shrub Hill Common. A photograph of this feature is shown in Figure 3.8. Site investigations could not identify any link between this feature and the depression within the potential area of the allocation. Dacorum Borough Council have also advised that, while they are uncertain regarding the purpose of this depression, they believe it to provide a means for controlling surface run-off generated by the surrounding residential areas, and that there is no physical link with the depression within the potential allocation area. The Thames Water sewer records suggest that there may be a connection from this depression into the large diameter surface water sewer that flows through Shrub Hill Common although this has not been confirmed.

**Figure 3.8 Depression located within Shrubhill Common**



## 4 Development Proposals

- 4.1 The proposed local allocation for land at West Hemel Hempstead suggests a development of up to 900 houses, a primary school, community facilities and a shop. The development principles in the Core Strategy highlight the need for strategic landscaping and an extension to Shrub Hill Common.
- 4.2 The existing depression within the potential allocation area, described in paragraphs 3.30 to 3.36, will be retained as far as is practical with adjacent proposed highway access from Long Chaulden. Any volume lost will be replaced by new surface water storage areas created within the potential allocation area.
- 4.3 The development concept plan dated May 2012, produced by Vincent & Gorbing is shown in **Appendix B**.

## 5 Flooding Constraints

5.1 The NPPF and associated Technical Guidance requires the following flooding sources to be considered for any development:

- Fluvial – flooding from rivers.
- Tidal – flooding from high tides, tidal surges or interaction between high tides and river flows.
- Pluvial – flooding caused by overland flows following rainfall.
- Groundwater – flooding caused by the emergence of water out of the ground.
- Sewers – flooding caused by water leaving the sewerage network (both surface and foul water)
- Artificial sources – flooding caused by the failure of water retaining structures.

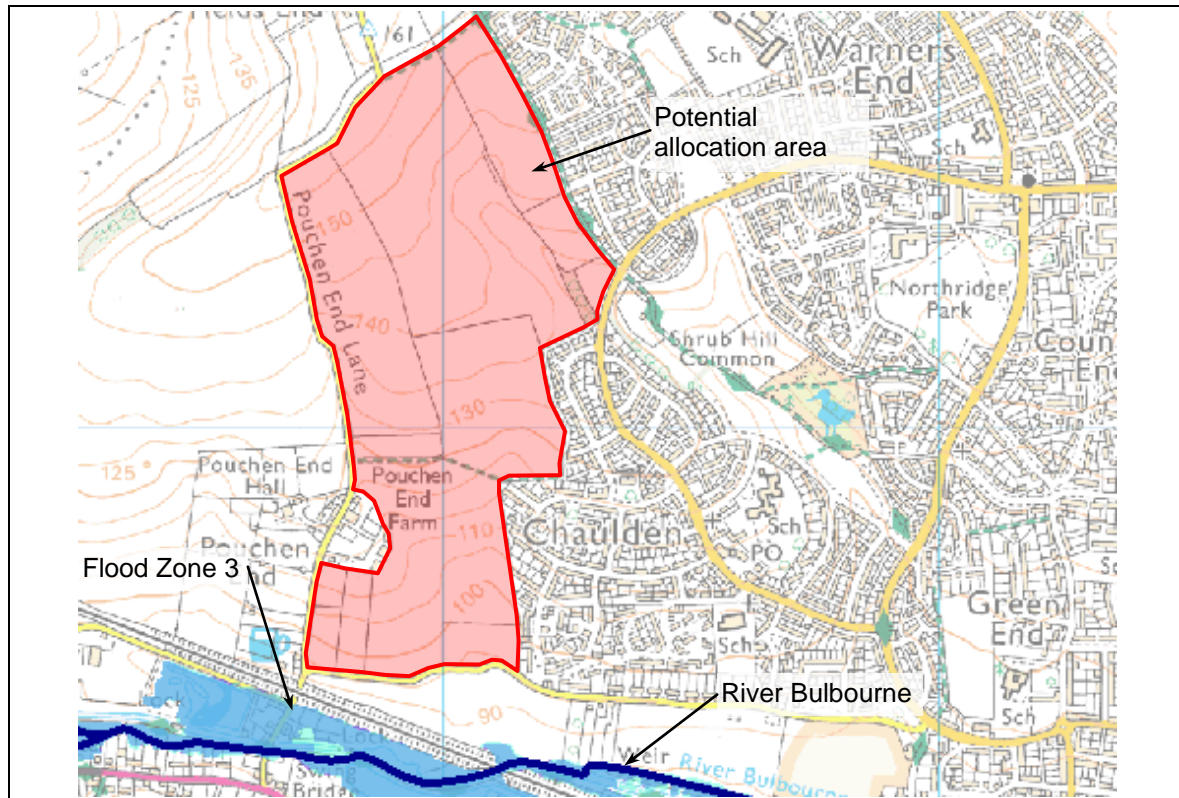
5.2 In order to establish any constraints on the potential area of the allocation resulting from flooding, each of these flooding sources is considered.

### Fluvial (River)

5.3 The Environment Agency has advised that the potential area of the allocation is located within Flood Zone 1 (less than 1 in 1,000-year (0.1% AEP) risk of flooding). The Environment Agency Flood Map shows that the nearest area of Flood Zone 2 and 3 to the potential area of the allocation is associated with the River Bulbourne approximately 700m to the south-west. This is indicated on Figure 5.1. On this basis, it is concluded that flooding from the River Bulbourne will not comprise a constraint to the future development of the potential allocation area.

5.4 As described previously, there is a ditch running through the centre of the potential allocation area. As this is an open channel, there is a potential that it could be a source of flooding. This will need to be considered during the development planning process to ensure sufficient space is provided to allow flooding to occur in a safe manner.

**Figure 5.1 Environment Agency Flood Map**



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## Pluvial (Overland)

- 5.5 The Strategic Flood Risk Assessment shows a number of locations to the south-east of the potential area of the allocation that have been affected by surface water flooding. While there are no formal records of surface water flooding occurring within the potential allocation area, anecdotal reports from local residents suggest that some surface water flooding or accumulation has occurred in the past; however, it has not been possible to verify this.
- 5.6 There are no substantial paved areas at elevations higher than the potential area of the allocation that could generate a substantial volume of surface run-off which would flow onto it; therefore, it is not considered to be at risk of surface water flooding from external sources.
- 5.7 The ground surface gradients within the potential allocation area are such that any surface run-off will have the potential to flow rapidly towards the lowest areas close to Long Chaulden and Chaulden Lane.
- 5.8 The existing overland flow routes within the potential area of the allocation have been identified using 2-dimensional flow modelling to simulate the run-off from a 50mm/hr rainfall event. As only the flow routes were to be identified, potential surface infiltration was ignored. The modelling was based on LIDAR terrain data obtained for the potential allocation area and the surrounding area. The resultant flow paths are illustrated on Figure 5.2 with the flow accumulation areas shown on Figure 5.3.

Figure 5.2 Overland flow paths



Figure 5.3 Overland flow accumulation areas





- 5.9 Figure 5.2 shows that the primary overland flow paths are located in the north-eastern and southern parts of the potential allocation area. The model results show that the ditch running through the north-eastern area does not follow the natural valley line; the natural overland flow path is more sinuous. Where this flow path crosses the line of the ditch, the ditch will intercept and convey them more efficiently to the depression than if they had followed the natural flow path.
- 5.10 The modelling shows that any flows that are able to leave the potential area of the allocation will continue across Long Chaulden and flow through Shrub Hill Common. The local topography is such that the primary flow path is constrained to a relatively narrow corridor until it reaches the second depression described in paragraph 3.38. At this point, the flows begin to spread to affect a larger area.
- 5.11 The flow paths in the southern section of the potential allocation area comprise two separate routes which merge before leaving the potential allocation area via the southern boundary. The western of these two flow paths originates from Pouchen End Lane; run-off from this road is channelled through the potential allocation area along the northern boundary of Pouchen End Farm. The second flow path runs along the eastern boundary adjacent to the existing residential properties. The two flow routes merge approximately 150m from the southern boundary. The flow path then crosses Chaulden Lane and passes through a field before entering the River Bulbourne.
- 5.12 Figure 5.3 shows that the only location within the potential allocation area where surface water will tend to accumulate is within the depression adjacent to Long Chaulden. No other areas of potential surface water accumulation have been identified.
- 5.13 The Environment Agency has provided surface water flooding maps for the wider area surrounding the potential allocation area which are included in **Appendix A**. These correlate well with the findings of the site-specific modelling described above.
- 5.14 Once developed, the infiltration of run-off will be limited by paved areas hence the volume of run-off will be greater. Any future development will need to be designed to ensure that the identified overland flow routes are taken into consideration to ensure that properties will not be adversely affected. In addition, measures will need to be put in place to prevent overland flows leaving any future development in an uncontrolled manner and causing surface water flooding further downstream.

## Tidal

- 5.15 The potential allocation area is remote from any tidally-influenced waterbodies and hence this source of flooding does not impose any constraints on future development.

## Sewer

- 5.16 There are no reports of historic sewer flooding occurring in the vicinity of the potential area of the allocation. The Strategic Flood Risk Assessment identifies Dacorum Borough Council as a low risk area for sewer flooding. In addition, there are no public sewers above the potential area of the allocation that could cause flooding.
- 5.17 Therefore, sewer flooding is not anticipated to present any constraints on future development.

## Groundwater

- 5.18 As previously described, the potential allocation area is located over a Principal Aquifer within the underlying Chalk; therefore, substantial amounts of groundwater are beneath the area. However, no groundwater has been observed in any of the boreholes installed in the north-eastern section.
- 5.19 The Strategic Flood Risk Assessment states that groundwater emergence has occurred at the base of the River Bulbourne valley; therefore, it is possible that the southern section of the potential allocation area adjacent to Chaulden Lane could be affected. Groundwater data supplied by the Environment Agency, described in paragraphs 3.27 to 3.29, and illustrated in Figure 3.4 and Figure 3.5, supports this and also shows that, as ground surface elevations rise, the depth to groundwater is anticipated to increase.
- 5.20 The potential allocation area is largely covered by a layer of clay; however there are some locations where Chalk can be observed on the surface. Therefore, there are pathways present that would enable groundwater to emerge if levels were sufficiently high. The gradients within the potential allocation area are such that any groundwater emerging will not accumulate but rather flow overland for interception by drainage features.
- 5.21 Any future development will need to be designed to ensure that any emerging groundwater can be appropriately intercepted before any buildings are affected. This will include the selection of suitable drainage techniques, which are discussed in Section 6.

## Artificial Sources

- 5.22 There are no impounded waterbodies at an elevation above the potential allocation area. In addition, the Environment Agency Reservoir Flood Map shows that the potential allocation area would not be affected by the failure of any nearby reservoirs. Therefore, it is concluded that flooding from artificial sources will not impose any constraints on the future development.

## Sequential Test

- 5.23 The purpose of the Sequential Test is to direct development towards areas of least flood risk in advance of higher risk areas becoming developed. As the potential area of the allocation is wholly located within Flood Zone 1; the Sequential Test is deemed as being satisfied.

## 6 Drainage Constraints

### Surface Water

#### Existing Drainage Regime

- 6.1 Based on the topographical survey, there are five drainage catchments within the potential area of the allocation. These are illustrated on drawing number MID3160/001 in **Appendix B**. Details of each are summarised in Table 6.1.

**Table 6.1 Existing drainage catchments**

Catchment	Area (ha)	Description	Existing outfall
1	18.56	Land on each side of the ditch running through the north-eastern section of the potential allocation area. There is also an area of land further to the north that also drains through this catchment.	Depression in eastern corner.
2	0.57	Land between the depression in the eastern corner of the potential allocation area and Long Chaulden.	Overland in a south-easterly direction across Long Chaulden.
3	8.39	Land draining to the eastern-most of the two valleys within the western section of the potential allocation area.	Overland into the residential area off Musk Hill to the east.
4	23.92	Land draining to the western section of the potential allocation area adjacent to Pouchen End Lane.	Overland across Chaulden Lane to the south towards the River Bulbourne.
5	2.43	Land immediately to the south of Pouchen End Farm draining towards the south-western corner of the potential allocation area.	Overland onto junction between Chaulden Lane and Pouchen End Lane.
<b>Total</b>	<b>53.87</b>		

#### Proposed Surface Water Outfalls

- 6.2 Any future development will drain to two surface water outfalls as listed below and illustrated on drawing number MID3160/002 in **Appendix B**:
- Outfall 1 – From the existing depression in the eastern corner of the potential allocation area.
  - Outfall 2 – Into the River Bulbourne via the Thames Water public sewerage network.
- 6.3 There are no other watercourses or public surface water sewers in the vicinity of the potential allocation area that are considered suitable outfalls.
- 6.4 For Outfall 1, any flows entering the existing depression will be discharged to the existing flow control chamber described in paragraph 3.35 and potentially into the ground by infiltration.
- 6.5 The existing flow control device will need to be inspected to establish whether its specification is suitable for use as part of any future development drainage system. If not, a new flow control device will need to be installed in the existing chamber.

- 6.6 For Outfall 2, as described in paragraph 3.17, there is an existing 375mm diameter public surface water sewer draining from the residential area immediately to the east of the southern section of the potential allocation area. This sewer increases in diameter to 525mm prior to discharging into the River Bulbourne. Any future development on the potential area of the allocation will discharge flows via a new manhole constructed on the existing sewer as it crosses Chaulden Lane.
- 6.7 Information available on Thames Water sewer records indicates that the existing sewer has a gradient of approximately 1 in 20. Preliminary analysis using a pipe diameter of 375mm gives the capacity of the sewer to be approximately 450l/s. The flow rate draining from the existing residential area is not known; however, based on an estimate of the area being drained to this outfall, it is considered likely that there is little available capacity within the existing sewer.
- 6.8 To accommodate the development flows, it may be necessary to upsize the existing sewer as it passes beneath Chaulden Lane and through the adjacent field. This can be achieved using the sewer requisition process and is currently being discussed with Thames Water.
- 6.9 In addition to these positive drainage outfalls, as described in paragraphs 3.10 to 3.13, the ground conditions with the potential allocation area are potentially suitable for the use of infiltration to dispose of surface water. The infiltration rate of chalk can vary widely; therefore testing in accordance with BRE Digest 365 is required to confirm this and establish the variations in infiltration rates across the area.
- 6.10 The potential allocation area, as described in paragraph 3.25, is entirely within Source Protection Zone 3 (Total Catchment). The purpose of these zones is to ensure that groundwater used for water supply purposes is protected from pollution; therefore, there are a number of restrictions placed on the types of development and forms of drainage system that can be located within them. Details of the restrictions are summarised below:
- No objections to landfill provided that sufficient evidence that the risk of pollution of groundwater is adequately mitigated by engineering and operational measures.
  - Minimise the use of underground storage for List 1 substances (EC Groundwater Directive 80/68/EEC).
  - No open storage for List 1 substances (EC Groundwater Directive 80/68/EEC).
  - Secure bulk storage for potentially polluting substances with impermeable bunding and safe disposal for spillages.
  - No disposal of liquid waste or slurry.
  - Discharge of storm sewage overflows to soakaways is not permitted except in exceptional circumstances.
  - Roof drainage may be discharged to soakaways.
  - Non-trafficked public amenity areas may discharge flows to soakaways.
  - Runoff from car parks and small roads may be drained to soakaways provided that suitable treatment such as an interceptor is provided.
  - Small roads, car parks and garage forecourts may be drained to soakaways provided that suitable treatment such as an interceptor is provided.
  - Flows from industrial areas may only be discharged to soakaways if appropriate protective measures are implemented and approved.

- Major roads may be permitted to drain to soakaways if the results of investigations are favourable and adequate protective precautions are implemented.

### Maximum Permitted Discharge Rates

- 6.11 The Environment Agency has stated that the maximum permitted discharge rate leaving any future development should be calculated on the basis of 5l/s/ha.
- 6.12 Catchments 1 and 4 currently drain to these outfalls; therefore, the catchment areas of these are used in the maximum permitted discharge rate calculations. Catchments 2, 3 and 5 are not included in the calculations as these areas do not currently drain to the outfalls listed above and including them may introduce additional flow which may exacerbate downstream flooding issues.
- 6.13 Therefore, the maximum permitted discharge rate from the potential area of the allocation will be 93l/s and 120l/s for Catchments 1 and 4 respectively for all rainfall events up to and including the 1 in 100-year +30% event.

### SUDS Selection

- 6.14 The Environment Agency requires SUDS to be considered for inclusion within any surface water drainage strategy. The SUDS techniques suitable for this development have been identified using the selection process defined in CIRIA C697 *The SUDS Manual*.
- 6.15 CIRIA C697, Table 5.2, reproduced in Table 6.2, identifies the types of SUDS components suitable for various development types. The development intentions for the potential area of the allocation are primarily residential; therefore all types of SUDS components, with the exception of the perimeter sand filter, are considered appropriate.
- 6.16 CIRIA C697, Table 5.6 gives an indication of the number of water quality treatment stages will be needed for certain types of development and the sensitivity of the receiving water. At this stage it is anticipated that groundwater and the local surface water sewerage system will be the receptors for surface run-off from any future development. As described above, the potential allocation area is located within Source Protection Zone 3 (Total Catchment); therefore *medium* sensitivity has been assumed.
- 6.17 Based on this, according to CIRIA C697, Table 5.6, the minimum number of treatment stages to be provided using SUDS for flows generated by residential areas and community facilities is 1 to 2.
- 6.18 The parameters for the selection of SUDS components for the potential allocation area using CIRIA C697, Table 5.4, which is reproduced in Table 6.3, are as follows:

- Soils: Permeable
- Area draining to a single SUDS component: 0 – 2ha  
*It is assumed that the SUDS will be distributed throughout any future development therefore the area draining to each will be small.*
- Minimum depth to watertable: >1m
- Site slope: >5%
- Available head: 0 – 1m
- Available space: High

**Table 6.2 CIRIA C697, Table 5.2 Land use selection matrix**

SUDS group	Technique	Low density	Residential	Local roads	Commercial	Hotspots	Construction site	Brownfield	Contaminated land
Retention	Retention pond	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y	Y <sub>2</sub>
	Subsurface storage	Y	Y	Y	Y	Y	Y <sub>3</sub>	Y	Y
Wetland	Shallow wetland	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Extended detention wetland	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Pond/wetland	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Pocket wetland	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Submerged gravel wetland	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Wetland channel	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
Infiltration	Infiltration trench	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	N	N	Y	Y <sub>4</sub>
	Infiltration basin	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	N	N	Y	Y <sub>4</sub>
	Soakaway	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	N	N	Y	Y <sub>4</sub>
Filtration	Surface sand filter	N	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Sub-surface sand filter	N	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Perimeter sand filter	N	N	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Bioretention/filter strip	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
	Filter trench	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	N	Y	Y <sub>2</sub>
Detention	Detention basin	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>1,2</sub>	Y <sub>3</sub>	Y	Y <sub>2</sub>
Open channels	Conveyance swale	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y	Y <sub>2</sub>
	Enhanced dry swale	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y	Y <sub>2</sub>
	Enhanced wet swale	Y	Y	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>1</sub>	Y <sub>3</sub>	Y	Y <sub>2</sub>
Source control	Green roof	Y	Y	N	Y <sub>2</sub>	Y	N	Y	Y
	Rainwater harvesting	Y	Y	N	Y <sub>2</sub>	N	N	Y	Y
	Pervious pavements	Y	Y	N	Y <sub>2</sub>	Y <sub>1</sub>	N	Y	Y <sub>2</sub>

Y: Yes N: No

<sup>1</sup> May require two treatment train stages, depending on type and intensity of road use and receiving water sensitivity

<sup>2</sup> May require three treatment train stages, depending on receiving watercourse sensitivity

<sup>3</sup> Will require draw-down and rehabilitation following construction activities, prior to use as a permanent drainage system

<sup>4</sup> Providing designs prevent mobilisation of contamination

Source: CIRIA C697 The SUDS Manual (2007)

**Table 6.3 CIRIA C697, Table 5.4 Site characteristics selection matrix**

SUDS group	Technique	Soils		Area draining to a single SUDS component		Minimum depth to water table		Site slope		Available head		Available space	
		Impermeable	Permeable	0 - 2ha	>2ha	0 - 1m	>1m	0 - 5%	>5%	0 - 1m	1 - 2m	Low	High
Retention	Retention pond	Y	Y <sub>1</sub>	Y	Y <sub>5</sub>	Y	Y	Y	Y	Y	Y	N	Y
	Subsurface storage	Y	Y	Y	Y <sub>5</sub>	Y	Y	Y	Y	Y	Y	Y	Y
Wetland	Shallow wetland	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	Y <sub>6</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	N	Y
	Extended detention wetland	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	Y <sub>6</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	N	Y
	Pond/wetland	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	Y <sub>6</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	N	Y
	Pocket wetland	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	N	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	Y	Y
	Submerged gravel wetland	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	Y <sub>6</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	N	Y
	Wetland channel	Y <sub>2</sub>	Y <sub>4</sub>	Y <sub>4</sub>	Y <sub>6</sub>	Y <sub>2</sub>	Y <sub>2</sub>	Y	N	Y	Y	N	Y
Infiltration	Infiltration trench	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y
	Infiltration basin	N	Y	Y	Y <sub>5</sub>	N	Y	Y	Y	Y	N	N	Y
	Soakaway	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y
Filtration	Surface sand filter	Y	Y	Y	Y <sub>5</sub>	N	Y	Y	N	N	Y	N	Y
	Sub-surface sand filter	Y	Y	Y	N	N	Y	Y	N	N	Y	Y	Y
	Perimeter sand filter	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y
	Bioretention/filter strip	Y	Y	Y	N	N	Y	Y	N	Y	Y	N	Y
	Filter trench	Y	Y <sub>1</sub>	Y	N	N	Y	Y	N	Y	Y	Y	Y
Detention	Detention basin	Y	Y <sub>1</sub>	Y	Y <sub>5</sub>	N	Y	Y	Y	N	Y	N	Y
Open channels	Conveyance swale	Y	Y	Y	N	N	Y	Y	N <sub>3</sub>	Y	N	N	Y
	Enhanced dry swale	Y	Y	Y	N	N	Y	Y	N <sub>3</sub>	Y	N	N	Y
	Enhanced wet swale	Y <sub>2</sub>	Y <sub>4</sub>	Y	N	Y	Y	Y	N <sub>3</sub>	Y	N	N	Y
Source control	Green roof	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	Rainwater harvesting	Y	Y	Y	N	Y	Y	Y	Y				
	Pervious pavements	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y

Y: Yes N: No

<sup>1</sup> With liner

<sup>2</sup> With surface baseflow

<sup>3</sup> Unless follows contours

<sup>4</sup> With liner and constant surface baseflow, or high ground water table

<sup>5</sup> Possible, but not recommended (implies appropriate management train not in place)

<sup>6</sup> Where high flows are diverted around SUDS component.

Source: CIRIA C697 The SUDS Manual (2007)

- 6.19 Based on this initial selection process, the following SUDS techniques are identified as suitable for the potential allocation area:
- Retention pond
  - Sub-surface storage
  - Infiltration trench
  - Infiltration basin
  - Soakaway
  - Green roof
  - Rainwater harvesting
- 6.20 In addition to these, despite being rejected by the selection process, it is also considered that permeable paving and open channels could be used within the drainage system of any future development. The inclusion of these will require appropriate engineering design to ensure their correct operation; however, they will provide further options for achieving the necessary number of treatment train elements described in paragraph 6.17.
- 6.21 Within any future development in the potential allocation area, it is anticipated that the majority of the required surface water storage will be provided by open features such as ponds or basins. These will also provide for large scale infiltration into the underlying strata. Sub-surface storage may also be used to provide local storage in areas where space is not available to provide open features; however, these will connect via the drainage network into open features.
- 6.22 The underlying strata suggest that infiltration will be viable although testing is required to confirm this. It is anticipated that soakaways and other infiltration-enabling features will be distributed across the areas where infiltration is established to be viable. These features will also be connected into the wider development drainage network to enable large rainfall events, which may exceed the infiltration capacity of the ground, to be safely managed.
- 6.23 The use of green roofs on the proposed residential properties is unknown due to uncertainties regarding ongoing future maintenance that the householders will need to undertake to ensure that they remain operational and effective into the future. Green roofs may be suitable for the community facilities where a maintenance company can be employed to undertake the necessary maintenance.
- 6.24 Large-scale, formal rainwater harvesting for re-cycling into the private properties is not proposed for this development due to uncertainties regarding future maintenance. However, all properties will be fitted with rainwater butts on appropriate downpipes. It may be possible to incorporate such systems into the community facilities where ongoing maintenance is more likely. When undertaking the drainage design for any future development, due to uncertainty in the maintenance of any rainwater harvesting and their consequential status at the time of a rainfall event, the storage that these will provide will not be included in any calculations.
- 6.25 Permeable paving is considered suitable for proposed parking and other private areas. The wider use of such surfacing is subject to the adoption requirements of the local highway authority. The permeable paving will provide treatment for flows passing through it. The private parking areas are considered to present a higher risk of surface run-off pollution due to substances dripping from parked vehicles and tyre and brake material deposited as vehicles manoeuvre.



6.26 The specific identification of SUDS to be used on the potential area of the allocation is dependent on the development layout and future discussions with the various adopting authorities such as Thames Water and Hertfordshire County Council. The list of suitable and possibly suitable SUDS techniques will be refined as the development planning process progresses.

#### Storage Requirements

6.27 To achieve the maximum permitted discharge rates stated in paragraph 6.13, storage will need to be incorporated into the proposed surface water drainage system. As previously described, infiltration as a means of surface water disposal is considered viable; however, no infiltration testing has been undertaken to determine the infiltration rate for different parts of the potential allocation area. Therefore, the calculations undertaken to produce the results given in this section assume that infiltration has not been used and hence give a worst-case scenario for the storage volume that will need to be provided. This section also includes details of the area that the required storage will occupy and provides an indication of where the storage should be located.

6.28 The Concept Plan for the potential area of the allocation illustrates areas of landscaping and public open space that would be suitable for locating ponds and other storage features within. The Concept Plan has been used to determine which areas are served by each storage facility. The storage calculations have been based on the following assumptions:

- The development proposals broadly comprise 900 dwellings and a primary school (as described in Section 4).
- The housing density within each residential development area is the same.
- All residential development areas will become 65% impermeable following development (based on a medium density layout approximating to 30dw/ha).
- The primary school has a total area of 2.5ha which is 50% impermeable. It is located within the catchment draining to Outfall 2.
- The land beyond the residential development areas and the school will be 15% impermeable to allow for access roads and other impermeable areas that may be placed within it.

6.29 In order to make optimum use of the available open space within any future development, the storage facilities are proposed to be distributed across the potential allocation area. Each storage area will control the flows from a defined section of the future development and will be linked to other facilities to convey flows to the outfall. To meet Environment Agency requirements, the surface water storage facilities must be capable of containing the 1 in 100-year rainfall event with a +30% adjustment for climate change.

6.30 Drawing number MID3160/002 in **Appendix B** illustrates the development catchments draining to each storage facility, and how the storage will be linked to enable flows to reach the outfall. Table 6.4 shows the post-development impermeable areas based on the assumptions outlined above that have been used to determine the storage volumes.

**Table 6.4 Post-development impermeable areas**

Development catchment	Total area (ha)	Gross areas (ha)			Impermeable area (ha)			
		Housing	School	Open space	Housing	School	Open space	Total
1	9.78	4.32	0.00	5.46	2.81	0.00	0.82	3.63
2	7.35	4.22	2.50	0.63	2.74	1.25	0.09	4.09
3	12.16 <sub>1</sub>	4.49	0.00	7.67	2.92	0.00	1.15	4.07
4	22.22	13.04	0.00	9.18	8.48	0.00	1.38	9.85
<b>Total</b>	<b>51.51</b>	<b>26.07</b>	<b>2.50</b>	<b>25.44</b>	<b>16.95</b>	<b>1.25</b>	<b>3.82</b>	<b>22.01</b>

<sup>1</sup> Total area omits the land immediately to the south of Pouchen End Farm which is not proposed for development and drains away from the natural outfall from the rest of the potential allocation area.

- 6.31 The 1 in 100-year +30% storage volumes have been calculated using MicroDrainage Source Control; the calculations are shown in **Appendix D**. As the locations, types and configuration of the proposed storage structures are not known, they have been modelled as an open structure with the flow rates limited using a simple head-discharge relationship.
- 6.32 A single storage facility has been assumed for each development catchment although, in reality, the storage is likely to be distributed across a number of facilities. As described in paragraph 6.27, the storage volume calculations ignore infiltration and hence are considered to be a worst-case scenario. Infiltration will enable the storage volume to be reduced; however, due to wide variations in the infiltration capacity of chalk, it has not been possible to provide a reasonable indication of the likely volume reduction that could be achieved.
- 6.33 The land take calculations assume a maximum storage depth of 1.0m and include a 30% allowance for earthworks, maintenance access strips and other associated landscaping features. Drawing number MID3160/002 in **Appendix B** illustrates the land take of the required storage volumes.
- 6.34 It is anticipated that the majority of the required storage volume will be provided by SUDS features such as ponds and open channels. In addition to storage, these features will also provide a water treatment function thereby forming part of the SUDS treatment train. In addition, where ground conditions are appropriate, these features will also facilitate infiltration of surface water into the groundwater.

#### **Outfall 1**

- 6.35 The maximum permitted discharge rate from Outfall 1 is 93l/s up to and including the 1 in 100-year +30% event. Only development catchment 4 drains to this outfall; therefore, as shown in Table 6.4, the impermeable area draining to this outfall is 9.85ha. This development catchment includes the existing depression, as described in paragraph 3.32. While as much of the existing depression as possible is intended to be retained, this part of the potential allocation area also includes the highway access onto Long Chaulden which will occupy part of the existing depression.
- 6.36 The proposed surface water drainage strategy assumes that the existing depression will be reconfigured and enlarged to form part of the storage needed for this part of the potential allocation area. The remaining storage volume will be provided in a new facility nearby. These two storage areas will be interlinked in order to enable them to operate as a single facility.

- 6.37 Flows from any future development will either discharge directly into the storage areas or will outfall into the existing ditchcourse running through the centre of the development catchment, as described in paragraphs 3.20 to 3.22. This ditch will be enhanced as necessary as part of any future development to ensure that sufficient capacity is available for the anticipated flows.
- 6.38 It is assumed that the existing outfall structures from the existing depression will be wholly or partially re-used; however, it is possible that these will need to be replaced if they do not meet the required specification or the future development layout requires their relocation.
- 6.39 The calculations show that a total storage volume of 6,075m<sup>3</sup> is required to achieve the maximum permitted discharge rate. Based on the assumptions outlined in paragraph 6.33, an area of land of approximately 0.79ha is required to accommodate this storage.

### **Outfall 2**

- 6.40 The maximum permitted discharge rate from Outfall 2 is 120l/s up to and including the 1 in 100-year +30% event. Development catchments 1, 2 and 3 drain to this outfall with, as shown in Table 6.4, a combined post-development impermeable area of 11.78ha. The development concept for and topography of this part of the potential allocation area is such that a cascaded storage arrangement has been used.
- 6.41 The proposed storage areas are sequentially linked with flow controls between them. The flow controls on each storage area are designed to allow the already attenuated flows from upstream storage areas to pass forward unrestricted while controlling the flows from the development which directly enter the storage area. This enables the maximum permitted discharge rate to be achieved while making efficient use of the available space. The maximum discharge rate from each development catchment is determined by proportioning the total maximum discharge rate for this part of the potential allocation area based on the area of the individual catchments.
- 6.42 The resultant maximum permitted discharge rates, storage volumes and land take requirements are shown in Table 6.5.

**Table 6.5 Surface water outfall 2 surface water storage volumes**

Development catchment	Total area (ha)	Impermeable area (ha)	Pass forward flow from upstream (l/s)	Catchment maximum discharge rate (l/s)	Maximum permitted discharge rate (l/s)	Required storage volume (m <sup>3</sup> )	Land take (ha)
1	9.78	3.63	0	40	40	2,160	0.28
2	7.35	4.09	40	30	70	2,690	0.35
3	12.16	4.07	70	50	120	2,360	0.31
<b>Total</b>	<b>29.29</b>	<b>11.79</b>				<b>7,210</b>	<b>0.94</b>

## Foul Water

### Flow Rates

- 6.43 Based on the development proposals outlined in Section 4, the resultant peak foul water flow rates for each option are shown in Table 6.6. The flow generation data has been obtained from Sewers for Adoption (6<sup>th</sup> Edition) paragraphs 2.12.1 and 2.12.2.

**Table 6.6 Foul water flow rates**

Land use	Flow generation	Quantity	Flow (l/s)
Residential	4000l/dwelling/day	900 dwellings	41.7
Primary school	0.6l/s/ha	2.5ha	1.5
<b>Total</b>			<b>43.2</b>

### Outfall Locations

- 6.44 There are three options available for foul water outfalls from the potential area of the allocation:
1. Single outfall into the existing 225mm diameter foul water sewer within Chaulden Lane.
  2. Single outfall into the existing 225mm diameter foul water sewer within Long Chaulden.
  3. Utilise both outfalls described in Options 1 and 2 together.
- 6.45 The choice of outfall option will depend on available capacity to be advised by Thames Water and constraints such as available space for pumping stations. Options 1, 2 and 3 are illustrated on drawing numbers MID3160/002, 003 and 004 respectively in **Appendix B**.

#### *Option 1*

- 6.46 According to Thames Water sewer records, the most suitable manhole for forming the development outfall for this option would be 1401. This manhole is approximately 1.5m deep and the downstream sewer is 225mm diameter. The peak flow rate that would be discharged to this outfall from the potential area of the allocation is 43.2l/s.
- 6.47 The topography of the potential allocation area is such that development catchments 1, 2 and 3 would be able to drain to this outfall by gravity; however, the land beyond the boundary through which the outfall from the potential allocation area must pass to reach manhole 1401 is too low to enable a gravity connection to be formed. As a result, this outfall will comprise a pumping station and rising main.
- 6.48 In order to discharge foul flows from development catchment 4 to this outfall, a pumping station located adjacent to Long Chaulden is required. This would lift foul flows into the gravity system serving development catchments 1, 2 and 3. Based on the anticipated number of houses (450) within development catchment 4, the peak flow rate from this pumping station will be 20.8l/s.

#### *Option 2*

- 6.49 This option involves the creation of an outfall into the existing 225mm diameter foul water sewer within Long Chaulden. The connection would be made into manhole 3201 which is approximately 4.5m deep. As with Option 1, the peak flow rate that would be discharged to this outfall from the any future development will be 43.2l/s.

6.50 The proposed outfall is sufficiently deep for development catchment 4 drain in its entirety to it by gravity. Foul flows from development catchments 1, 2 and 3 will need to be pumped from a location adjacent to Chaulden Lane into the gravity system draining directly to the outfall.

### **Option 3**

6.51 Option 3 is a combination of Options 1 and 2. This option will require less pumping as a greater proportion of the potential allocation area can drain to an outfall by gravity. It will still be necessary to use a pumping station to discharge flows into the sewer within Chaulden Lane; however, pumping to transfer flows between catchments is not needed.

6.52 The flow rate to each outfall is dependent on the number of properties connected to each. Development catchment 4 will drain to Long Chaulden and is assumed to contain 450 properties. Development catchments 1, 2 and 3 together are also assumed to contain 450 properties and drain to Chaulden Lane. This gives the following peak flow rates:

- Long Chaulden: 20.8l/s
- Chaulden Lane: 22.3l/s

6.53 This is the preferred option on the basis that the development flows are more distributed across the existing foul water sewerage network and that less pumping is required. The distribution of flows between the two outfalls is subject to discussion with Thames Water and the positioning of houses within any future development.

### **Off-site Issues**

6.54 Thames Water has advised that there are concerns with regard to the capacity available within the local foul water sewerage network to accept flows of this magnitude from the potential allocation area. Following advice from Thames Water, a developer funded impact study will be necessary to establish the available capacity and the extents of any off-site upgrade works that will need to be completed.

6.55 A review of the *Dacorum Borough Council, St Albans City and District Council, Three Rivers District Council, Watford Borough Council, Welwyn Hatfield Borough Council Water Cycle Study – Scoping Study* (April 2010) has shown that there are capacity issues both within the strategic foul water sewerage network and at Maple Lodge Waste Water Treatment Works (WwTW) where sewage from Hemel Hempstead is currently sent for treatment. Various options are being considered to increase treatment capacity including changing the layout of Maple Lodge WwTW to increase capacity and transferring flows to another works. The above document estimates that network and treatment capacity improvements of this type and scale could take up to 10 years to deliver.

6.56 Given the estimated timescales for the delivery of capacity improvements, it is possible that these would not be in place by the time development is started or available to serve the early phases. To cover this eventuality, the viability of constructing a temporary waste water treatment works as part of any future development to serve the initial phases has been investigated. This facility would remain operational until Thames Water has completed the necessary upgrades whereupon the development would be connected to the public foul water sewerage system and the on-site works decommissioned. In order for an on-site treatment works to be used, the Option 1 outfall configuration described above would be required.

- 6.57 A specialist supplier has been contacted to obtain outline information regarding the scale of works that would be needed. The information supplied has been based on assumptions relating to the quality of discharged effluent, sludge handling and pumping. To minimise the scale of the works, a Sequencing Batch Reactor plant is proposed which would involve above ground tanks. A plant sufficient to treat the flows from the whole development would require an area of land approximately 60m square. The cost of the works is estimated to be between £1.0m and £1.5m. If the development programme is such that the public sewerage system capacity improvements would be undertaken before all the development phases are completed, it is possible that the scale of the on-site works could be reduced accordingly as the number of dwellings served would be lower.
- 6.58 Further discussions with the Environment Agency are required to agree the consent details for the treated effluent to be discharged into the River Bulbourne. In addition, the maintenance arrangements for the works will require confirmation. Discussions with Thames Water regarding the future transfer of the development outfall from the works to the public foul water sewerage system are ongoing.
- 6.59 A potential alternative to discharging flows via the existing strategic sewerage network to Maple Lodge WwTW is to construct a dedicated foul water sewer to Berkhamsted WwTW located approximately 2km to the west of the potential area of the allocation. The *Dacorum Borough Council, St Albans City and District Council, Three Rivers District Council, Watford Borough Council, Welwyn Hatfield Borough Council Water Cycle Study – Scoping Study* (April 2010) states that by 2015, it is anticipated that Berkhamsted WwTW will be able to accommodate increased flows due to an increase in its dry weather flow consent volumes. The introduction of this increase is driven by the predicted growth in the Berkhamstead area. The potential allocation area is not within the Berkhamstead area; therefore, for this option to be viable, Thames Water will need to confirm whether the flows from the potential allocation area can be accommodated in addition to those from the predicted growth within Berkhamstead. It is possible that, to ensure capacity is available, some upgrade works will still be required; however, these are likely to be smaller in scale than those at Maple Lodge WwTW and consequentially be completed in a shorter timescale.
- 6.60 If discharging flows to Berkhamsted WwTW is confirmed as viable by Thames Water, the Option 1 outfall configuration described above will be required to form the connection to the works. Due to the works being at a slightly higher level than the outfall from the potential allocation area, flows will need to be pumped via a rising main to the works rather than lifted into a gravity sewer. The rising main would need to be laid along Chaulden Lane, Pouchen End Lane and Pix Farm Lane to reach the works. The viability of this option will need to be confirmed with Thames Water.
- 6.61 From the above it is considered that options exist to accommodate foul water that will ensure development can progress. Issues relating to strategic investment in the sewerage network clearly need to be addressed on a strategic level considering the overall growth planned for the area, taking account of the statutory responsibilities of the relevant undertakers.

## Adoption Issues

- 6.62 It is anticipated that all the drainage for any future development will be offered for adoption to appropriate bodies as set out below:
- Pipework etc. – Thames Water under a S104 Agreement
  - SUDS features – Hertfordshire County Council
- 6.63 Discussions with Thames Water regarding the adoption of the on-site foul water sewerage system draining to an on-site treatment works are ongoing.
- 6.64 Hertfordshire County Council as the Lead Flood Authority under the Flood and Water Management Act 2010 will be responsible for the adoption of any SUDS included within any future development. While they currently do not have the powers or policies to do this, it is anticipated from supplied information that these will be put in place in 2013; therefore, by the time the potential area of the allocation is brought forward for detailed planning, design and construction, a mechanism for SUDS adoption should be in place.

# 7 Conclusions & Recommendations

## Conclusions

### General

- 7.1 The potential area of the LA3 allocation comprises approximately 53.9ha of undeveloped agricultural land bounded to the east by the western edge of Hemel Hempstead and to the west by open fields.
- 7.2 The ground investigation report associated with the northern section of the potential allocation area states that no evidence of contamination has been found. No information relating to the remainder of the potential allocation area is currently available.
- 7.3 The topography of the potential allocation area is gently undulating and comprises two shallow valleys both falling in a generally southerly direction. The total fall from north to south across the potential allocation area is approximately 63m.
- 7.4 The ground conditions within the potential allocation area generally comprise clay overlying chalk; therefore it is concluded that infiltration into the chalk may be a viable means of surface water disposal for any future development.
- 7.5 There are no public surface, foul or combined sewers within the potential allocation area. The nearest public sewers are located within the residential area to the east and south-east, and within Long Chaulden and Chaulden Lane. The sewers in the residential area and Chaulden Lane are small diameter and relatively shallow; within Long Chaulden, the sewers are larger in diameter and considerably deeper.
- 7.6 All the surface water sewers in the area ultimately discharge into the River Bulbourne to the south of the potential allocation area. The foul water sewerage network serving the residential area adjacent to the potential allocation area generally falls in a south-easterly direction and ultimately drains to Maple Lodge WwTW to the south-east.
- 7.7 A well defined ditchcourse runs from north to south through the north-eastern section of the potential allocation area. The channel terminates in a depression located adjacent to Long Chaulden. The purpose of this depression is unknown; however, from information received, it is believed to have been constructed to reduce the risk of surface water flooding affecting the residential area to the south. The depression has a maximum storage volume of 1,500m<sup>3</sup>.
- 7.8 The outlet from the depression connects to a deep (6.5m) manhole containing a vortex flow control; however, the specification of this flow control is currently unknown. A survey has established that the flow control chamber is connected into the local public surface water sewerage system within Long Chaulden via a 675mm diameter pipe.
- 7.9 A second depression has been located within Shrub Hill Common to the south-east of the potential allocation area. Dacorum Borough Council has advised that the purpose of this feature is unknown and that they do not believe there is any physical link between this and the depression within the potential area of the allocation.
- 7.10 The bed rock beneath the potential allocation area (Chalk) is designated a *Principal Aquifer* and is classified as being at *Intermediate* risk of pollution. Therefore, the potential allocation area is located within Source Protection Zone 3 hence there are a number of constraints that would affect the use of infiltration for surface water disposal.



7.11 No groundwater was encountered during the site investigations undertaken within the northern part of the potential allocation area. Groundwater monitoring data from the Environment Agency for locations adjacent to local rivers at levels lower than the potential allocation area show levels close to or at ground level.

### **Flood Risk**

7.12 The potential allocation area is located within Flood Zone 1; therefore, there are no constraints on future development resulting from fluvial flooding. In addition, the potential allocation area is deemed to have satisfied the Sequential Test.

7.13 The aforementioned ditch running through the northern section of the potential allocation area is proposed to be retained following development. Appropriate space will need to be provided to ensure that potential flooding from this feature will not affect adjacent proposed properties.

7.14 There are no substantial paved areas higher than the potential allocation area that could give rise to overland flows from beyond the potential allocation area boundary that could affect any future development.

7.15 The gradient of the potential allocation area is such that surface run-off could flow rapidly through any future development; therefore, it will need to be designed to ensure that appropriate flow routes are provided to direct flows away from properties. Modelling has shown that the two valleys within the potential allocation area are the key overland flow routes with flows generally directed away from adjacent residential areas. Any future development must include features that will prevent overland flows crossing the south-eastern boundary and causing flooding downstream.

7.16 The potential allocation area is remote from any tidally influenced waterbodies; therefore, tidal flooding does not impose any constraints on the potential area of the allocation.

7.17 There are no reports of any sewer flooding in the vicinity of the potential allocation area and the area of Dacorum Borough Council is identified as a low risk area of sewer flooding; therefore, this source of flooding does not place any constraints on future development.

7.18 The topography of the potential allocation area is such that groundwater flooding is considered unlikely to present a significant constraint to development; however, where chalk is exposed at the surface there is possibility that groundwater could emerge if levels become sufficiently high.

7.19 There are no artificially impounded waterbodies at an elevation above the potential allocation area, therefore, flooding from such sources will not impose any constraints on further development.

### **Surface Water**

7.20 The surface run-off from the potential allocation area currently either infiltrates into the ground, flows overland into the ditchcourse leading to the depression or sheds onto adjacent land.

7.21 The existing depression and associated connection into the local surface water sewerage network will be re-used to drain the eastern half of the potential area of the allocation. Development on the western section of the potential allocation area will drain via the local surface water sewerage network into the River Bulbourne. The maximum permitted discharge rates from any future development will be 93l/s and 120l/s for the eastern and western halves of the potential allocation area respectively for all rainfall events up to and including the 1 in 100-year +30% event.

- 7.22 Thames Water has advised that there are concerns with regard to the capacity available within the local sewerage network to accept the flows from any future development within the potential allocation area; therefore, upgrades to the local surface water sewerage network may be required to accommodate future development flows.
- 7.23 The SUDS selection process defined in CIRIA C697 has identified that retention ponds, sub-surface storage, infiltration trenches and basins, soakaways, green roofs and rainwater harvesting are appropriate SUDS techniques. In addition, permeable paving and open channel features are also considered suitable.
- 7.24 The use of green roofs and formal rainwater harvesting systems is likely be restricted to the proposed primary school for ongoing maintenance reasons. All the proposed dwellings will be fitted with water butts.
- 7.25 The SUDS techniques will need to be arranged to ensure that at least two levels of water treatment are provided for all future development run-off in order to provide appropriate protection for groundwater.
- 7.26 Infiltration may be a viable means for disposing of surface water run-off from any future development; however, to date, no infiltration testing has been undertaken to establish the extents to which this may be possible. The proposed drainage system serving the development will incorporate features to enable any available infiltration capacity to be utilised thereby reducing the volume of run-off.
- 7.27 Storage facilities for any future development will be distributed throughout any future development in topographically appropriate locations. These will be inter-connected in order to efficiently use the space available. Total storage volumes of 7,210m<sup>3</sup> and 6,075m<sup>3</sup> are required for the western and eastern areas respectively. These volumes are a worst-case scenario as infiltration is ignored; however, they could be reduced if infiltration is proven to be viable.
- 7.28 As far as is practicable, the existing depression is to be retained post-development. It is likely that some modifications will be necessary to enhance the volume and to account for potential encroachment from the proposed highway access from Long Chaulden.
- 7.29 It is anticipated that most of the storage will be provided through the use of open features which will also provide a water quality improvement and, if ground conditions are appropriate, infiltration opportunities.

#### **Foul Water**

- 7.30 The potential area of the allocation will generate a peak foul water flow rate of 43.2l/s.
- 7.31 Three outfall options are available to discharge foul water from any future development. These involve discharging flows to public foul water sewers in either Long Chaulden or Chaulden Lane, or both. The options involving just a single outfall will require pumping stations to transfer sewage within any future development. The use of both outfall locations simultaneously to distribute flows between them is the preferred option.
- 7.32 Thames Water has advised that there are concerns regarding the capacity available within the local foul water sewerage network and at Maple Lodge WwTW to accept flows of this magnitude. Off-site improvement works may be required. A developer funded impact study will be necessary to establish available capacity and the extents of any required upgrade works.

- 7.33 The timescales for Thames Water to provide sufficient off-site capacity to deal with growth at Hemel Hempstead (including this allocation) could be around 10 years and hence may not correlate with the preferred development programme for the LA3 allocation. To address this, the viability of a temporary on-site treatment works has been considered. This will require an area measuring approximately 60m square and cost between £1.0m and £1.5m. Discussions with the Environment Agency are required to agree the consent details for the treated effluent to be discharged into the River Bulbourne.
- 7.34 An alternative option is to discharge flows to Berkhamstead WwTW which is reported to be likely to have sufficient capacity although some small scale upgrade work may be needed. Flows from the potential allocation area would need to be pumped 2km via a dedicated pipeline to reach the works.
- 7.35 It is anticipated that Thames Water will adopt the proposed pipework and other ancillary structures comprising any future development drainage system under a Section 104 Agreement. Hertfordshire County Council, as Lead Local Flood Authority, will adopt the SUDS features.

## Recommendations

- 7.36 Infiltration testing within the chalk in accordance with BRE Digest 365 should be undertaken to confirm whether infiltration is a viable means of surface water disposal for the potential area of the allocation.
- 7.37 The specification of the existing vortex flow control immediately downstream of the existing depression should be investigated to ascertain whether it will be suitable for use by any future development.
- 7.38 Thames Water should be instructed to undertake a developer-funded impact study to establish the capacity available in the local sewerage networks and treatment works, and the extents of any off-site improvement works that may be necessary.
- 7.39 This report should be updated following receipt of information from Thames Water pertaining to adoption issues associated with a temporary on-site treatment works and the potential for discharging flows to Berkhamstead WwTW.



# Appendix A

## Correspondence

**Paul Birkenshaw**

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**From:** NET Enquiries [NETenquiries@environment-agency.gov.uk]  
**Sent:** 11 May 2011 10:24  
**To:** Chris Hughes  
**Subject:** NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.  
**Attachments:** Hemel Hempstead FRA site location plan.docx; Copyright Statement and Disclaimer.pdf; FRA-FCA advisory text.pdf

Dear Mr Hughes

**Proposed development at Fields End Lane, Hemel Hempstead, HP1**

Thank you for your enquiry. The site in question is outside any known main river flood plain. This means that the chance of river flooding is less than 0.1% in any given year. I have no record of river flooding at this site.

We advise you to contact the local water company regarding previous or potential flooding from sewers. You may also wish to contact the local authority regarding flooding from any non-main rivers or surface water runoff.

You may benefit further from free pre-application advice from our Planning Liaison Team. In the first instance, please refer to the Flood Risk Standing Advice section of our website at <http://www.environment-agency.gov.uk/research/planning/33098.aspx>

If the Advice does not answer your enquiry, please complete and return a pre-planning enquiry form which can be downloaded from: <http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Please provide as much information on the form as possible regarding the site and the proposed development. It is essential that you provide us with the full address (with postcode), site size and plan, distance from any local watercourse and previous use of the site. This should ensure that we provide you with relevant advice.

Please submit to [colneplanning@environment-agency.gov.uk](mailto:colneplanning@environment-agency.gov.uk)

If you would like to speak to them in the meantime, please call 01707 632332.

Our Planning team will send their planning advice within 21 days of receiving your form.

If I can be of any further help, please contact me.

Yours sincerely

**Annette Smith**  
**External Relations Officer**  
Direct dial 01707 632301  
Direct fax 01707 632 610  
Direct email [NETenquiries@environment-agency.gov.uk](mailto:NETenquiries@environment-agency.gov.uk)

**We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive.**

<https://web.questback.com/isa/qbv.dll/SQ?q=8w2Qkfx%2BivseokDpT0B63lh1YXluaKKXuf2xnWFtQPwSWG%3D%3D>

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**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 11 May 2011 10:12  
**To:** NET Enquiries  
**Subject:** RE: NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Annette,

Please find attached the site plan for the application for Fields End Lane, Hemel Hempstead.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

[D] 0121 230 6017  
[T] 0121 230 6010  
[F] 0121 230 6011  
[W] <http://www.jmp.co.uk>

Please consider the environment before printing this email.

---

**From:** NET Enquiries [mailto:NETenquiries@environment-agency.gov.uk]  
**Sent:** 11 May 2011 10:07  
**To:** Chris Hughes  
**Subject:** NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Dear Mr Hughes

Thank you for your enquiry. Please could you forward a copy of the site plan for your proposed development, as it was not with your email.

Many thanks

Annette

**Annette Smith**  
**External Relations Officer**  
Direct dial 01707 632301  
Direct fax 01707 632 610  
Direct email [NETenquiries@environment-agency.gov.uk](mailto:NETenquiries@environment-agency.gov.uk)

---

**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 06 May 2011 12:22  
**To:** Enquiries, Unit  
**Subject:** RE: ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Hi,

Please find the responses to the queries from the below email, reference number 110505/AR08.

- Post code = HP1  
12 figure OS site grid reference for a point near the centre of the site = 503118,207487
- No particular river in mind. Generally, any information which could benefit the FRA would be appreciated.
- No further information comes to mind aside from what was sent with the application.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

[D] 0121 230 6017  
[T] 0121 230 6010  
[F] 0121 230 6011  
[W] <http://www.jmp.co.uk>

Please consider the environment before printing this email.

---

**From:** Enquiries, Unit [mailto:enquiries@environment-agency.gov.uk]  
**Sent:** 05 May 2011 15:14  
**To:** Chris Hughes  
**Subject:** RE: ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Dear Chris,

Thank you for your enquiry.

In order for us to assist you with your request, we require further information. Please respond to this email, quoting enquiry reference number 110505/AR08, with the following information:

- \* Full/additional address details of the site in question
  - \* Does the information required relate to a particular river or stretch of river?
  - \* Any additional information you believe may be useful so that we can clarify your enquiry.
- Once we have received the above information, we will forward the details of your enquiry to the relevant person/team.

We look forward to receiving your response.

Warm regards

Aimee Reed  
Customer Service Advisor  
Environment Agency  
Customer Contact Centre  
Part of National Operations  
Quadrant 2  
Parkway Avenue  
Parkway Business Park  
Sheffield  
S9 4WF

03708 506506  
7113063



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**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]

**Sent:** 04 May 2011 15:53

**To:** Enquiries, Unit

**Subject:** ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Click [here](#) to report this email as spam.

Sir/Madam,

JMP, on behalf of our client, is investigating the flooding and drainage constraints which will impact upon the future development of a site near Fields End Lane, Hemel Hempstead as shown on the attached location plan. The output of this investigation will support the promotion of the site in the LDF.

We have a number of queries that we hope you can assist us with.

- 1 - Could you confirm that the site is located entirely within Flood Zone 1?
- 2 - What will be the maximum permitted post-development surface water discharge rate from the site?
- 3 - Do you have any records of flooding on or near to the site, or within the local area?
- 4 - Are there any sources of flooding which could affect the site that the Environment Agency believes will require specific consideration?
- 5 - Are there any other issues that the Environment Agency believes should be incorporated within our drainage and flooding constraints investigation?
- 6 - Are there any issues associated with groundwater in the area that we should be aware of? A desk study has shown that the ground beneath the site is clay to a depth of approximately 18m overlying chalk; therefore, we anticipate that the site will have limited permeability while being underlain by an aquifer.

Thank you for your assistance. If you have any queries please contact either Paul Birkenshaw or myself.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

[D] 0121 230 6017  
[T] 0121 230 6010  
[F] 0121 230 6011  
[W] <http://www.jmp.co.uk>

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JMP Consultants Ltd  
Registered office: Mercantile Chambers, 53 Bothwell Street, Glasgow, G2 6TS  
Registration number: SC88006

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Chris Hughes  
J M P Consulting  
85-89 Colmore Row  
Birmingham  
West Midlands  
B3 2BB

**Our ref:** NE/2011/111963/01-L01  
**Your ref:** MID3160 L.002  
**Date:** 2 June 2011

Dear Chris

**Residential and associated amenity development at land at Fields End Lane, Hemel Hempstead.**

Thank you for your recent email consultation. We appreciate the opportunity to comment on your proposals in their early stages.

Flood Risk

Although we can confirm the site is not at risk of fluvial flooding, you should reference Dacorum Borough Council's Strategic Flood Risk Assessment (SFRA) for details of any other known flood risk. The SFRA will also provide guidance on flood risk policies which must also be incorporated into your proposals.

Greenfield run-off rates need to be achieved on this site. This is normally in the order of 5 litres per second per hectare. I attach the SuDS hierarchy which illustrates the benefits of different drainage strategies available to you.

The sloping nature of the site will have a bearing on the design of the surface water drainage system and this should be considered at an early stage. You must ensure that the layout of the development does not compromise the options for the sustainable drainage system (SuDS). This will need to be evaluated as part of the FRA.

Any drainage design must be protective of the groundwater and in line with our '[Groundwater Protection: policy and practice \(GP3\)](#)' for the use of infiltration techniques to be approved. Only clean, uncontaminated water should be discharged into the ground.

In this development area we feel it is essential to provide a green link through the development, linking the Local Nature Reserve to open countryside. This would provide an excellent opportunity for ponds and wetlands as part of a sustainable drainage scheme. I would be happy to meet with you to discuss this further.

Environment Agency  
Apollo Court, 2 Bishop Square Business Park, Hatfield, Hertfordshire, AL10 9EX.  
Customer services line: 08708 506 506  
Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)



Green roofs and green walls could be used throughout your site, as could basins and ponds. These would not only attenuate surface water run-off, but also provide landscape and wildlife benefits, and could provide educational benefits if your proposals continue to include a school. Hardstanding areas, such as residential driveways and pathways, could be constructed from porous paving or gravel to help water infiltrate rather than run-off. If particular drainage options are not suitable on your site, you must justify this as part of your Flood Risk Assessment (FRA).

### Water Efficiency

This site is located within an area of 'serious' water stress. This means there is a high population with high water demands and limited water availability – it does not reflect water companies' ability to supply water.

We therefore suggest you investigate the use of water efficiency measures and aim to achieve 105 litres/head/day (l/h/d), equivalent to level 3/4 for water within the Code for Sustainable Homes. This is a recommendation of the Scoping Report for the Dacorum, St Albans, Three Rivers, Welwyn and Hatfield and Watford joint Water Cycle Study.

### Groundwater protection

You will need to produce a basic Preliminary Risk Assessment (PRA) to assess if land contamination may be present at the site. You can submit the PRA to us before you formally apply for planning permission. This way we can address any issues prior to planning permission being determined

You should also confirm with Thames Water that there will be sewage capacity for this development site.

We would be happy to be involved in future pre-application discussion including drafts of your FRA and PRA prior to their submission as part of a formal planning application.

Yours sincerely

**Deborah Horner**  
**Planning Liaison Officer**

Direct dial 01707 632491

Direct e-mail [colneplanning@environment-agency.gov.uk](mailto:colneplanning@environment-agency.gov.uk)

## Paul Birkenshaw

---

**From:** NET Enquiries [NETenquiries@environment-agency.gov.uk]  
**Sent:** 25 April 2012 16:05  
**To:** Paul Birkenshaw  
**Subject:** NE30596 BC - Proposed development at Fields End Lane, Hemel Hempstead.  
**Attachments:** Groundwater data.xls; Areas Susceptible to Surface Water Flooding Map.pdf; Flood Map for Surface Water – 1 in 200 chance rain.pdf; Flood Map for Surface Water – 1 in 30 chance rain.pdf; Surface Water letter.pdf; VAT receipt.pdf; Standard Notice.pdf

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Dear Mr. Paul Birkenshaw

### Enquiry regarding proposed development at Fields End Lane, Hemel Hempstead, Herts

Thank you for your enquiry. I have checked with our Flood Risk Mapping and Data Management Team and there is no relevant modelling data for the river Bulbourne. Please find attached surface water flooding maps and groundwater level information from the nearest hydrometric sites. The site in question is outside any known main river flood plain. This means that the chance of river flooding is less than 0.1% in any given year. I have no record of river flooding at this site or no record of any groundwater flooding incidents.

We advise you to contact the local water company regarding previous or potential flooding from sewers. You may also wish to contact the local authority regarding flooding from any non-main rivers or surface water runoff.

If I can be of any further help, please contact me.

Yours sincerely

**Becki Clark**  
**External Relations Officer**  
Direct dial 01707 632302  
Direct fax 01707 632 610  
Direct email [NETenquiries@environment-agency.gov.uk](mailto:NETenquiries@environment-agency.gov.uk)

---

**From:** Paul Birkenshaw [mailto:Paul.Birkenshaw@jmp.co.uk]  
**Sent:** 29 March 2012 09:04  
**To:** planning, colne  
**Subject:** RE: NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Reference: MID3160-Eo.045/pjb

Dear Sir,

We have previously been in contact with the Environment Agency with regard to a site on the western edge of Hemel Hempstead. An e-mail trail of previous correspondence is provided below. The reference number associated with our previous consultations is NE/2011/111963/01.

Since our initial consultations, the site we have been investigating has expanded significantly bringing together several land owners who wish to promote the site for development. The site is being considered for inclusion within the Dacorum Core

Strategy and through this process has been given the reference LA3. A map showing the location of the site and boundary of the enlarged site is attached.

At this stage we are seeking to establish the constraints that will affect the future development of the site with particular reference to flooding and drainage matters.

We have completed a Pre-planning Enquiry form, which is attached to this e-mail, in order to obtain the Agency's views relating to the proposed development. In addition to this we have the following queries that we would appreciate your assistance with answering:

- Please could you provide a price for the supply of Product 4 data for the River Bulbourne at the southern end of the site?
- Please can you confirm the approach that we should use in order to establish the maximum permitted discharge rate from the site?
- Does the Agency have any records of flooding from any source either on or near to the site?
- Are there any sources of flooding that you consider we should place particular emphasis on investigating as they could impact upon the site?
- Are you aware of any other issues related to flooding and drainage that we should consider within our development constraints investigation?
- We are aware that the geology underlying the site is chalk. Does the Agency have any records of groundwater flooding or groundwater level information in the vicinity of the site?
- Are there any constraints on the use of infiltration that we should be aware of when considering the potential drainage solutions for this site?

Thank you for your assistance with the above. If you have any queries, please give me a call on one of the numbers below.

Regards,  
Paul Birkenshaw  
Principal Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

[D] 0121 230 6039  
[T] 0121 230 6010  
[M] 07792 903558  
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---

**From:** NET Enquiries [mailto:NETenquiries@environment-agency.gov.uk]  
**Sent:** 11 May 2011 10:24  
**To:** Chris Hughes  
**Subject:** NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Dear Mr Hughes

## **Proposed development at Fields End Lane, Hemel Hempstead, HP1**

Thank you for your enquiry. The site in question is outside any known main river flood plain. This means that the chance of river flooding is less than 0.1% in any given year. I have no record of river flooding at this site.

We advise you to contact the local water company regarding previous or potential flooding from sewers. You may also wish to contact the local authority regarding flooding from any non-main rivers or surface water runoff.

You may benefit further from free pre-application advice from our Planning Liaison Team. In the first instance, please refer to the Flood Risk Standing Advice section of our website at <http://www.environment-agency.gov.uk/research/planning/33098.aspx>

If the Advice does not answer your enquiry, please complete and return a pre-planning enquiry form which can be downloaded from: <http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Please provide as much information on the form as possible regarding the site and the proposed development. It is essential that you provide us with the full address (with postcode), site size and plan, distance from any local watercourse and previous use of the site. This should ensure that we provide you with relevant advice.

Please submit to [colneplanning@environment-agency.gov.uk](mailto:colneplanning@environment-agency.gov.uk)

If you would like to speak to them in the meantime, please call 01707 632332.

Our Planning team will send their planning advice within 21 days of receiving your form.

If I can be of any further help, please contact me.

Yours sincerely

**Annette Smith**  
**External Relations Officer**  
Direct dial 01707 632301  
Direct fax 01707 632 610  
Direct email [NETenquiries@environment-agency.gov.uk](mailto:NETenquiries@environment-agency.gov.uk)

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---

**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 11 May 2011 10:12  
**To:** NET Enquiries  
**Subject:** RE: NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Annette,

Please find attached the site plan for the application for Fields End Lane, Hemel Hempstead.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

[D] 0121 230 6017  
[T] 0121 230 6010  
[F] 0121 230 6011  
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**From:** NET Enquiries [mailto:NETenquiries@environment-agency.gov.uk]  
**Sent:** 11 May 2011 10:07  
**To:** Chris Hughes  
**Subject:** NE27295/AS - 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Dear Mr Hughes

Thank you for your enquiry. Please could you forward a copy of the site plan for your proposed development, as it was not with your email.

Many thanks

Annette

**Annette Smith**  
**External Relations Officer**  
Direct dial 01707 632301  
Direct fax 01707 632 610  
Direct email [NETenquiries@environment-agency.gov.uk](mailto:NETenquiries@environment-agency.gov.uk)

---

**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 06 May 2011 12:22  
**To:** Enquiries, Unit  
**Subject:** RE: ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Hi,

Please find the responses to the queries from the below email, reference number 110505/AR08.



- Post code = HP1  
12 figure OS site grid reference for a point near the centre of the site = 503118,207487
- No particular river in mind. Generally, any information which could benefit the FRA would be appreciated.
- No further information comes to mind aside from what was sent with the application.

Regards,

Chris Hughes

Engineer

JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

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[T] 0121 230 6010

[F] 0121 230 6011

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**From:** Enquiries, Unit [mailto:enquiries@environment-agency.gov.uk]

**Sent:** 05 May 2011 15:14

**To:** Chris Hughes

**Subject:** RE: ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

Dear Chris,

Thank you for your enquiry.

In order for us to assist you with your request, we require further information. Please respond to this email, quoting enquiry reference number 110505/AR08, with the following information:

\* Full/additional address details of the site in question

\* Does the information required relate to a particular river or stretch of river?

\* Any additional information you believe may be useful so that we can clarify your enquiry.

Once we have received the above information, we will forward the details of your enquiry to the relevant person/team.

We look forward to receiving your response.

Warm regards

Aimee Reed

Customer Service Advisor

Environment Agency

Customer Contact Centre

Part of National Operations

Quadrant 2

Parkway Avenue

Parkway Business Park

Sheffield

S9 4WF

03708 506506

7113063

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**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 04 May 2011 15:53  
**To:** Enquiries, Unit  
**Subject:** ref 110505/AR08 Proposed development at Fields End Lane, Hemel Hempstead.

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Sir/Madam,

JMP, on behalf of our client, is investigating the flooding and drainage constraints which will impact upon the future development of a site near Fields End Lane, Hemel Hempstead as shown on the attached location plan. The output of this investigation will support the promotion of the site in the LDF.

We have a number of queries that we hope you can assist us with.

- 1 - Could you confirm that the site is located entirely within Flood Zone 1?
- 2 - What will be the maximum permitted post-development surface water discharge rate from the site?
- 3 - Do you have any records of flooding on or near to the site, or within the local area?
- 4 - Are there any sources of flooding which could affect the site that the Environment Agency believes will require specific consideration?
- 5 - Are there any other issues that the Environment Agency believes should be incorporated within our drainage and flooding constraints investigation?
- 6 - Are there any issues associated with groundwater in the area that we should be aware of? A desk study has shown that the ground beneath the site is clay to a depth of approximately 18m overlying chalk; therefore, we anticipate that the site will have limited permeability while being underlain by an aquifer.

Thank you for your assistance. If you have any queries please contact either Paul Birkenshaw or myself.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

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[T] 0121 230 6010  
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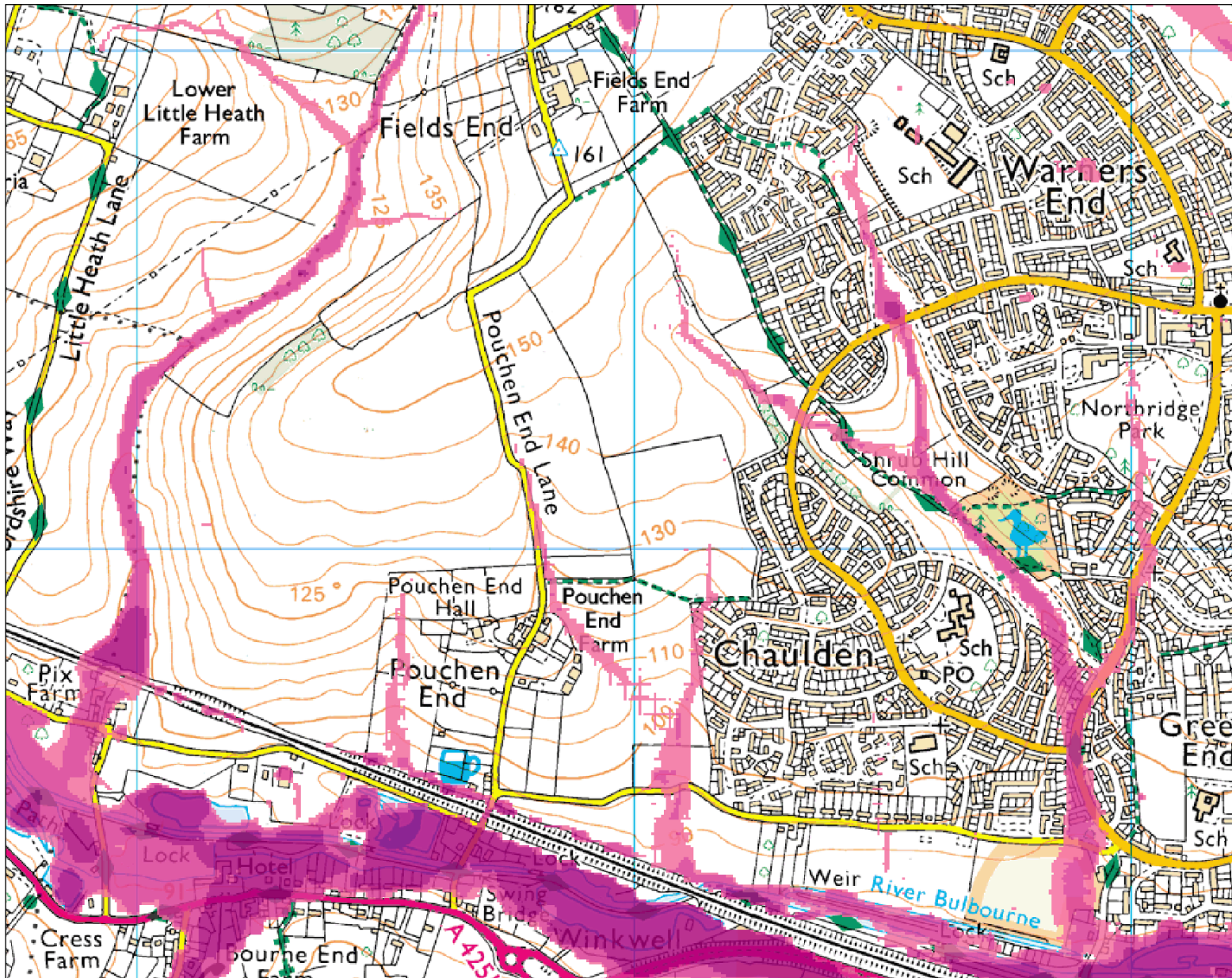
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# Map showing Areas Susceptible to Surface Water Flooding created 24 April 2012 [Ref:NE30596BC]



Scale 1:12,052



- Areas Susceptible to Surface Water
- Less
- Intermediate
- More
- Out of range

### Flood Map Areas (assuming no defences)

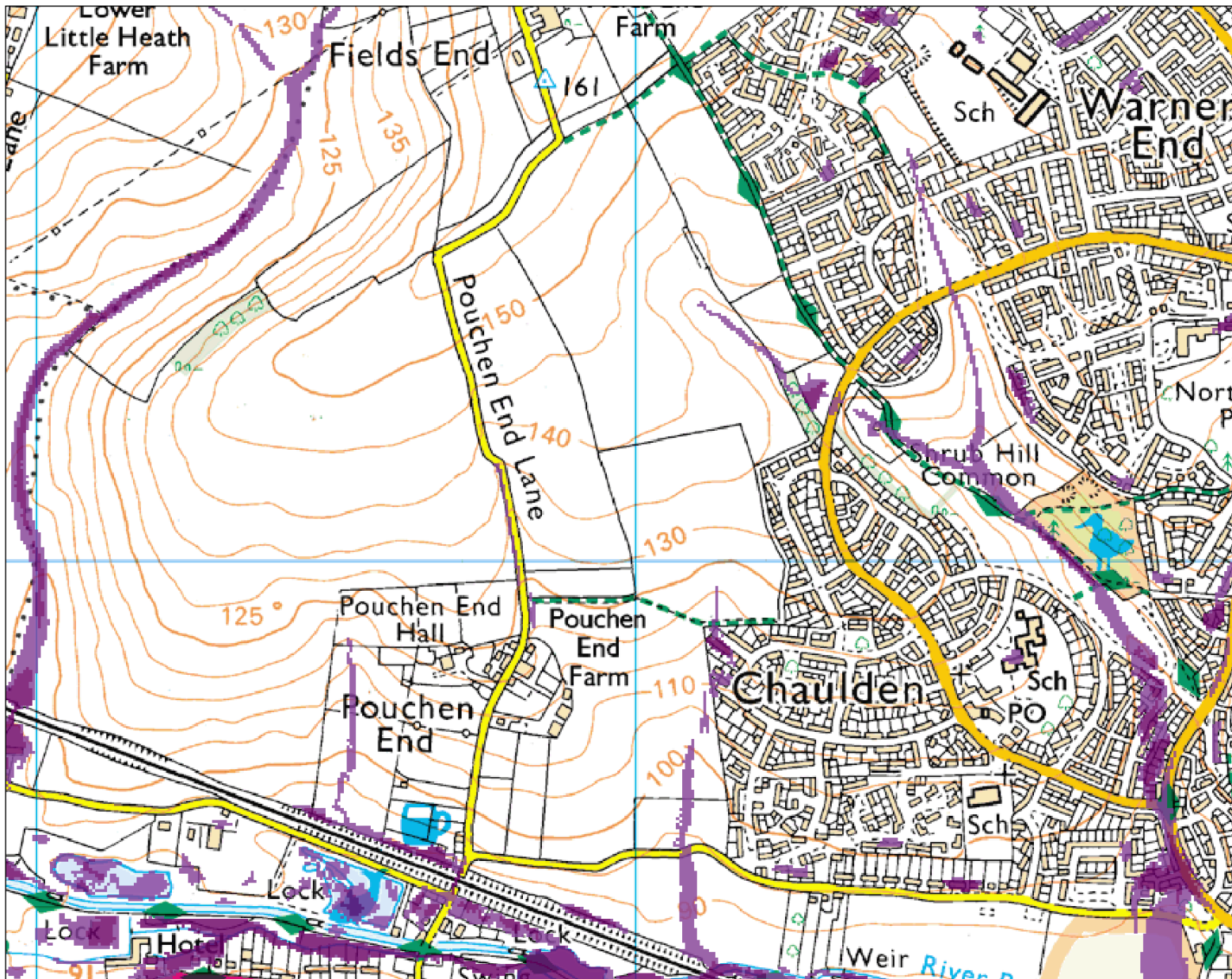
**Flood Zone 3** shows the area that could be affected by flooding:

- 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.





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# Flood Map for Surface Water - 1 in 30 chance rain created 24 April 2012 [Ref:NE30596BC]



Scale 1:10,001



-  FMfSW - 1 in 30 chance rain
-  Surface Water Flooding
-  Deeper Surface Water Flooding
-  Out of range

### Flood Map Areas (assuming no defences)

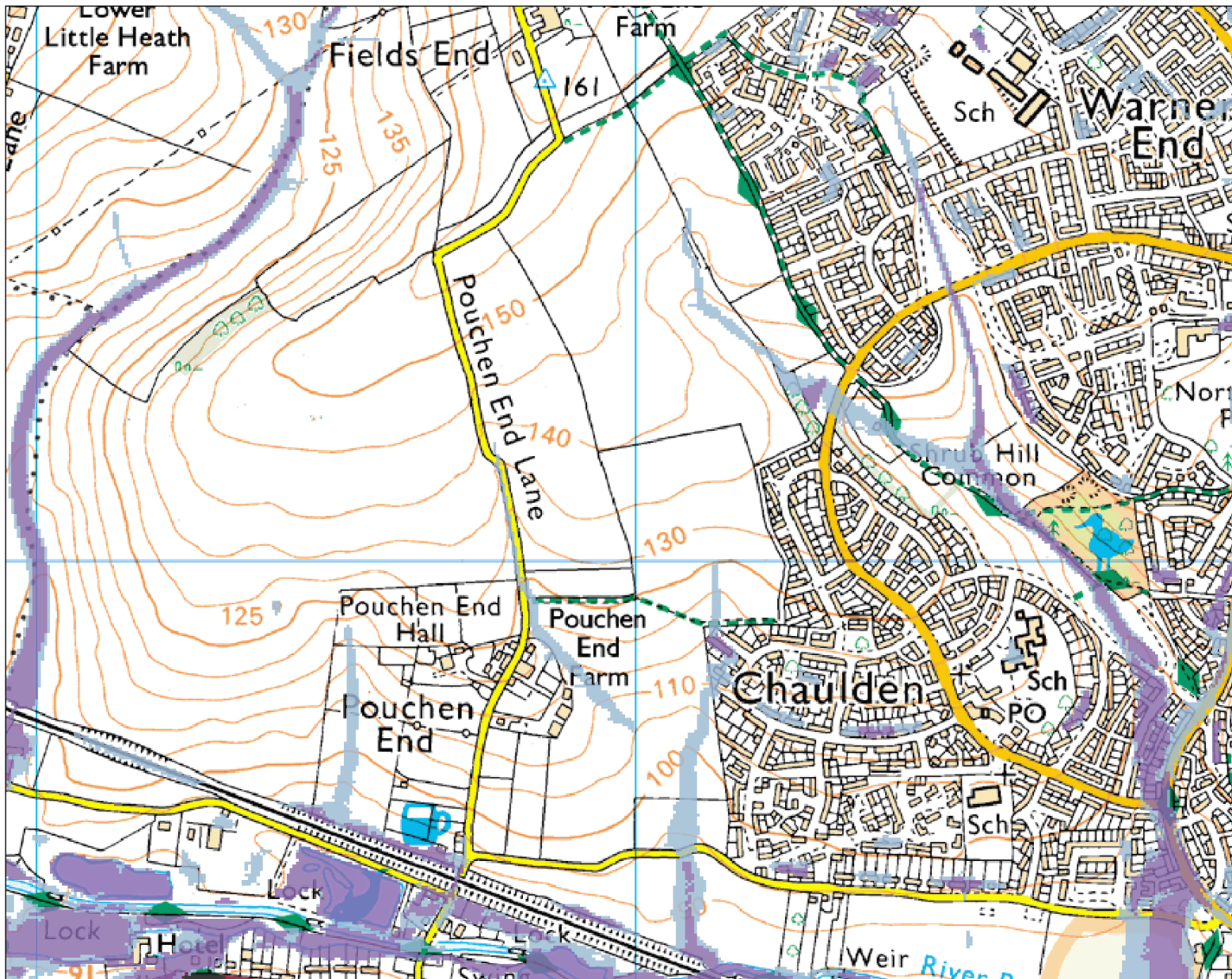
**Flood Zone 3** shows the area that could be affected by flooding:

- 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.





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# Flood Map for Surface Water - 1 in 200 chance rain created 24 April 2012 [Ref:NE30596BC]



Scale 1:10,001



-  FMfSW - 1 in 200 chance rain
-  Surface Water Flooding
-  Deeper Surface Water Flooding
-  Out of range

### Flood Map Areas (assuming no defences)

**Flood Zone 3** shows the area 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.

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# Hydrometric monitoring sites close to site in Fields End Lane, Hemel Hempstead, H



## Legend

### Hydrometric Monitoring Points

- Wind speed and direction
- Climate stations
- Precipitation - recording
- Precipitation - manually read
- Effluent site
- Groundwater level (observation boreholes) continuous recording
- Groundwater level (observation boreholes) manually read
- River flow - continuous
- Surface water level (including tide and lake level) - continuous
- River flow - instantaneous
- Continuous water quality monitoring
- Gate level
- Manually read gauge board
- Operational Control
- Pipe flow
- Pumping Station
- Reservoir abstraction rates



0 260 520 780 m.



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## Paul Birkenshaw

---

**From:** Laura Wood [Laura.Wood@dacorum.gov.uk]  
**Sent:** 17 June 2011 16:06  
**To:** Chris Hughes  
**Cc:** Richard Blackburn  
**Subject:** RE: Hemel Hempstead - Land off Fields End Lane, drainage query.

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Dear Chris,

I am afraid that I haven't been able to find out as much about these two drainage features as I would have liked. What I have managed to glean from colleagues who have worked for the Council for many years is as follows:

### Feature A

This land moved from Council to private ownership 10-15 years ago. I am informed by a colleague in our Estates team (Peter Hamilton) that part of the agreement of the land transfer was that the storage basin was constructed. Peter thinks that it was put in place in readiness to serve any development on the adjacent land and that it is literally a land scrape which holds water until it can percolate into the soil. It does not appear it was ever connected up to the waste water pipe system or connected to site B.

### Feature B

I can find no information about this water storage feature. We think that it serves as a water storage basin for run-off from Shrubhill Common and is independent from the storage feature A. We don't think there is an underground pipe connection, but I cannot confirm this.

Sorry that the information is so sparse.

### PUBLIC CONSULTATION INFO

The information we received from members of the public about surface water flooding on your client's land was anecdotal rather than backed up by any real evidence, so I am unable to point you to any particular incidences of flood problems in recent years.

### OTHER INFORMATION

You may be interested in the preliminary Flood Risk Assessment and Preliminary Drainage Strategy produced by consultants EPG Clear for their client Barrats Strategic Land back in April 2008. This formed part of submission made by Barrats to the Core Strategy and Site Allocations DPDs at a very early stage in their production. The study covers your client's land as well as that owned by Barrats. We only have one copy of this document and it is in paper format, but we can arrange for them to be copied if you wish, as it is public information. The charge would be about £5 per document. The Surface water Drainage document refers to the 'man-made open earthworks balancing pond' at Site B. There are photos of ponding and saturated soils on the site and they produced existing surface water runoff rates and other information which I am sure would be of interest.

I hope that the above information is helpful.

Kind regards

Laura

---

Laura Wood  
Team Leader (Strategic Planning)  
Strategic Planning and Regeneration  
01442 228661

---

**From:** Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
**Sent:** 13 June 2011 14:46  
**To:** Laura Wood  
**Subject:** Hemel Hempstead - Land off Fields End Lane, drainage query.

Reference: MID3160-Eo.019/ch

Laura,

Please find attached a plan showing the location of the 2 water storage features we spoke about this morning. The site lies between Long Chaulden and Fields End Lane. Location A is where the 6m deep manhole was found adjacent to a water storage area. Location B shows the second water storage feature which was discovered on our site visit adjacent to the junction of Shrub Hill Road with Jocketts Road.

These features (the storage area or manhole) are not shown on Thames Water sewer records leading us to believe that these are purely land drainage features. The 6m deep manhole contained a flow control device which suggests that it, in conjunction with the adjacent storage area, possibly has a flood alleviation function by controlling land drainage flows.

Essentially, we are trying to find out the function of these storage features and flow controls, whether they are connected together or are independent in their operation, which areas of land they serve, where they discharge flows to and any available parameters relating to their operation such as flow rates.

Any information you can provide would be much appreciated.

Also, you mentioned that during previous consultations local residents have complained about surface water flooding in the area. Please could you provide details of the surface water flooding that was the subject of these complaints so we can take this into consideration within our assessment.

Thanks again,

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

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## Paul Birkenshaw

---

**Subject:** FW: Proposed development at Fields End Lane, Hemel Hempstead.

---

**From:** Andy Hardstaff [mailto:andy.hardstaff@hertscc.gov.uk]  
**Sent:** 31 May 2011 09:59  
**To:** Chris Hughes  
**Subject:** RE: Proposed development at Fields End Lane, Hemel Hempstead.

Chris

My apologies for not replying sooner - I have annotated your original email below. By way of context Hertfordshire County Council is at the early stages of its role as Lead Local Flood Authority and the current focus is on developing a strategic assessment of flood risk together with a supporting strategy which will be developed over the coming year.

Our involvement in drainage approval work and SUDs has yet to be confirmed by legislation (anticipated from April 2011) and until that time existing practice will continue.

Regards

Andy Hardstaff  
Environmental Resource Planning [CHN 111](#)  
Hertfordshire County Council  
HERTFORD  
SG13 8DN

01992 556470  
[www.hertsdirect.org](http://www.hertsdirect.org)

-----Original Message-----

From: Chris Hughes [mailto:Chris.Hughes@jmp.co.uk]  
Sent: 27 May 2011 16:57  
To: Andy Hardstaff  
Subject: Proposed development at Fields End Lane, Hemel Hempstead.

Andy,

With regard to the proposed site at Fields Lane, Hemel Hempstead (see the attached location plan) and following on from our conversation earlier this month, I am currently putting together the drainage review report.

Are you able to provide any information relating to the queries listed below?

Any assistance is much appreciated.

Regards,  
Chris Hughes  
Engineer  
JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

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-----Original Message-----

From: Chris Hughes

Sent: 06 May 2011 13:53

To: 'andy.hardstaff@hertscc.gov.uk'

Subject: Proposed development at Fields End Lane, Hemel Hempstead.

Andy,

As per our conversation a few moments ago please see below.

JMP, on behalf of our client, is investigating the flooding and drainage constraints which will impact upon the future development of the site near Fields End Lane, Hemel Hempstead as shown on the attached location plan. The output of this investigation will support the promotion of the site in the LDF.

We have a number of queries that we hope you can assist us with.

1 - What will be the maximum permitted post-development surface water discharge rate from the site? *Hertfordshire as Lead Local Flood Authority does not yet have the Drainage Approval / Sustainable Urban Drainage adoption powers and will develop local policy from when required to apply national standards. In the interim existing practice will be defined by the local planning authority (in this case Dacorum) and the Environment Agency plus any requirements that Thames Water will apply if connections are being sought to their network.*

2 - Do you have any records of flooding on or near to the site, or within the local area? *The only records I have to hand are those collected from the SFRA for Dacorum and some from Hertfordshire Highways of highway flood related reports within 1 km of the proposed site - I only have the aggregated map of the data and it will cover everything from flooded footways to large puddles on the highway to blocked gullies on to more extensive flooding which may affect properties.*

3 - Are there any other issues that Hertfordshire believe should be incorporated within our drainage and flooding constraints investigation? *From the perspective of Lead Local Flood Authority I can't pre-empt the Local Strategy and any related local guidance but one of the recommendations of a scrutiny topic group on river quality was that HCC in developing its new role in Surface Water Management gives "Consideration of how sustainable drainage techniques could be applied in new developments and introduced into existing areas to improve water quality and amenity in addition to attenuating surface water flow for flood risk management." - this will be potentially be developed over the next year but in the interim gives some insight into thinking. If there are any issues that relate to the highway (either existing or proposed for adoption) I would need to refer you to colleagues in Hertfordshire Highways.*

Regards,

Chris Hughes

Engineer

JMP Consultants Ltd, 85-89 Colmore Row, Birmingham, B3 2BB

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[T] 0121 230 6010

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Thames Water Property Insight  
12 Vastern Road  
READING  
RG1 8DB

**Search address supplied** Land Off  
Fields End Lane  
Hemel Hempstead

**Your reference** N/A  
**Our reference** ALS/ALS Standard/2011\_2000962

**Search date** 12 May 2011

Thames Water Utilities Ltd

Property Insight  
PO Box 3189  
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504  
F 0118 923 6655/57  
E [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
I [www.twpropertyinsight.co.uk](http://www.twpropertyinsight.co.uk)

Registered in England and Wales  
No. 2366661, Registered office  
Clearwater Court, Vastern Road  
Reading RG1 8DB

# Asset Location Search



**Search address supplied: Land Off, Fields End Lane, Hemel Hempstead,**

Dear Sir / Madam

**An Asset Location Search is recommended when undertaking a site development.** It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

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Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

## Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0118 925 1504, or use the address below:

Thames Water Utilities Ltd  
Property Insight  
PO Box 3189  
Slough  
SL1 4WW

Tel: 0118 925 1504  
Fax: 0118 923 6657

Email: [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
Web: [www.twpropertyinsight.co.uk](http://www.twpropertyinsight.co.uk)

Thames Water Utilities Ltd

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# Asset Location Search



## Waste Water Services

**Please provide a copy extract from the public sewer map.**

The following quartiles have been printed as they fall within Thames' sewerage area:

TL0207SE  
TL0207NE  
TL0307SW  
TL0307NW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Sewers indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended that these details are checked with the developer.

## Clean Water Services

**Please provide a copy extract from the public water main map.**

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# Asset Location Search



The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TL0207SE	Veolia Water
TL0207NE	Veolia Water
TL0307SW	Veolia Water
TL0307NW	Veolia Water

Veolia Water  
Tamblin Way  
Hatfield  
AL10 9EZ  
Tel: 0845 7823333  
Fax: 01707 277104

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

## Payment for this Search

A charge will be added to your suppliers account.

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# Asset Location Search



## Further contacts:

### Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Center on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)  
Thames Water  
Clear Water Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0845 850 2777  
Fax: 0118 923 6613  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

Should you require any further information regarding budget estimates, diversions or stopping up notices then please contact:

DevCon Team  
Asset Investment  
Thames Water  
Maple Lodge STW  
Denham Way  
Rickmansworth  
Hertfordshire  
WD3 9SQ

Tel: 01923 898 072  
Fax: 01923 898 106  
Email: [devcon.team@thameswater.co.uk](mailto:devcon.team@thameswater.co.uk)

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Clearwater Court, Vastern Road  
Reading RG1 8DB

# Asset Location Search



## Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact our Kew Service Desk by writing to:

Clean Water Design  
Thames Water Utilities  
1 Kew Bridge Road  
Brentford  
Middlesex  
TW8 0EF

Tel: 0845 850 2777  
Fax: 0208 213 8833  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

Thames Water Utilities Ltd

Property Insight  
PO Box 3189  
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 502750,207250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. WU298557 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

<b>Manhole Reference</b>	<b>Manhole Cover Level</b>	<b>Manhole Invert Level</b>
N/a	n/a	n/a

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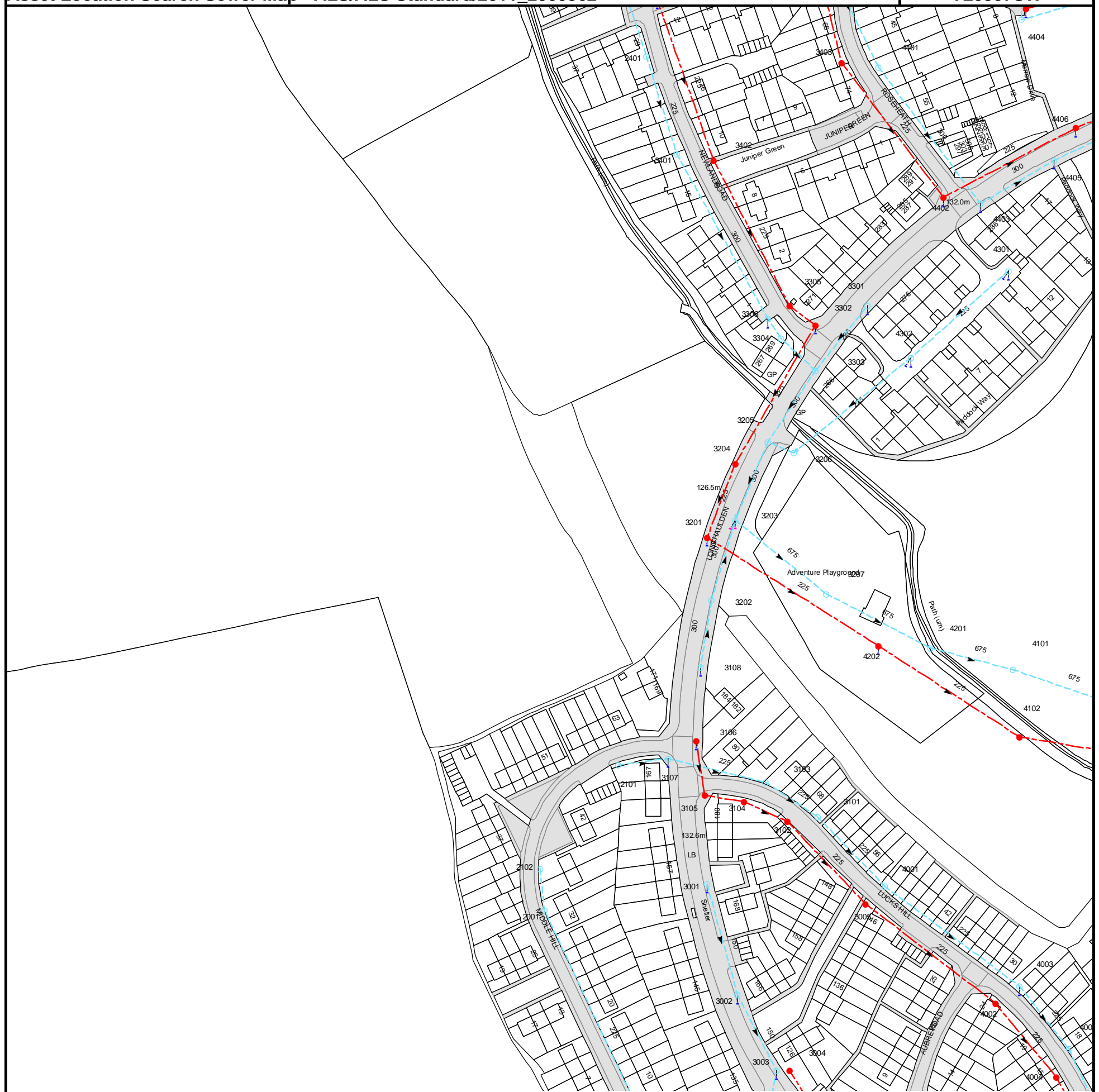
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 503250,207250

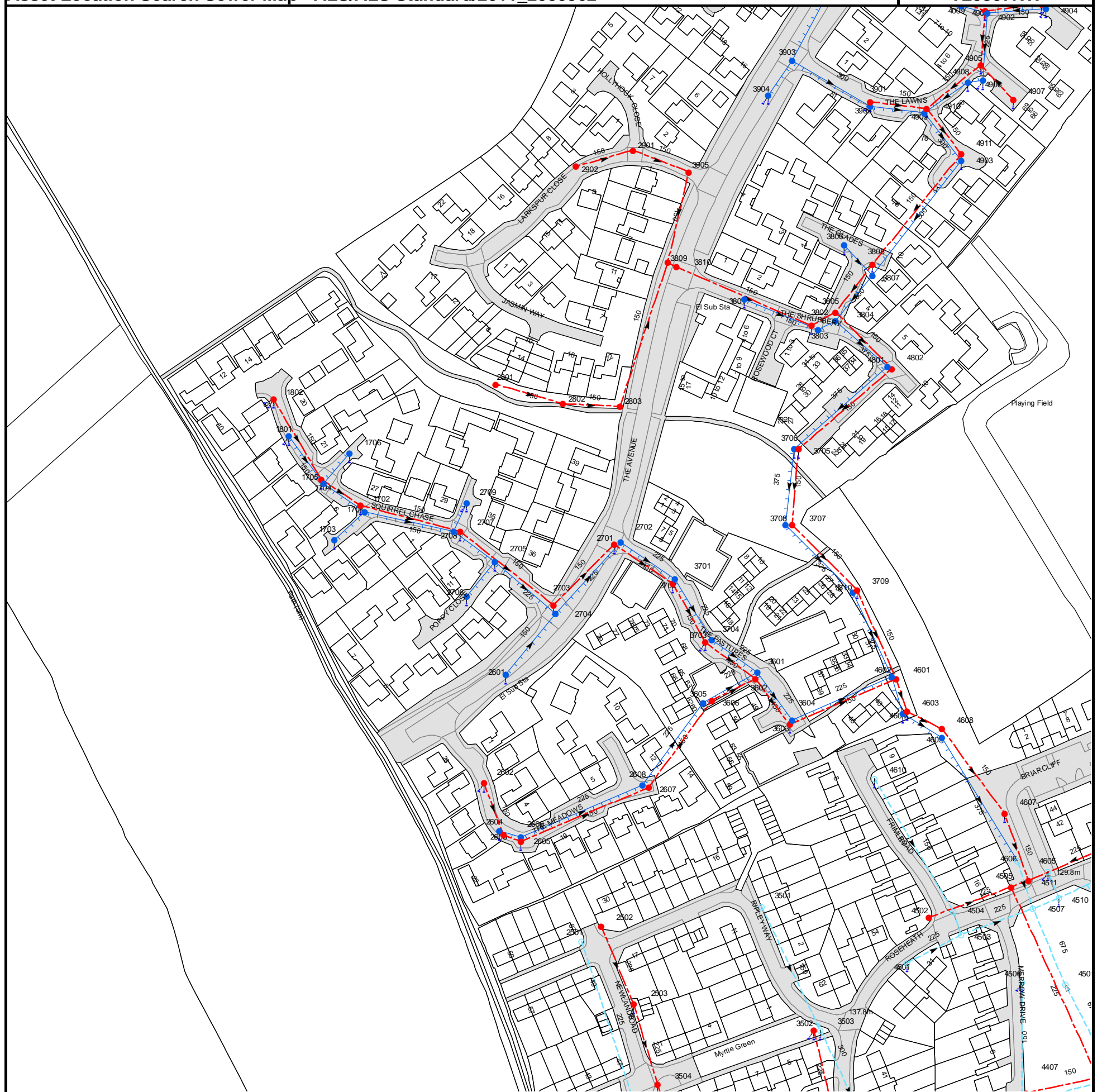
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Manhole Reference	Manhole Cover Level	Manhole Invert Level
4301	130.57	128.69
4101	n/a	n/a
4003	127.22	125.41
4102	n/a	n/a
4404	129.58	n/a
4403	131.43	128.01
4002	n/a	n/a
4201	118.97	115.02
4402	132.3	130.03
4001	n/a	n/a
4202	121.48	119.48
4302	130.05	128.03
4401	n/a	n/a
3005	n/a	n/a
3301	132.14	129.75
3403	n/a	n/a
3101	n/a	n/a
3207	n/a	n/a
3303	129.98	127.29
3302	131.41	128.39
2401	n/a	n/a
3401	137.49	134.76
3402	317.17	n/a
3003	129.09	127.42
3004	n/a	n/a
3002	130.5	128.94
2001	n/a	n/a
3001	n/a	n/a
2102	n/a	n/a
3102	130.57	128.03
3104	n/a	n/a
3105	132.3	129.46
3103	n/a	n/a
2101	n/a	n/a
3107	132.23	130.48
3106	131.72	130.13
3108	129.6	127.37
3202	127.39	125.2
3201	126.37	121.87
3203	126.03	119.57
3204	126.8	123.95
3206	126.89	125.31
3205	127.15	124.94
3304	n/a	n/a
3306	132.24	130.49
3305	n/a	n/a
4405	129.13	125.87
4004	n/a	n/a
4005	n/a	n/a
4406	128.27	125.12
4407	129.38	126.2

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
2708	147.32	145.11
2707	147.27	145.57
2709	147.11	145.46
2706	146.99	145.42
1802	151.07	149.32
1801	150.2	148.34
1705	149.24	147.66
1704	149.17	147.24
1703	148.76	147.21
1706	149.35	147.8
1702	148.74	147.12
1701	148.64	146.67
4607	130.25	128.75
4505	n/a	n/a
4907	146.64	145.07
4606	129.92	126.41
4506	129.14	127.55
4905	147.12	144.86
4906	147.05	145.15
4901	147.93	146.12
4902	147.94	145.84
4503	n/a	n/a
4502	134.79	n/a
4504	133.16	131.13
4609	132.35	130.05
4608	132.48	130.59
4903	144.99	143.34
4911	145.1	143.14
4909	145.8	144.16
4910	145.9	144.08
4908	146.67	144.89
4501	135.62	133.2
4610	136.3	134.69
4604	135.79	133.12
4603	135.66	132.66
4601	136.2	133.04
4602	136.16	134.04
4802	138.95	136.95
4801	139.02	137.39
3807	142.14	140.33
3808	142.32	140.12
3902	146.2	144.84
3901	146.24	144.5
3710	137.65	135.64
3709	137.69	134.2
3805	141.3	138.81
3804	140.96	138.85
3806	142.91	141.38
3803	141.17	139.44
3802	141.35	139.82
3503	138.22	134.38
3502	138.43	134.8
3801	142.92	140.98
3602	141.1	139.28
3601	141.1	139.52
3501	n/a	n/a
3904	147.33	145.85
3708	139.45	136.37
3603	139.9	137.92
3903	147.7	145.5
3604	139.91	138.06
3707	139.36	134.88
3706	138.66	136.84
3705	138.57	136.11
2608	143.6	141.93
2607	143.49	141.58
3504	140.33	137.99
3809	n/a	n/a
3702	143.13	140.92
3701	143.06	141.42
3810	n/a	n/a
3905	n/a	n/a
3605	142.4	140.99
3703	142.52	140.55
3606	142.22	140.49
3704	142.46	140.81
2602	145.57	143.43
2705	146.51	144.8
2801	n/a	n/a
2604	145.04	143.43
2603	144.97	142.91
2601	146.15	144.73
2606	144.87	143.12
2605	144.83	142.73
2703	145.6	143.57
2704	145.58	144.03
2802	n/a	n/a
2902	n/a	n/a
2501	142.88	n/a
2502	n/a	n/a
2701	144.17	142.07

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2803	n/a	n/a
2702	144.05	142.43
2901	n/a	n/a
2503	141.74	139.64
4510	129.55	126.94
4509	127.69	124.38
4511	129.81	127.88
4507	129.5	126.25
4904	148.09	146.49
4605	129.94	127.96

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# ALS Sewer Map Key

## Public Sewer Types (Operated & Maintained by Thames Water)

	<b>Foul:</b> A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	<b>Surface Water:</b> A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	<b>Combined:</b> A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

### Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

## Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

## Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Control Valve
	Drop Pipe
	Ancillary
	Weir

## End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Outfall
	Undefined End
	Inlet

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0118 925 1504.

## Other Symbols

Symbols used on maps which do not fall under other general categories

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

### Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

## Other Sewer Types (Not Operated or Maintained by Thames Water)

	Foul Sewer		Surface Water Sewer
	Combined Sewer		Gully
	Culverted Watercourse		Proposed
	Abandoned Sewer		

# Asset Location Search



Mr Paul Birkenshaw  
JMP Consultants Ltd  
85-89 Colmore Row  
BIRMINGHAM  
B3 2BB

**Search address supplied** Land West Of  
Hemel Hempstead

**Your reference** MID3160-Eo.040/pjb

**Our reference** ALS/ALS Standard/2012\_2193371

**Search date** 20 March 2012

You are now able to order your Asset Location Search requests online by visiting  
[www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)

Thames Water Utilities Ltd

Property Searches  
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# Asset Location Search



**Search address supplied:** Land West Of, Hemel Hempstead,

Dear Sir / Madam

**An Asset Location Search is recommended when undertaking a site development.** It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

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Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

## Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0118 925 1504, or use the address below:

Thames Water Utilities Ltd  
Property Searches  
PO Box 3189  
Slough  
SL1 4WW

Tel: 0118 925 1504  
Fax: 0118 923 6657

Email: [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
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Reading RG1 8DB



# Asset Location Search



## Waste Water Services

**Please provide a copy extract from the public sewer map.**

The following quartiles have been printed as they fall within Thames' sewerage area:

TL0206SE  
TL0206NE  
TL0306SW  
TL0306NW  
TL0306SE  
TL0306NE  
TL0307SE

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

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Reading RG1 8DB

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The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TL0206SE	Veolia Water
TL0206NE	Veolia Water
TL0306SW	Veolia Water
TL0306NW	Veolia Water
TL0306SE	Veolia Water
TL0306NE	Veolia Water
TL0307SE	Veolia Water

Veolia Water  
Tamblin Way  
Hatfield  
AL10 9EZ  
Tel: 0845 7823333  
Fax: 01707 277104

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- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

## Payment for this Search

An invoice is enclosed. Please send remittance to Thames Water Utilities Ltd., PO Box 223, Swindon, SN38 2TW.

Thames Water Utilities Ltd

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PO Box 3189  
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504  
F 0118 923 6655/57  
E [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
I [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)

Registered in England and Wales  
No. 2366661. Registered office  
Cleanwater Court, Vastern Road  
Reading RG1 8DB

# Asset Location Search



## Further contacts:

### Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0845 850 2777  
Fax: 0118 923 6613  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

Should you require any further information regarding budget estimates, diversions or stopping up notices then please contact:

DevCon Team  
Asset Investment  
Thames Water  
Maple Lodge STW  
Denham Way  
Rickmansworth  
Hertfordshire  
WD3 9SQ

Tel: 01923 898 072  
Fax: 01923 898 106  
Email: [devcon.team@thameswater.co.uk](mailto:devcon.team@thameswater.co.uk)

Thames Water Utilities Ltd

Property Searches  
PO Box 3189  
Slough SL1 4WW

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Clearwater Court, Vastern Road  
Reading RG1 8DB

# Asset Location Search



## Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0845 850 2777  
Fax: 0208 213 8833  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

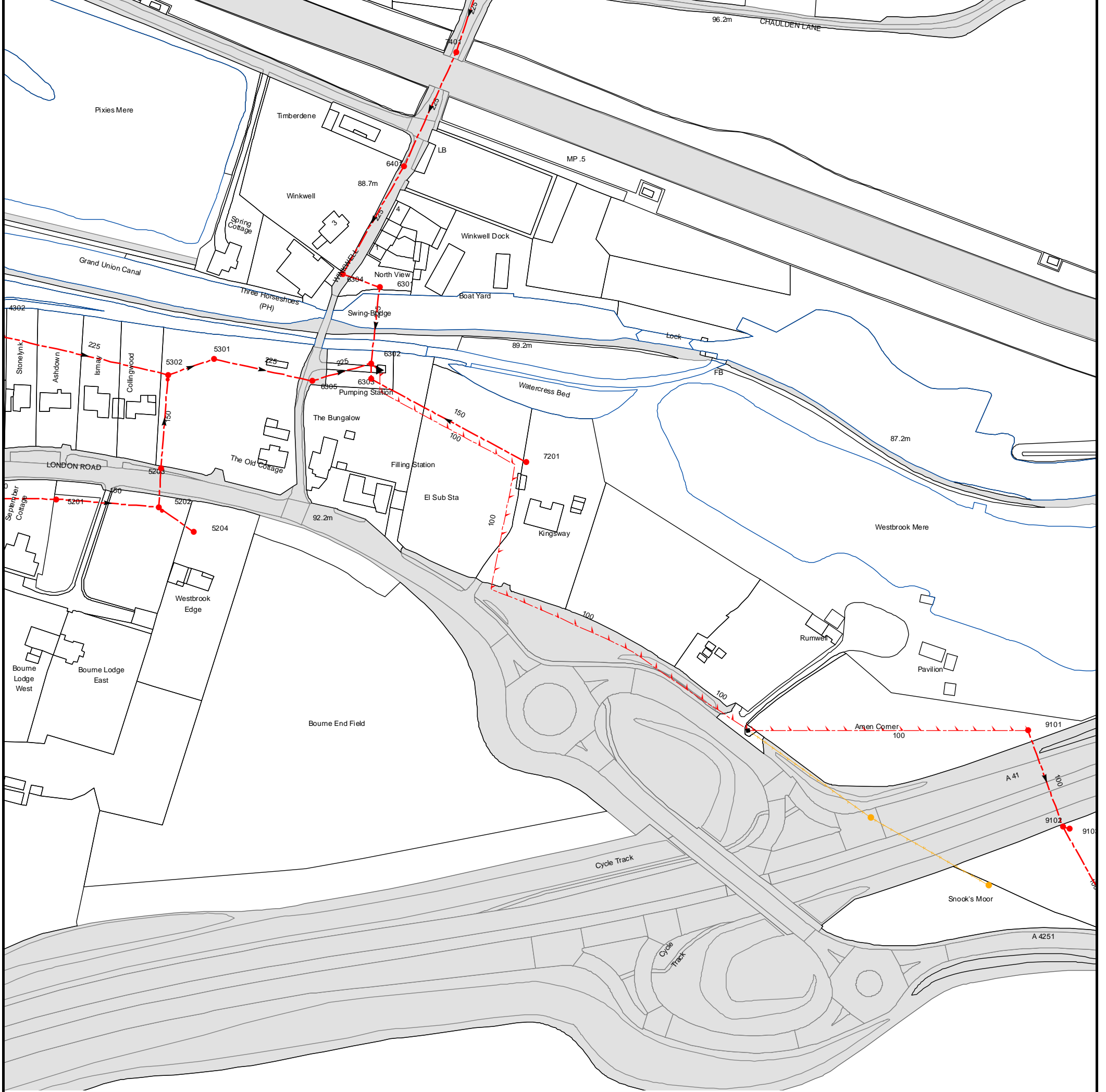
Thames Water Utilities Ltd

Property Searches  
PO Box 3189  
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504  
F 0118 923 6655/57  
E [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
I [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)

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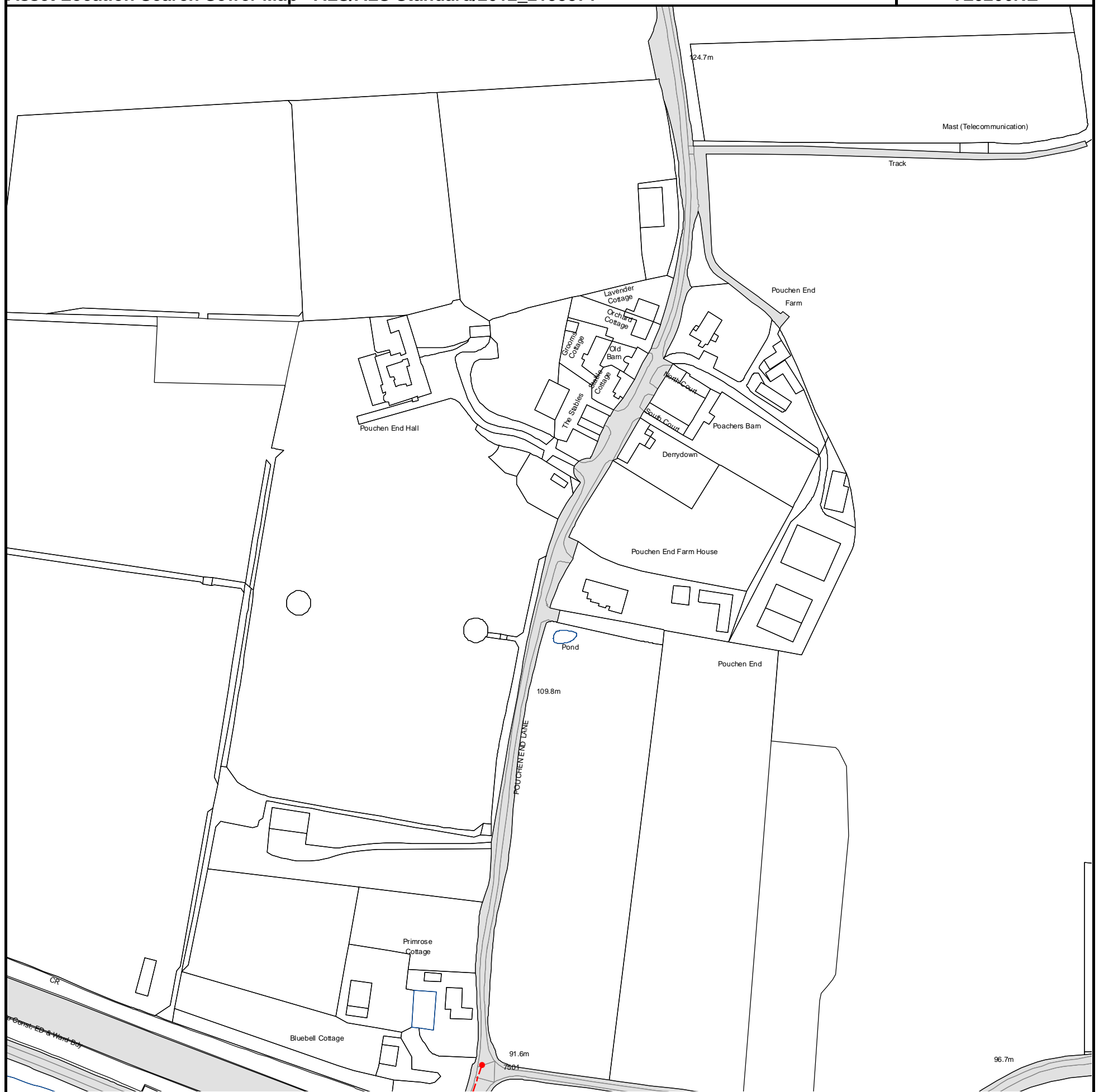
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 502750,206250  
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5202	93.4	91.39
5203	92.58	90.85
5302	89.79	86.37
5204	93.4	92.34
5301	89.78	86.33
6305	n/a	n/a
6304	88.97	86.21
6302	n/a	n/a
6303	n/a	n/a
6301	89.13	86.08
6401	88.6	86.85
9103	n/a	n/a
9102	n/a	n/a
9101	n/a	n/a
7201	89.43	88.4
7401	89.28	87.67
-	-	-
5201	n/a	n/a

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 502750,206750

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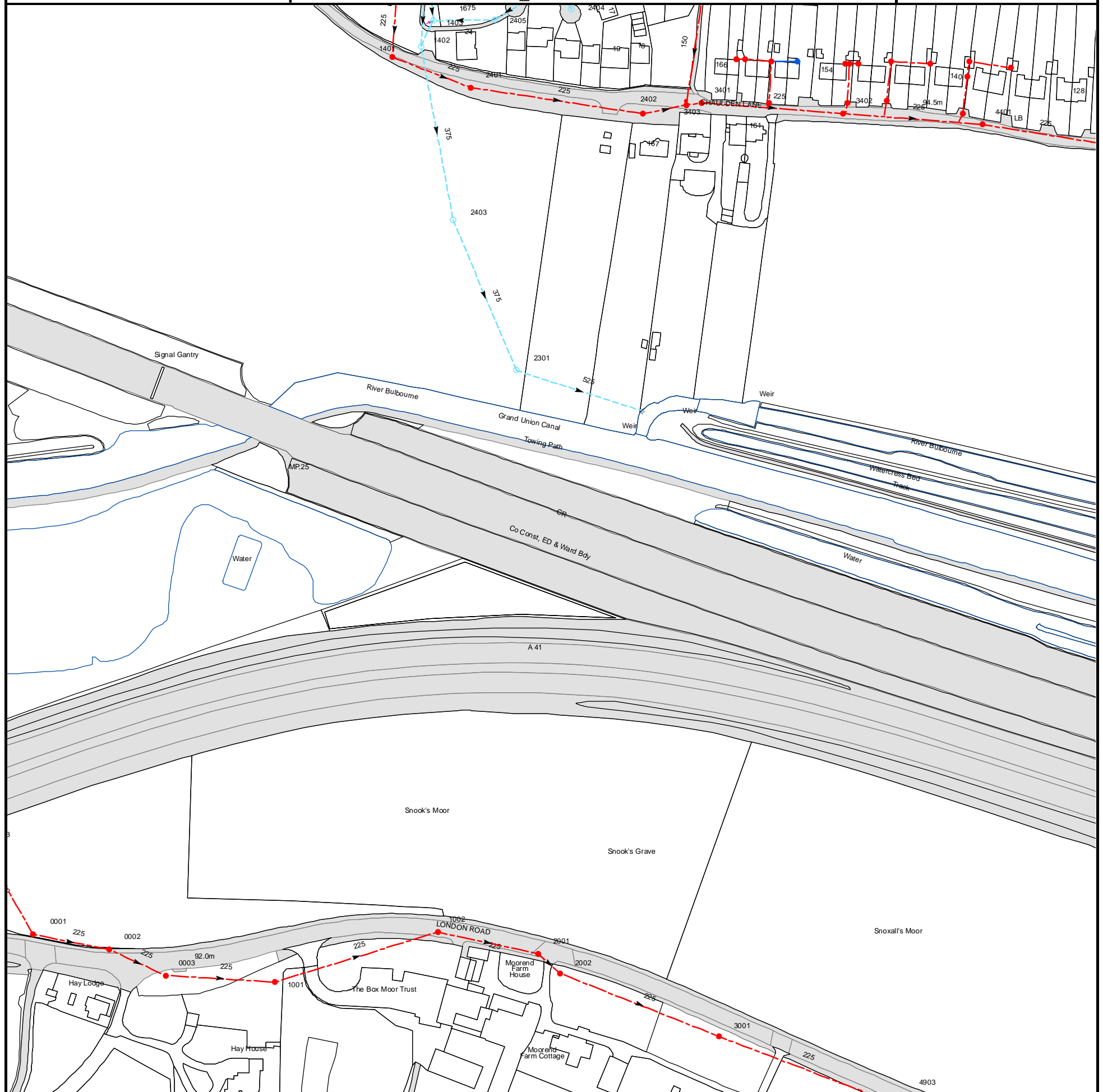
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<b>Manhole Reference</b>	<b>Manhole Cover Level</b>	<b>Manhole Invert Level</b>
7501	91.87	90.27

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 503250,206250

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
1403	97.61	93.86
1002	91.7	90.27
2403	n/a	n/a
2401	n/a	n/a
1001	94.43	90.86
1401	95.33	93.79
1402	n/a	n/a
0003	n/a	n/a
0002	92.59	90.87
0001	94.43	91.15
44ZX	n/a	n/a
4401	94.43	88.71
44ZT	n/a	n/a
44ZV	n/a	n/a
44ZR	n/a	n/a
44ZW	n/a	n/a
44ZP	n/a	n/a
44ZQ	n/a	n/a
34ZS	n/a	n/a
34ZP	n/a	n/a
3402	94.57	88.97
34ZT	n/a	n/a
34ZR	n/a	n/a
3001	n/a	n/a
34YY	n/a	n/a
34YX	n/a	n/a
34YV	n/a	n/a
34YW	n/a	n/a
34YS	n/a	n/a
3403	95.37	92.31
3401	95.35	89.14
2405	98.3	94.06
2301	87.98	86.49
2001	91.78	n/a
2002	n/a	n/a
2404	98.54	95.78
2402	95.46	92.47

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 503250,206750

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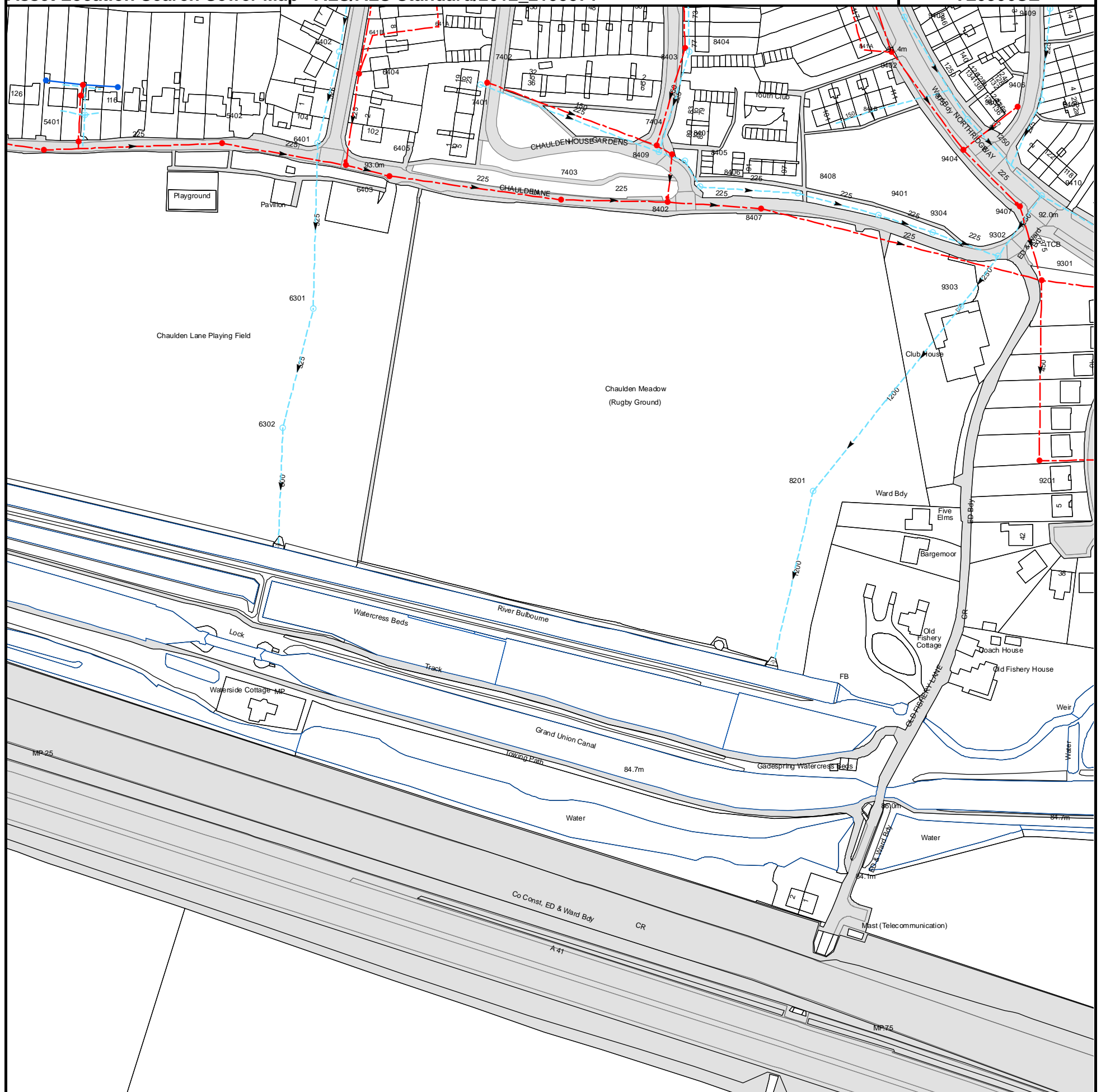
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Manhole Reference	Manhole Cover Level	Manhole Invert Level
1603	106.94	103.47
1601	105.88	103.3
2803	n/a	n/a
2802	n/a	n/a
2604	n/a	n/a
2605	103.6	101.79
2606	103.65	101.25
1802	n/a	n/a
1701	105.88	103.74
1505	99.38	98.34
1702	n/a	n/a
1605	105.49	103.96
1801	115.39	112.41
1501	99.61	97.24
1604	n/a	n/a
1607	102.26	99.7
1502	99.87	97.86
1606	102.46	100.2
1602	104.32	101.67
1503	98.95	96.28
1504	99.13	97.52
4510	103.23	101.3
4702	111.52	109.33
4804	n/a	n/a
4505	101.45	99.02
4506	101.31	98.35
4509	103.13	101.71
4904	n/a	n/a
4503	101.09	98.12
4504	101.09	98.81
4513	104.31	102.85
4604	107.03	105.55
4603	111.26	109.82
4701	111.41	109.44
4903	125.16	123.13
4902	n/a	n/a
4502	101.39	97.85
4501	101.39	98.58
4901	126.81	124.18
3801	121.42	n/a
3706	n/a	n/a
3906	127.29	123.78
3905	127.68	124.68
3507	101.16	97.65
3506	101.17	98.4
3605	105	103.09
3606	104.91	103.54
3804	121.45	118.6
3904	n/a	n/a
3707	116.47	n/a
3702	n/a	n/a
3708	116.42	114.02
3704	116.44	113.9
3703	n/a	n/a
3505	100.49	98.08
3504	100.51	97.41
3705	116.14	113.53
3803	n/a	n/a
3802	121.35	118.28
3508	103.58	101.27
3509	103.73	101
3603	n/a	n/a
3501	104.49	102.76
3502	104.28	102.34
3604	105.66	103.97
3601	n/a	n/a
3602	n/a	n/a
3701	n/a	n/a
3503	99.81	96.74
2902	n/a	n/a
3902	127.04	125.53
2901	n/a	n/a
3903	128.72	125.21
2701	n/a	n/a
2603	n/a	n/a
2602	106.12	103.01
2501	100.22	98.61
2702	n/a	n/a
2801	n/a	n/a
2508	98.87	94.46
2502	104.76	102.96
2503	104.82	103.05
2507	99.35	97.27
2504	100.96	99.2
2506	99.31	97
2505	100.81	98.86
2601	107.93	105.21
4601	108.46	106.63
4705	116.68	115.33
4704	116.48	115.19
4802	122.32	118.93

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4805	122.49	n/a
4801	n/a	n/a
4511	103.6	101.42
4507	100.68	98.55
4512	103.57	101.88
4508	100.63	99.15
4803	122.54	120.08
4703	n/a	n/a
4602	108.26	107.12

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 503750,206250

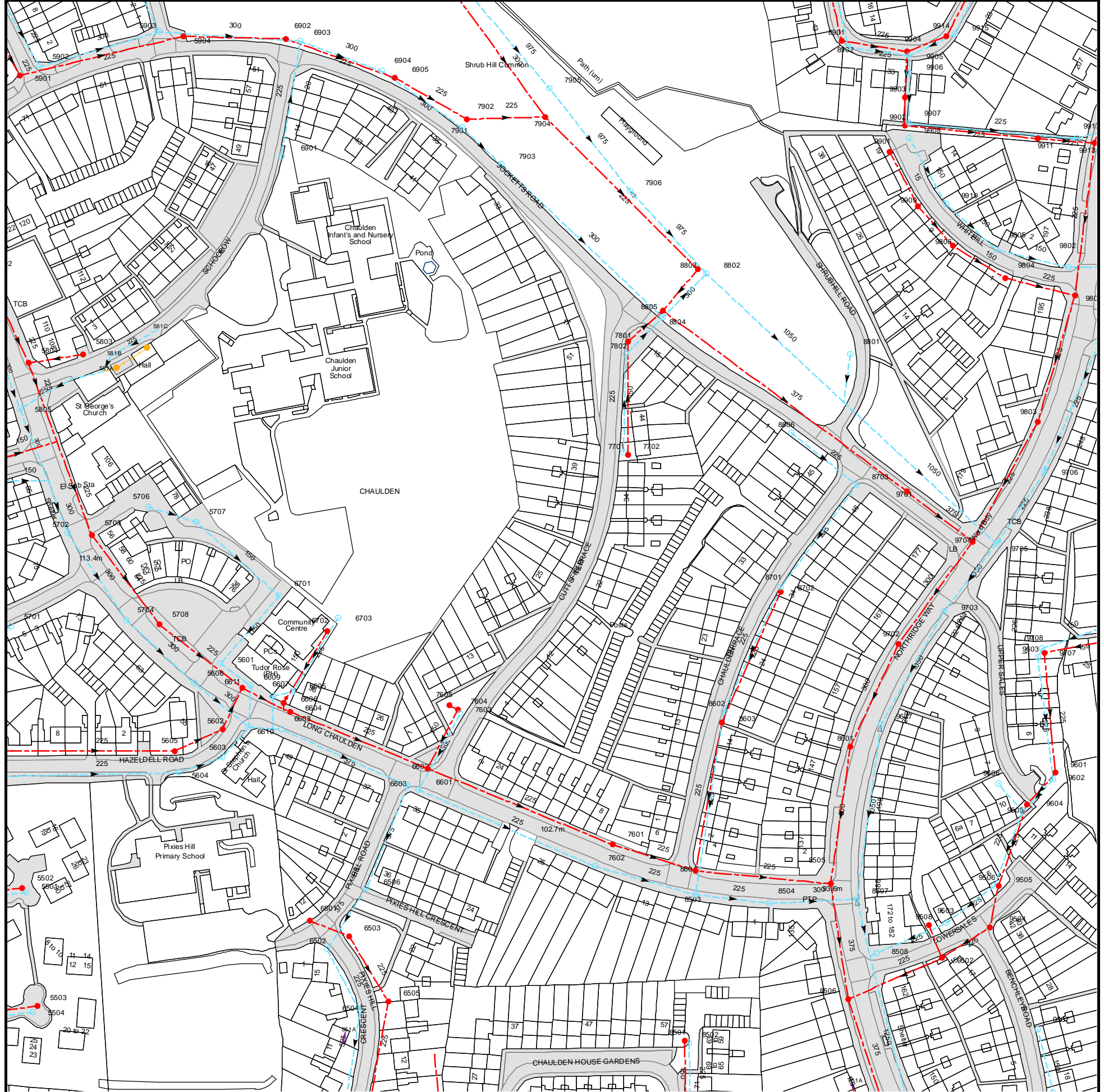
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Manhole Reference	Manhole Cover Level	Manhole Invert Level
54YW	n/a	n/a
54ZT	n/a	n/a
54YX	n/a	n/a
54YY	n/a	n/a
5401	94	88.39
54YZ	n/a	n/a
54YT	n/a	n/a
8201	87.03	84.77
9401	89.92	88.43
8408	90.08	88.83
9402	91.63	89.75
9201	87.35	85.73
9410	92.1	88.3
9301	n/a	n/a
9408	n/a	n/a
9409	95.18	92.39
9302	n/a	n/a
9304	n/a	n/a
8407	89.75	87.06
9303	89.25	85.4
9404	91.9	89.18
9405	91.71	88.62
9403	91.55	88.87
9406	93.16	91.65
9407	92.19	87.37
6402	96.5	92.79
6403	93.29	87.83
6404	96.05	93.61
6405	92.9	87.77
6301	n/a	n/a
6401	n/a	n/a
5402	94.14	88.08
7401	n/a	n/a
7402	95.34	92.2
6302	n/a	n/a
7404	91.65	89.6
8409	91.53	89.76
8402	90.16	87.24
8405	n/a	n/a
8401	91.35	89.46
8403	n/a	n/a
7403	91.38	87.44
8404	n/a	n/a
8406	90.33	89.34

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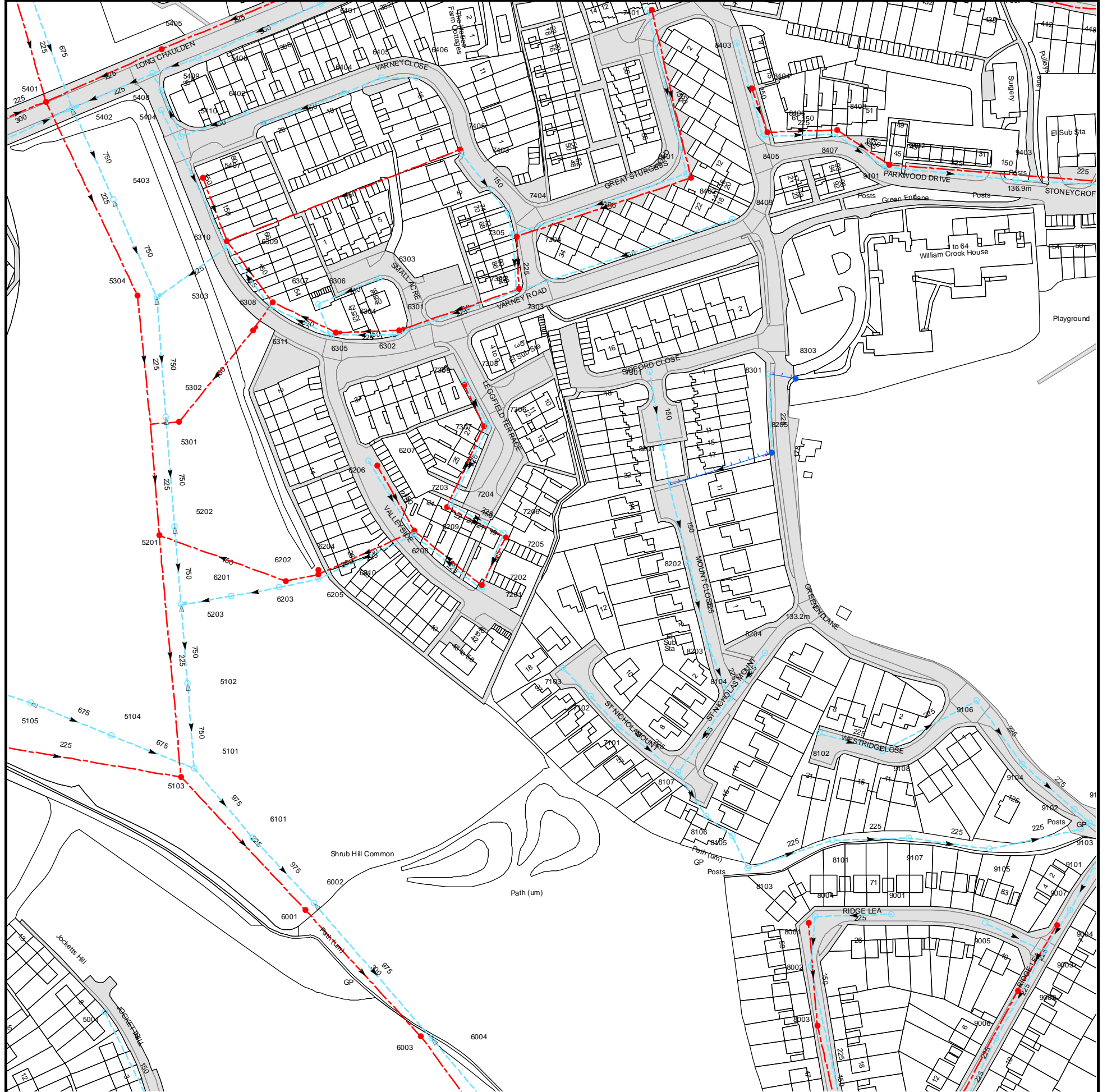


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Manhole Reference	Manhole Cover Level	Manhole Invert Level
5701	n/a	n/a
5805	118.73	116.95
5901	124.91	122.75
5502	103.74	101.9
5501	103.64	102.14
5703	114.53	111.84
5702	115.07	113.28
5803	119.64	117.06
5804	119.89	116.74
5504	100.56	99.28
5503	100.6	98.92
5902	124.82	122.77
5704	112.18	110.11
8506	92.56	90.28
8508	92.99	91.03
8504	94.61	91.46
8507	93.51	90.13
8505	93.75	91.78
8601	95.69	93.46
9607	96.04	91.95
9702	99.58	97.23
8702	97.27	95.36
8701	97.25	95.82
8703	98.79	96.43
8806	n/a	n/a
8801	102.46	100.87
9901	n/a	n/a
8902	n/a	n/a
8901	n/a	n/a
9603	n/a	n/a
9911	116.3	113.71
9803	105.45	103.61
9507	94.86	93.35
9708	n/a	n/a
9706	104.33	100.51
9707	n/a	n/a
9602	n/a	n/a
9601	n/a	n/a
9506	n/a	n/a
9705	101.6	96.81
9805	111.88	109.16
9505	n/a	n/a
9606	n/a	n/a
9804	111.38	108.55
9502	94.12	92.35
9703	n/a	n/a
9914	n/a	n/a
9503	n/a	n/a
9910	n/a	n/a
8603	98.66	94.73
8602	98.63	95.21
9806	n/a	n/a
9915	n/a	n/a
9704	n/a	n/a
9903	117.84	114.49
9902	116.28	114.34
9701	n/a	n/a
9904	n/a	n/a
9908	n/a	n/a
9907	116.36	114.66
9906	118.15	114.98
9905	n/a	n/a
9909	n/a	n/a
9508	94.31	92.58
9504	95.71	94.22
9605	101.35	99.31
9604	101.47	99.31
6703	110.81	109.62
6503	101.92	98.34
6504	99.59	95.82
6506	102.95	101.22
6904	112.9	111.21
6505	n/a	n/a
6905	n/a	n/a
6603	105.57	103.45
6502	n/a	n/a
6702	110.72	n/a
6602	105.53	103.61
7605	107.42	104.84
7604	107.09	104.49
5706	115.24	113.74
5603	108.19	106.4
5602	108.49	105.79
6610	108.77	106.28
6611	109.22	105.61
6609	109.5	107.89
5606	110.16	108.01
5601	110.05	108.87
5707	115.04	112.85
6601	105.58	103.63
7603	107.09	104.9

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7901	n/a	n/a
7902	109.42	107.1
7903	n/a	n/a
5708	111.43	108.67
5903	n/a	n/a
5605	n/a	n/a
6903	116.74	114.73
6501	101.98	n/a
6607	108.85	106.89
6701	112	110.34
6901	119.26	117.7
6608	108.36	106.17
6606	108.56	105.56
6902	n/a	n/a
6604	108.38	105.23
6605	109.19	107.92
5604	107.76	106.52
5904	121.67	119.15
9802	n/a	n/a
9801	109.22	107.28
9912	114.36	113.04
9913	113.81	111.64
8804	102.2	100.58
8805	102.59	97.62
7602	100.98	98.68
7601	100.75	98.1
8502	94.59	93.37
8501	n/a	n/a
7701	n/a	n/a
7802	104.8	103.28
7702	n/a	n/a
7801	104.06	102.16
7906	102.33	98.31
7904	104.5	102.39
7905	104.56	100.28
8604	97.1	93.87
8503	97.17	94.59
8803	100.99	98.41
8802	100.92	97.83

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
5001	n/a	n/a
5104	112.58	n/a
5403	122.04	118.52
5402	127.17	120.24
5105	114.57	111.33
5401	127.41	n/a
8407	n/a	n/a
8408	n/a	n/a
9401	139.28	137.86
9402	139.26	137.63
8102	130.37	128.72
8204	132.36	131.04
8205	136.18	135.39
8303	137.27	136.49
8301	137.24	136.44
8406	140.8	139.5
8003	n/a	n/a
8002	n/a	n/a
8001	124.8	123.41
8004	n/a	n/a
9001	n/a	n/a
8101	127.93	124.99
9108	130.33	128.67
9003	n/a	n/a
9004	n/a	n/a
9006	n/a	n/a
8103	n/a	n/a
8105	n/a	n/a
8104	131.31	129.75
8409	139.7	138.33
8405	140.78	139.79
8404	141.28	n/a
8403	141.77	140.76
9107	n/a	n/a
9106	129.98	127.88
9005	n/a	n/a
9105	127.09	124.42
9403	137.02	135.91
9002	n/a	n/a
9104	127.79	125.83
6310	n/a	n/a
6309	n/a	n/a
5407	n/a	n/a
6403	n/a	130.36
6402	130.98	127.87
5406	130.38	127.84
6404	n/a	n/a
6206	129.03	127.65
6207	129.05	127.28
6303	134.45	132.47
6405	137.93	135.81
6302	133.19	131.4
6301	133.4	131.32
6002	108.67	105.21
6205	125.64	n/a
6204	125.79	119.94
6210	125.93	122.93
6305	131.43	129.25
6304	131.53	129.11
6306	n/a	n/a
6401	134.86	132.29
6003	106.81	104.32
6004	106.48	102.59
7203	131.73	129.81
7204	n/a	n/a
5304	120.42	118.58
5408	128.77	126.33
6101	109.68	106.28
5101	111.05	107.89
6201	n/a	n/a
6311	128.34	121.38
6308	128.62	127.53
6209	n/a	n/a
6208	n/a	n/a
6406	139.12	136.64
7405	139.37	137.31
7403	139.32	137.67
7309	135.04	133.38
7308	135.13	133.78
7201	n/a	n/a
7202	n/a	n/a
7307	134.87	132.54
7206	n/a	n/a
7205	n/a	n/a
7404	139.21	137.42
7305	138.92	137.28
7306	135.05	132.87
5303	120.53	116.75
5201	116.34	114.45
5409	n/a	n/a
5405	129.58	126.74



















Manhole Reference	Manhole Cover Level	Manhole Invert Level
5404	n/a	n/a
5302	118.41	114.6
5202	116.49	112.64
6001	n/a	n/a
6307	n/a	n/a
6202	n/a	n/a
6203	n/a	n/a
5301	118.34	117.05
5203	114.62	110.49
5103	111.17	109
5410	128.25	126.99
5102	112.54	108.57
9007	n/a	n/a
9102	125.21	123.67
9103	n/a	n/a
9109	124.36	123.39
9101	123.68	122.65
7401	142.18	141.24
7301	137.68	135.98
7402	n/a	n/a
8201	n/a	n/a
7102	129.48	127.6
8107	128.42	126.47
8202	134.2	133.08
8402	n/a	n/a
8401	140.44	139.31
7101	128.75	127.11
7103	130.22	129
7302	137.08	135.31
7304	138.97	136.96
7303	137.24	135.1
8106	n/a	n/a
8203	132.47	131.12

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.








# ALS Sewer Map Key

## Public Sewer Types (Operated & Maintained by Thames Water)

-  **Foul:** A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
-  **Surface Water:** A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
-  **Combined:** A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
-  Trunk Surface Water
-  Trunk Foul
-  Storm Relief
-  Trunk Combined
-  Vent Pipe
-  Bio-solids (Sludge)
-  Proposed Thames Surface Water Sewer
-  Proposed Thames Water Foul Sewer
-  Gallery
-  Foul Rising Main
-  Surface Water Rising Main
-  Combined Rising Main
-  Sludge Rising Main
-  Proposed Thames Water Rising Main
-  Vacuum





## Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

-  Air Valve
-  Dam Chase
-  Fitting
-  Meter
-  Vent Column




## Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

-  Control Valve
-  Drop Pipe
-  Ancillary
-  Weir





## End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

-  Outfall
-  Undefined End
-  Inlet






## Other Symbols

Symbols used on maps which do not fall under other general categories








-  Public/Private Pumping Station
-  Change of characteristic indicator (C.O.C.I.)
-  Invert Level
-  Summit

## Areas

Lines denoting areas of underground surveys, etc.

-  Agreement
-  Operational Site
-  Chamber
-  Tunnel
-  Conduit Bridge

## Other Sewer Types (Not Operated or Maintained by Thames Water)

-  Foul Sewer
-  Surface Water Sewer
-  Combined Sewer
-  Gully
-  Culverted Watercourse
-  Proposed
-  Abandoned Sewer

### Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0118 925 1504.

## Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0845 9200 800.

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to him at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to WaterVoice Thames on 0845 758 1658 (it will cost you the same as a local call) or write to them at 4<sup>th</sup> Floor (South), High Holborn House, 52-54 High Holborn, London WC1V 6RL.

### Ways to pay your bill

<b>By Post</b> – Cheque only, made payable to 'Thames Water Utilities Ltd' writing your Thames Water account number on the back. Please fill in the payment slip below and send it with your cheque to Thames Water Utilities Ltd., PO Box 223, Swindon SN38 2TW	<b>By BACS Payment</b> direct to our bank on account number 90478703, sort code 60-00-01 may be made. A remittance advice must be sent to Thames Water Utilities Ltd., PO Box 223, Swindon SN38 2TW. Or fax to 01793 424599 or email: cashoperations@thameswater.co.uk	<b>Telephone Banking</b> By calling your bank and quoting your invoice number and the Thames Water's bank account number 90478703 and sort code 60-00-01	<b>By Swift Transfer</b> You may make your payment via SWIFT by quoting <b>NWBKGB2L</b> together with our bank account number 90478703, sort code 60-00-01 and invoice number
--	--	---	--

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

# Invoice



## Mr Paul Birkenshaw

JMP Consultants Ltd  
85-89  
Colmore Row  
Birmingham  
B3 2BB

Thames Water Utilities Ltd.  
PO Box 223  
Swindon  
SN38 2TW

**Customer Reference:** MID3160-Eo.040/pjb

**Invoice No:** ADS12324794  
**Our Ref:** ALS/ALS  
Standard/2012\_2193371

**Customer Number:** ADS123420

**Posting Date:** 20-03-2012

**Purchase Order No:**

**Due Date:** 03-04-2012

**Search Address Supplied:** Land West Of, Hemel Hempstead,

Description of Charges	Qty	Unit Price	VAT (20%)	Amount (Inc VAT)
Asset Location Search	1	£230.00	£46.00	£276.00

**OUTSTANDING AMOUNT (Inc. VAT)**

£276.00

**Please send any outstanding amount to Thames Water, PO Box 223, Swindon, SN38 2TW.**

Your payment terms are within 14 days. Please see previous page for ways to pay.

For queries please contact the Property Searches Customer Support Team on Tel: 0118 925 1504.

**VAT Reg. No GB 537456915**



Girobank plc Bootle Merseyside GIR 0AA

Payment slip

bank giro credit



138 208 70	Reference (customer account number) ADS123420 / ADS12324794
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Credit account number 257 1706
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Amount due (40p fee payable at PO counter) £ 276
Cheque NOT acceptable at Post Office

By transfer from Alliance and Leicester Giro account number

Cashiers stamp and initials


Signature

JMP Consultants Ltd  
85-89  
Colmore Row  
Birmingham  
B3 2BB

Date

**NatWest**  
Collection Account  
Thames Water  
Utilities Ltd

Cash		
Cheques		
£		

57-17-06

Please do not write or mark below this line and do not fold this counterfoil





## Search Code

### **IMPORTANT CONSUMER PROTECTION INFORMATION**

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

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- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

#### **The Code's core principles**

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

#### **Complaints**

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

**Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.**

#### **TPOs Contact Details:**

The Property Ombudsman scheme  
Milford House  
43-55 Milford Street  
Salisbury  
Wiltshire SP1 2BP  
Tel: 01722 333306  
Fax: 01722 332296  
Email: [admin@tpos.co.uk](mailto:admin@tpos.co.uk)

You can get more information about the PCCB from [www.propertycodes.org.uk](http://www.propertycodes.org.uk).

**PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE**



Job No.	
Action By	
Action Completed	
Date Completed	
Action File Ref.	



**Chris Hughes**

Developer Services Waste - Provinces

JMP Consultants Ltd  
85-89 Colmore Row  
Birmingham  
B3 2BB

Your ref  
Our ref 715664/DTS - 28771  
Name Jonathan Shildrick  
Phone 0118 373 8708  
Fax 0118 373 8973  
E-Mail [jonathan.shildrick@thameswater.co.uk](mailto:jonathan.shildrick@thameswater.co.uk)

28 June 2011

Dear Mr Hughes,

**Proposed Development At Land At Fields End Lane, Hemel Hempstead**

I write in relation to the above site and further to your Pre-Development Enquiry application and the attached letter dated 4<sup>th</sup> May 2011 regarding the proposed development here.

We have notified our Asset Planners of the proposals and they have made comment regarding the capacity of the public sewers adjacent to the proposed site to accommodate the flows from the new mixed use development.

They have concerns regarding the sewerage network capacity in this area as it is unlikely to be able to support the demand anticipated from this development. It will therefore be necessary for us to undertake investigations into the impact of the development by means of a developer funded impact study to determine whether possible connection points to the system exist currently or what upgrades to the existing network are required before the site can connect to it.

Firstly, we will require a cheque made payable to Thames Water Utilities Ltd for £400 + VAT which our Modelling Group need in order to scope what is required as part of the impact study. This will enable them to create a quote for the impact study itself which I will then forward to you.

If you wish to proceed with this enquiry, I look forward to receiving the initial fee upon receipt of which I will instruct our Modelling Group to scope the study. If you have any further queries then please do not hesitate to call me on the above number.

Yours sincerely,

Jonathan Shildrick  
Developer Services Engineer

Thames Water Utilities  
Ltd, Clearwater Court,  
Vastern Road, Reading  
RG1 8BD

T 0118 3 738744  
I [www.thames-water.com](http://www.thames-water.com)

Registered in England and  
Wales  
No. 2366661, Registered office  
Clearwater Court, Vastern Road  
Reading, Berks. RG1 8BD