



Flood Risk Assessment

**Proposed Residential Development
Land East of Leicester Road,
Earl Shilton**

Revision B: May 2024

Report Reference: 923-FRA-01-B

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1.3 Current Use and Description

- 1.3.1 There has been no previous development on the site. The existing site is shown on the topographical survey enclosed in **Appendix B**.
- 1.3.2 There is a ditch which runs directly adjacent and parallel to the site's northern boundary, which falls in an eastward direction. Following the longitudinal fall, the visibility of the ditch terminates at the Spring Gardens road junction. From this point onwards, the surface water flow being conveyed through the ditch, is discharged via a pipe with an unknown diameter.
- 1.3.3 The site generally falls from south to north with average gradient of 1 in 10. The majority of the application site falls towards the northern boundary towards the existing ditch, whereas the very eastern extent falls towards Spring Gardens, which runs parallel with the eastern boundary.
- 1.3.4 The neighbouring land uses are a mix of commercial and residential to the north, east and south. To the west, the site abuts Leicester Road, beyond which lie two open greenfield parcels that have been granted planning consent. The northern parcel (Gladman Developments) has outline approval for 140 dwellings (planning ref 21/00135/OUT). The southern parcel (Development at Hill Top Farm) has full planning approval for 50 dwellings (planning ref 20/00916/FUL).
- 1.3.5 On land immediately north, there is a site known as 'Swedish Cottage'. In September 2023, full planning permission was granted for, 'Change of use an alteration to existing commercial building (Class E) to meeting hall (Class F1) with associated access, parking and ancillary works.' (planning ref. 23/00596/FUL). Following this planning consent, a hybrid planning application has been submitted for the same land parcel. The proposal still covers what has now been consented; however, it also allows for outline permission of 6 residential dwellings (planning ref 24/00035/HYB). The Hybrid application was validated in January 2024 and is currently awaiting a decision.

1.4 Proposed Development

- 1.4.1 The proposed development will comprise of up to 33 dwellings. The proposed development layout is shown on the plan enclosed in **Appendix C**.
- 1.4.2 In line with paragraph 006 of the Planning Practice Guidance for 'Flood risk and costal change' the lifetime of a residential development is considered to be at least 100 years.
- 1.4.3 The 'Flood Risk Vulnerability Classification' of various development types is defined within Annex 3 of the National Planning Policy Framework (NPPF) – December 2023. A residential development is classified as a More Vulnerable. The relevant extract from Annex 3 of the NPPF is set out below.

More Vulnerable

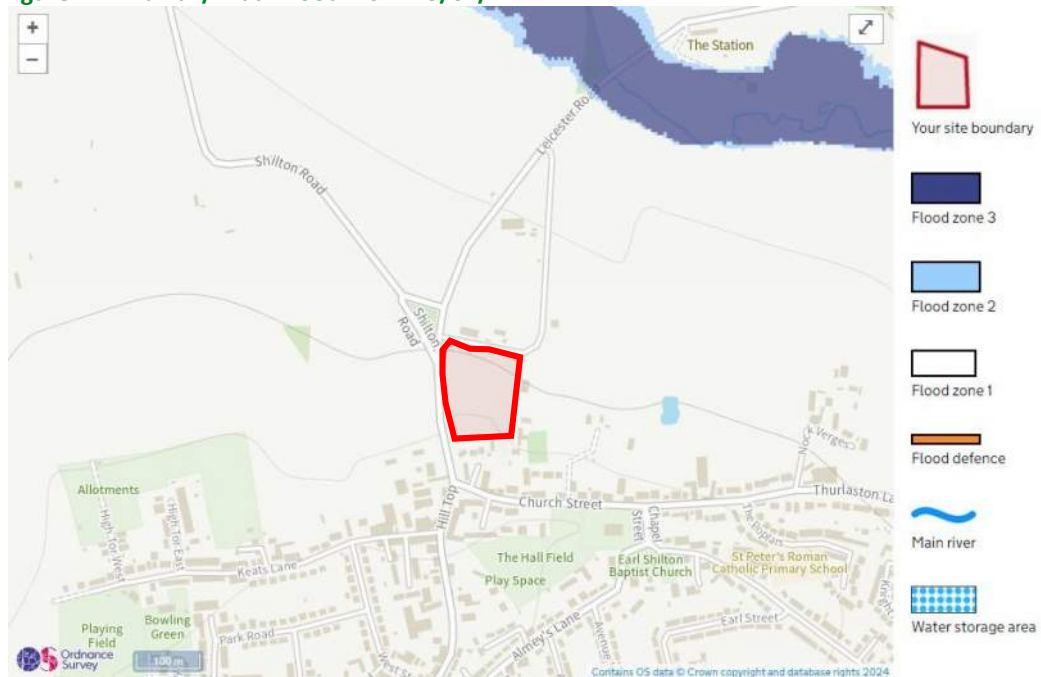
- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- **Buildings used for dwelling houses**, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries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

2.0 Site Specific Flood Risk

2.1 Risk of Fluvial / Tidal Flooding

- 2.1.1 The likelihood of fluvial and tidal flooding is defined on the Environment Agency's map 'Flood Map for Planning'. This flood map is published on the gov.uk website.
- 2.1.2 An extract of this flood map is provided below in **Figure 2.1**. The approximate site boundary is shown in red.

Figure 2.1: Fluvial / Tidal Flood Risk - 15/02/24



Source: <https://flood-map-for-planning.service.gov.uk>

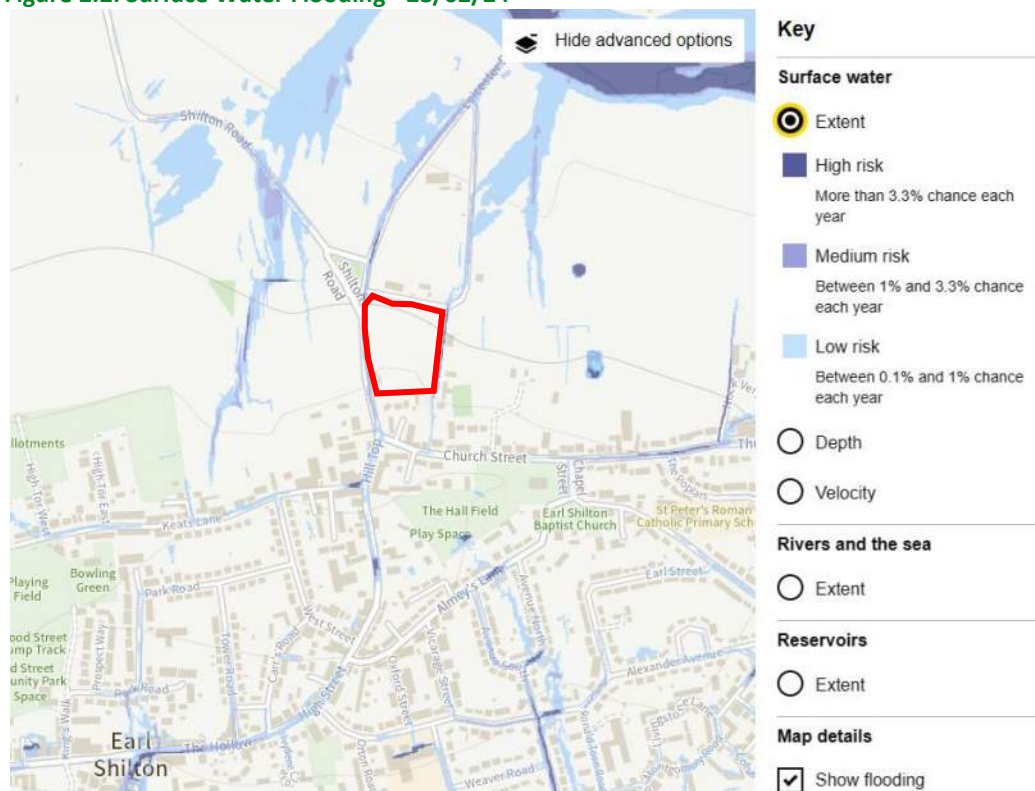
- 2.1.3 The Environment Agency's flood map shows that the proposed development site is located within Flood Zone 1 (Low Probability) and as such, the development is at a low (less than 1 in 1000 years) risk of flooding from rivers or the sea.

2.2 Risk of Surface Water Flooding

- 2.2.1 The likelihood of surface water flooding is defined on the Environment Agency's map 'Flood risk from surface water'. This flood map is published on the gov.uk website.
- 2.2.2 An extract of this flood map is provided below in **Figure 2.2**. The approximate site location is shown within the red boundary.
- 2.2.3 Regarding the accuracy of this map the EA state that:

"Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding. Because of this, we report the highest risk within 20m of a specific location, such as an individual property. This means reports for neighbouring properties may show different levels of risk."

Figure 2.2: Surface Water Flooding - 28/02/24



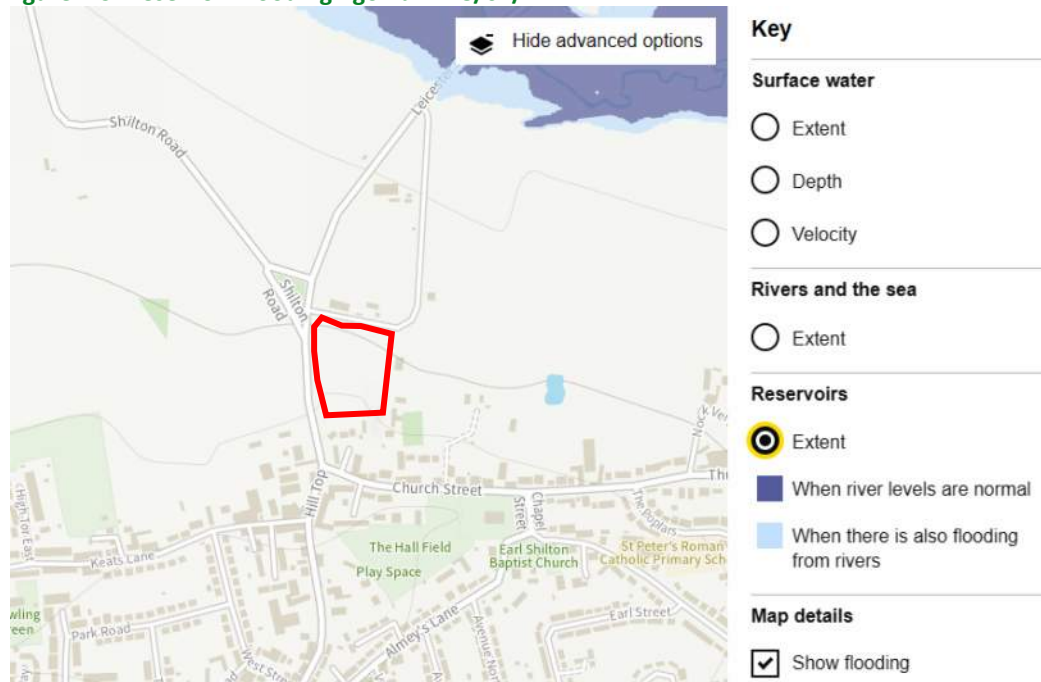
Source: <https://check-long-term-flood-risk.service.gov.uk/map>

- 2.2.4 The site is located in an area of very low surface water flood risk.

2.3 Risk of Reservoirs, Canals and Other Artificial Sources Flooding

- 2.3.1 The likelihood of reservoir water flooding is defined on the Environment Agency's map 'Flood Risk from Reservoirs'. This flood map is published on the gov.uk website.
- 2.3.2 An extract of this flood map is provided below in **Figure 2.3**. The approximate site location is shown within the red boundary.

Figure 2.3: Reservoir Flooding - gov.uk - 28/02/24



Source: <https://check-long-term-flood-risk.service.gov.uk/map>

- 2.3.3 The site is not at risk of reservoir flooding.

2.4 Risk of Ground Water Flooding

- 2.4.1 We do not have any records of ground water flooding within the vicinity of the site. We therefore consider the risk of ground water sewer flooding to be low.

2.5 Risk of Sewer Flooding

- 2.5.1 We do not have any records of sewer flooding within the vicinity of the site. We therefore consider the risk of sewer flooding to be low.

2.6 Previous Flood Events

- 2.6.1 The Environment Agency's Historic Flood Map does not show any flooding within the boundary of the site. The Environment Agency's "Historic Flood Map is a GIS layer showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater springs that meet set criteria. It shows areas of land that have previously been subject to flooding in England. Records began in 1946 when predecessor bodies to the Environment Agency started collecting detailed information about flooding incidents".

2.7 Summary of Flood Risk

- 2.7.1 The proposed development site is located within Flood Zone 1 and is at a low risk of flooding from all other sources.

2.8 Flood Risk Vulnerability and Flood Zone 'Compatibility'

- 2.8.1 The suitability of different development types to be built and occupied within a particular Flood Zone is defined within Table 2 of the Planning Practice Guidance for 'Flood Risk and Coastal Change'. Table 2 is replicated below in **Table 2.1** below. This table maps vulnerability classes against the flood zones to indicate where development is 'appropriate' and where it should not be permitted.
- 2.8.2 The proposed residential development is located within Flood Zone 1 and is classified as a More Vulnerable development. Based on this categorisation of the development it is considered 'appropriate' neither a Sequential Test nor Exception Test are required.

Table 2.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Zone	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

✓ Development is appropriate

✗ Development should not be permitted.

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

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

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

3.0 Surface Water Management

3.1 Existing Drainage

3.1.1 The site is currently undeveloped with no positive drainage.

3.2 Existing Discharge Rate

3.2.1 The existing discharge rate for the site has been calculated using the IH124 method. Full calculations are enclosed in **Appendix F** whilst the input parameters and results are summarised in **Table 3.1** below.

Table 3.1: Existing Run-off Rate Calculation Parameters and Results

Parameter	Value
Proposed Drained Area (ha)	0.564, see Appendix E
SAAR (mm)	626
Soil Index / SPR	4 / 47
Region	4
Results	Value
Q _{Bar} (l/s)	2.4
Q1 (l/s)	2.0
Q30 (l/s)	4.7
Q100 (l/s)	5.9
Results	Value
Q _{Bar} (l/s/ha)	4.3
Q1 (l/s/ha)	3.5
Q30 (l/s/ha)	8.3
Q100 (l/s/ha)	10.5

3.2.2 Within the vicinity of the proposed development, Leicestershire County Council represent the Lead Local Flood Authority (LLFA). The LLFA have produced a document called 'Interim LLFA Guidance Note: Planning and Development in Leicestershire'. Within Section 7 of LLFA document, guidance is provided on existing and proposes peak discharge rates. It states, to minimise risk of system blockage, the council would allow 5 l/s as the minimum discharge rate from a site.

3.2.3 Based on LLFA guidance, the allowable discharge rate for the site can be 5 l/s as a minimum; therefore, surface water post development will be restricted to a discharge rate of 5 l/s.

3.3 Proposed Method of Discharge

3.3.1 Paragraph 56 of the Planning Practice Guidance for 'Flood Risk and Coastal Change' defines the hierarchy of drainage options. Where reasonably practicable the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration)
2. to a surface water body
3. to a surface water sewer, highway drain, or another drainage system
4. to a combined sewer

3.3.2 Each of these is considered separately below:

Into the ground

3.3.3 Inspection of the British Geological Survey's maps show that the superficial deposits at the site have only been recorded for the southwestern corner. The deposits have been identified as Wigston Member – Sand and Gravel. The bedrock geology which underlies the site is Gunthorpe Member – Mudstone.

3.3.4 Based on the above geology description we would anticipate that infiltration techniques across the site would be unviable. As this is an outline application, infiltration testing will be undertaken at the detailed design stage to confirm this assumption. Should infiltration be found to be viable the drainage strategy proposed for the development will be altered to take this into account.

To a surface water body

- 3.3.5 There is a ditch located along the proposed development's northern boundary and conveys surface water flows in an eastbound direction towards the road junction at Spring Gardens. A CCTV Drain Investigation was completed on the 14th February 2024, to determine whether this ditch would represent a suitable outfall for the proposed development. A copy of the investigation report which summaries the findings is enclosed in **Appendix H**.
- 3.3.6 The CCTV Drain Investigation confirmed the presence of a manhole within the eastern end of the ditch, where it terminates directly adjacent to Spring Gardens. From the site visit, it was concluded that surface water flows enter the manhole through its cover, as opposed to any upstream piped connection. From the manhole, there is only one outgoing pipe, which heads towards the direction of Spring Gardens, and this appears to be the drainage asset that disposes surface water flows intercepted by the ditch.
- 3.3.7 The investigation report states that the water level in the ditch was up to the top of cover of the ditch manhole, whereas the water level in the manhole was 430mm lower. The water level in the manhole was observed to remain about the same both with and without rain. The water level in the manhole was recorded as being level with the invert level of the outgoing pipe.
- 3.3.8 The depth to the solid bottom of the ditch manhole was measured as 1350mm. Based on the surveyed cover level for the ditch manhole which is shown on the Topographical Survey as 97.35 mODN (metres above Ordnance Datum Newlyn), the associated invert level can be calculated as $97.35 \text{ mODN} - 1350\text{mm} = 96.920 \text{ mODN}$. The inert level of the outgoing pipe will provide a sufficient level difference to ensure a gravity connection can be made from the proposed development to the ditch on the northern boundary.
- 3.3.9 As a surface water body is viable, the use of alternative drainage methods will not be considered further in this report.

3.4 Proposed Drainage Strategy

3.4.1 Surface water discharge from the proposed development will outfall to a ditch located along the northern site boundary. The surface water discharge rate from the site will be restricted to a minimum discharge rate of 5 l/s (8 l/s/ha), in accordance with Lead Local Flood Authority guidance. This will ensure the risk of blockage within the proposed surface water drainage network is minimised.

3.4.2 The proposed drainage strategy will comprise a:

- A piped network
- Hydro-Brake® flow control
- Detention Basin – online
- Permeable paving to private drives - tanked

3.4.3 The proposed surface water drainage strategy is shown on the MAC drawing number 923-FRA03A enclosed in **Appendix D**.

Design Parameters

3.4.4 Surface water drainage will be designed using the rainfall parameters from the Flood Estimation Handbook (FEH).

3.4.5 New Climate Change (CC) allowances were published by the Environment Agency in May 2022. The new data can be accessed using an interactive webpage which provides the peak rainfall intensity climate change allowances for the 2050s and 2070s epoch. The CC allowance is set on a catchment basis.

3.4.6 The proposed development is located within Soar Management Catchment. The proposed development is expected to have a lifespan which exceeds the 2050s; therefore, the 2070s epoch will be used. For drainage design the Upper End Allowance must be used, the parameters for this catchment and epoch are replicated in **Table 3.2** below.

Table 3.2: Climate change allowances for peak rainfall

Annual Exceedance Rainfall Event	Upper End Allowance
3.3%	35%
1%	40%

3.4.7 To ensure a worst-case assessment is undertaken a 40% climate change allowance will be used for the 1% annual exceedance rainfall event.

3.5 Attenuation Design

- 3.5.1 Surface water attenuation is required to store excess water during an extreme event whilst maintaining a minimum discharge rate of 5.0 l/s. Surface water will be attenuated within a detention basin. Full calculations are enclosed in **Appendix F** whilst design parameters are set out below.

Table 3.3: Attenuation Calculation Parameters and Results

Parameter	Value
Return Period (years)	100 + 40% Climate Change
Rainfall Parameters	FEH22
Drained Area (ha)	0.620, see Appendix E includes 10% urban creep
Discharge Rate (l/s)	5.0
Discharge Rate (l/s/ha)	8.1
Results	Value
Storage Requirement (m ³)	366

3.6 Overland Flows

- 3.6.1 In case of an extreme rainfall event, where the threshold of the design parameters noted in **Table 3.3** above are exceeded, overland flows will be directed to follow the natural topography of the land, towards the ditch which is situated along the site's northern boundary. The ditch in question is being used as the intended outfall for the proposed development and is located immediately downstream of the detention basin being used to attenuation surface water flows generated from the residential scheme.
- 3.6.2 Based on a comparison of the existing and proposed drainage strategies, it can be concluded that the established drainage regime for overland flows will not be altered as part of the proposed development.

3.7 Maintenance Requirements

3.7.1 The drainage will be designed in line with Building Regulations, and the “Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England (“the Code”); as well as local SUDS guidance to ensure compliance with best practice guidance, thus minimising the maintenance requirements. A full maintenance plan for the site will be developed at the detailed design stage.

3.7.2 The person / authority responsible for maintenance of the drainage will depend on ownership which will vary across the site. As detailed design and adoption progresses the exact body responsible for adoption of the various surface water aspects will become clear. Typical responsibilities are set out below in **Table 3.4**.

Table 3.4: Surface Water Maintenance

Drainage	Maintainer
Drains	Home owner
Private Sewers	Home owner / management company
Household SUDS	Home owner
Communal SUDS - private	Management company / home owner.
Adopted SUDS	SUDS Body: Local Authority / water company / other SUDS adopting body.
Adopted sewers	Water company

3.7.3 A detailed drainage maintenance plan will be prepared by the body responsible for maintenance once detailed design has been undertaken. This will follow the principles set out in the SUDS Manual, which are set out below:

Permeable Paving – taken from the SUDS Manual

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers' recommendations – pay particular attention to areas where water runs onto pervious pavement from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contribution and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly to the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements.
Remedial Actions	Remedial any landscaping which through vegetation maintenance or soil slip has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitate of surface and upper structure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Initial inspection	Monthly for three months after installation
Monitoring	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly. 48h after large storms in first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Detention Basin – taken from the SUDS Manual

Maintenance Schedule	Required Action	Typical Frequency
Detention basins would be expected to last as long as the development with appropriate maintenance.		
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Reseed poor areas of vegetation growth	As required
Occasional Maintenance	Prune and trim any trees and remove cuttings	Every 2 years / as required
	Remove sediment from inlets, outlets and main basin when required.	Every 5 years, or as required)
	Repair erosion or other damage by reseedling or re-turfing	As required
Remedial Actions	Repair / rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Pipes

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Open any inspection chambers and remove and debris.	Annually
Remedial Actions	Remediate any damaged pipe works.	As required
Monitoring	Monitor inspection chambers	Annually

Hydro-Brake®

3.7.6 All maintenance should follow manufacturer's current guidance. As a Hydro-Brake® does not include any moving parts, maintenance is limited.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Open any inspection chambers and remove any debris.	Annually
Remedial Actions	Remediate any damaged elements.	As required
Monitoring	Monitor inspection chambers	Annually

4.0 Foul Water Management

4.1 Existing Drainage

- 4.1.1 The site is currently a field, therefore does not have any existing foul water infrastructure.
- 4.1.2 Existing adopted sewers within the vicinity of the site are shown on the asset plan enclosed in **Appendix G**.

4.2 Proposed Drainage Strategy

- 4.2.1 Within the vicinity of the proposed development, the nearest available public sewers are located to the south, which predominantly consist of a combined sewer. There is a 225mm diameter vitrified clay pipe that is used as the main run, conveying flows centrally throughout the town. Despite the combined sewer being the main conveyance for foul flows generated within the settlement, there are some properties that benefit from foul sewer connections. However, the adopted foul sewer runs are relatively short i.e. no longer than 40m and ultimately connect into the combined network.
- 4.2.2 There is a section of the combined sewer network which runs beneath the Clear View Crescent cul-de-sac, which serves the residential properties that abut the proposed development's southern red line boundary. However, proposing a connection into this run would mean constructing a sewer and maintaining its associated easement through third-party land, currently comprising rear gardens.
- 4.2.3 Given the above, the more logical connection point would be into the combined sewer at manhole reference 8202, which is located beneath the road junction of Leicester Road, Hill Top and Church Street, immediately upstream of the Clear View Crescent cul-de-sac. Therefore, the current intention is to discharge foul water into the combined sewer. manhole reference 8202, as it is the closest connection point to the proposed development, which is situated within land that is publicly accessible.
- 4.2.4 Manhole reference 8202 has an invert level approximately 0.5m higher than the highest ground level surveyed on site. Therefore, flows will need to be discharged via pumping station to ensure effective conveyance to the adopted sewer network. As good practice, pumped flows will terminate at an intermediate manhole that will be installed no closer than 5m from the proposed outfall connection point, to allow for a sufficient length of pipe for foul flows to gravitate into the downstream network.
- 4.2.5 Severn Trent Water will be consulted at the detailed design stage to agree a suitable foul water drainage strategy for the development proposal.

4.3 Maintenance Requirements

- 4.3.1 The drainage will be designed in line with Building Regulations and ‘the Code’ to ensure compliance with best practice guidance thus minimising the maintenance requirements. A full maintenance plan for the site will be developed at the detailed design stage.
- 4.3.2 The person / authority responsible for maintenance of the drainage will depend on ownership which will vary across the site. As detailed design and adoption progresses the exact body responsible for adoption of the various surface water aspects will become clear. Typical responsibilities are set out below in **Table 4.1**.

Table 4.1: Foul Water Maintenance

Drainage	Maintainer
Drains	Home owner
Private Sewers	Home owner / Management company
Adopted sewers	Water company

5.0 Conclusions

5.1 Site location and proposed development

- 5.1.1 The proposed residential development is located at 'Land East of Leicester Road, Earl Shilton'.
- 5.1.2 The proposed development will comprise of up to 33 dwellings.

5.2 Flood Risk

- 5.2.1 The proposed development site is located within Flood Zone 1 and is at a low risk of flooding from all other sources.
- 5.2.2 The proposed development's vulnerability classification is compatible with the Flood Zone therefore the development is appropriate.

5.3 Surface Water Management

- 5.3.1 The key proposed surface water parameters are:
- Discharge rate: 5.0 l/s (LLFA minimum standard)
 - Outfall: watercourse – The existing outfall point has been confirmed through a CCTV Drainage Investigation.
 - Attenuation requirement: 366 m³
 - SUDS features
 - A piped network
 - Hydro-Brake® flow control
 - Detention Basin – online
 - Permeable paving to private drives – tanked

5.4 Foul Water Management

- 5.4.1 The intention is to discharge foul water to the adopted combined sewer located in beneath the road junction of Leicester Road, Hill Top and Church Street. The currently proposed connection point is manhole reference 8202, which has an invert level approximately 0.5m higher than the highest ground level surveyed on site. Therefore, flows will need to be discharge via pumping station.
- 5.4.2 Notwithstanding the above, this Flood Risk Assessment report has been drafted to support an outline planning application. As such, Severn Trent Water will be consulted at the detailed design stage to agree a suitable foul water drainage strategy for the development proposal.

Appendix A

Location Plan

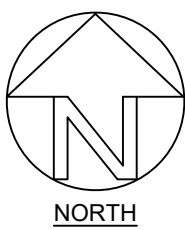
MAC drawing no. 923-FRA01

[illegible]

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Drainage Strategies

Appendix B

Topographical Survey
Brightsurv Ltd drawing no. T01 Revision B



GENERAL NOTES

This drawing is to be read and printed in full colour.

SURVEY NOTES

1. This plan should only be used for its original purpose. Brightsurv Ltd accepts no responsibility if supplied to any other party than the original client.
2. Certain areas of the site may have been inaccessible due to dense vegetation, vehicles etc on site at the time of survey, therefore not all services may be identified on the survey drawing.
3. Information shown outside of the site boundary has been taken from Ordnance Survey records and would need verification to be relied upon.
4. The spread of vegetation shown is approximate only. Where canopy spread is critical then this shall be regularly checked. Generally only trees with a spread greater than 2.0m will be shown on the drawing.
5. Where the identity of a service is shown this is based on a visual id only. Where specific identification is required then additional survey work shall be undertaken.
6. Dimensions shown are in millimetres and levels in metres unless indicated.

Levels Levels relate to GPS observations.

LEGEND KEY			
AV Air Valve	FL Floor Level	RE Rodding Eye	
B Bollard	FLI Flood Light	RL Ridge Level	
BH Borehole	FW Foul Water	RS Road Sign	
BL Bed Level	G Gully	RWP Rainwater Pipe	
BS Bus Stop	GV Gas Valve	St Stump	
BT BT Cover	Ht Height	SL Soft Level	
BW Brick Wall	IC Inspection Chamber	SV Stop Valve	
CATV Cable TV Cover	IL Invert Level	SVP Soil & Vent Pipe	
CIB Close Boarded	IRR Iron Railing	SW Surface Water	
CL Chain Link	KO Kerb Outlet	SWW Stone Wall	
CL Cover Level	LB Letter Box	THL Threshold Level	
Col. Column	LP Lamp Post	TL Traffic Light	
CRW Concrete Retaining Wall	MH Manhole	TP Telegraph Pole	
CW Concrete Wall	Mk Marker Post	US Underside	
C/P Catch Pit	NP Name Plate	UTL Unable To Lift	
DPC Damp Proof Course	OH Overhead	VP Vent Pipe	
Dr Drain	P Post	WL Water Level	
EL Eaves Level	PI Pipe	WM Water Meter	
ER Earth Rod	PR Post & Rail	WO Wash Out	
EP Electricity Pole	PW Post & Wire	WT Water Tap	
FH Fire Hydrant	PL Parapet Level		

Building		Tree Canopy	
Vegetation		Fence	
Control Station		Boundary	
Bush/Shrub		Contours	
Tree		OH Telecom	
Tree (Multi-Bolt)		OH Electric	
Gate		Foul Water	
		Surface Water	

Rev B - March 2024-
Building Heights added.

Rev A - Feb 2024- Additional
Track and road added.

**Brightsurv
Ltd.**

9 Thickwillow
Godmanchester
PE29 2LR

Contact: Richard@brightsurv.co.uk
Tel: 07843 411 341

Client Manor Oak Homes

Project Land off Leicester Road
Earl Shilton

Title Topographical Survey

Checked by RB Date April 2023

Project ref Drawing no. Revision
BRI753 T01 B

Scale at A1 1:500 Drawn by RB

Status
For Information

Appendix C

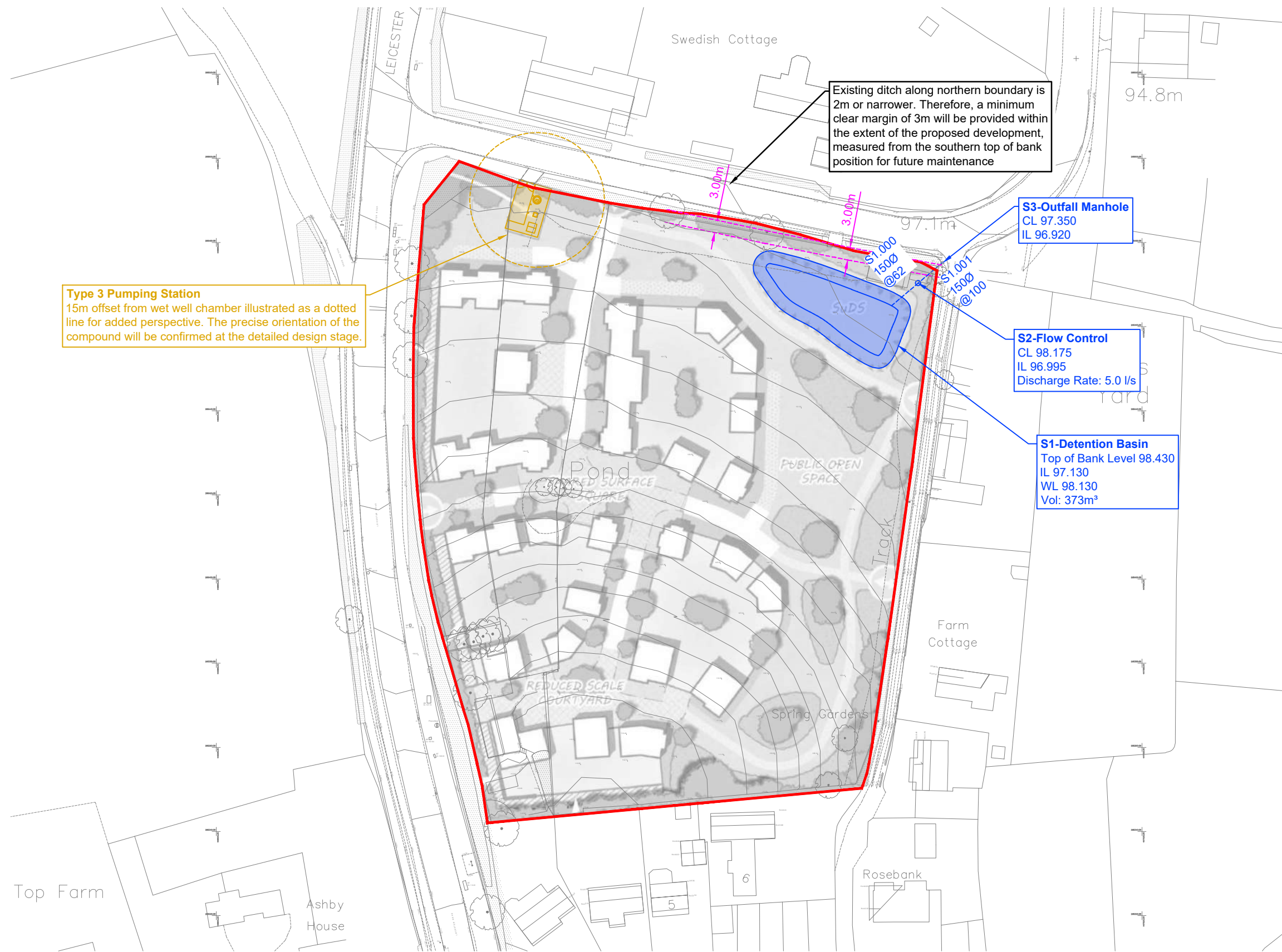
Concept Masterplan – 01

Insitu Design Ltd job no MAN0.221003, drawing no. CMP-01, Revision R5



Appendix D

Proposed Drainage Strategy
MAC drawing no. 923-FRA03A



- Notes:
1. Based on Topographical Survey by Brightsurv Ltd, drawing number T01 Revision B dated March 2024.
 2. Drawing based on Ordnance Survey mapping. ©Crown Copyright and database rights 2024 OS Licence no.AC0000849896.
 3. Based on Based on Concept Masterplan - 01 by Insitu Design Ltd, job number MANO.221103, drawing number CMP-01 Revision R5 dated 15.03.24.

Key

- Site Boundary
- Proposed Surface Water Drainage
- Proposed Surface Water Attenuation
- Proposed Type 3 Foul Water Pumping Station

MAC T: 01604 340544 Northampton Office E: info@mac-ltd.co.uk W: mac-ltd.co.uk Martin Andrews Consulting Ltd • Transport Assessments • Flood Risk Assessments • Highway Advice • Access Design • Drainage Strategies • Vehicle tracking	Client: Manor Oak Homes		Project: Land East of Leicester Road, Earl Shilton	
	Title: Proposed Drainage Strategy		Date: 19.04.24	
			Drw: AN	
			Chk: MJA	
	Drawing No: 923-FRA03		Revision: A	Scale: 1000 Size: A3

Appendix E

Proposed Impermeable Area
MAC drawing no. 923-FRA02A



- Notes:**
1. Based on Topographical Survey by Brightsurv Ltd, drawing number T01 Revision B dated March 2024.
 2. Drawing based on Ordnance Survey mapping. ©Crown Copyright and database rights 2024 OS Licence no.AC0000849896.
 3. Based on Based on Concept Masterplan - 01 by Insitu Design Ltd, job number MANO.221103, drawing number CMP-01 Revision R5 dated 15.03.24.

Key

 Site Boundary

 Development Area = 9,403m²
PIMP = 60%
Impermeable Area = 5,642m²

 T: 01604 340544 Northampton Office E: info@mac-ltd.co.uk W: mac-ltd.co.uk Martin Andrews Consulting Ltd	• Transport Assessments • Flood Risk Assessments • Highway Advice • Access Design • Drainage Strategies • Vehicle tracking	Client: Manor Oak Homes		Project: Land East of Leicester Road, Earl Shilton				
		Title: Proposed Impermeable Area			Date: 19.04.24			
					Drw: AN			
					Chk: MJA			
		Drawing No: 923-FRA02			Revision: A		Scale: 1:1000	
							Size: A3	

Appendix F
Drainage Design Calculations



Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1-Detention Basin	0.620	5.00	98.430	1200	446960.486	298464.962	1.300
S2-Flow Control			98.175	1200	446966.812	298470.329	1.180
S3-Outfall Manhole			97.350	1200	446972.547	298475.194	0.430

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1-Detention Basin	S2-Flow Control	8.296	0.600	97.130	96.995	0.135	61.5	150	5.11	50.0
1.001	S2-Flow Control	S3-Outfall Manhole	7.521	0.600	96.995	96.920	0.075	100.3	150	5.23	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.285	22.7	84.0	1.150	1.030	0.620	0.0	150	1.309
1.001	1.003	17.7	84.0	1.030	0.280	0.620	0.0	150	1.022



Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	8.296	61.5	150	Circular	98.430	97.130	1.150	98.175	96.995	1.030
1.001	7.521	100.3	150	Circular	98.175	96.995	1.030	97.350	96.920	0.280

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1-Detention Basin	1200	Manhole	Adoptable	S2-Flow Control	1200	Manhole	Adoptable
1.001	S2-Flow Control	1200	Manhole	Adoptable	S3-Outfall Manhole	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1-Detention Basin	446960.486	298464.962	98.430	1.300	1200				
						0	1.000	97.130	150
S2-Flow Control	446966.812	298470.329	98.175	1.180	1200		1	1.000	96.995
						0	1.001	96.995	150
S3-Outfall Manhole	446972.547	298475.194	97.350	0.430	1200		1	1.001	96.920
									150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	4.7
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	5.9
Winter CV	0.840	Drain Down Time (mins)	240	1 year (l/s)	2.0	Check Discharge Volume	x

Storm Durations

60	120	180	240	360	480	600	720	960	1440	2160	2880	4320	5760	7200	8640	10080
----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-------



Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Soil Index	4	Growth Factor 30 year	1.95	Q 1 year (l/s)	2.0
Greenfield Method	IH124	SPR	0.47	Growth Factor 100 year	2.48	Q 30 year (l/s)	4.7
Positively Drained Area (ha)	0.564	Region	4	Betterment (%)	0	Q 100 year (l/s)	5.9
SAAR (mm)	626	Growth Factor 1 year	0.85	QBar	2.4		

Node S2-Flow Control Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	96.995	Product Number	CTL-SHE-0103-5000-1135-5000
Design Depth (m)	1.135	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node S1-Detention Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.130
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	289.0	0.0	1.000	559.0	0.0	1.001	0.0	0.0



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S1-Detention Basin	352	98.005	0.875	53.4	365.5220	0.0000	SURCHARGED
360 minute winter	S2-Flow Control	352	97.997	1.002	5.1	1.1335	0.0000	FLOOD RISK
120 minute winter	S3-Outfall Manhole	52	96.974	0.054	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S1-Detention Basin	1.000	S2-Flow Control	5.1	0.339	0.224	0.1460	
360 minute winter	S2-Flow Control	1.001	S3-Outfall Manhole	5.0	0.831	0.281	0.0452	153.1



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Data updated: 14/02/24

Scale: 1:1250
Map Centre: 446884,298395

Date: 28/02/24
Our Ref: 1407531 - 1

Wastewater Plan A2
Powered by digdat

Public Foul Gravity/Lateral Drain		Highway Drain		Manhole Foul	
Public Combined Gravity/Lateral Drain		Overflow Pipe		Manhole Surface	
Public Surface Water Gravity/Lateral Drain		Disposal Pipe		Abandoned Pipe	
Pressure Foul		Culverted Water Course		Chamber	
Pressure Combined		Pumping Station		Section 104 sewers are shown in green	
Pressure Surface Water		Fitting		Private sewers are shown in magenta	

alexander.nelson@mac-ltd.co.uk

923



Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2024 All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.



GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.
4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.
17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014
18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.
19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

CLAYDON

254A MAIN ROAD
DUSTON
NORTHAMPTON
NN5 6PP

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email: bob-claydon@btconnect.com

CCTV DRAIN INVESTIGATION

Client: Martin Andrews Consulting Ltd.
Location: LAND OFF LEICESTER ROAD AND SPRING GARDENS, EARL SHILTON
Details: Drain investigation works from ditch manhole as requested
Date: 14.2.24

The water level in the ditch was up to the top of the cover of the ditch manhole and flowed over the edge into the manhole. The water level in the manhole was 430mm lower and remained about the same with rain or no rain. The level could only be lowered by a small amount for a short time by bailing or jet pumping before it returned to the same level. Only one pipe in the corner of the ditch manhole was visible. The water level in the manhole was level with the invert level of this pipe. It was not possible to carry out any CCTV drain survey works as any outlets from the manhole in the ditch were underwater. The depth to the solid bottom was 1350mm. The duty of pipes in the ditch manhole (in/out) is not known. It appears that the only entry point for the ditch water into the manhole is via the cover.

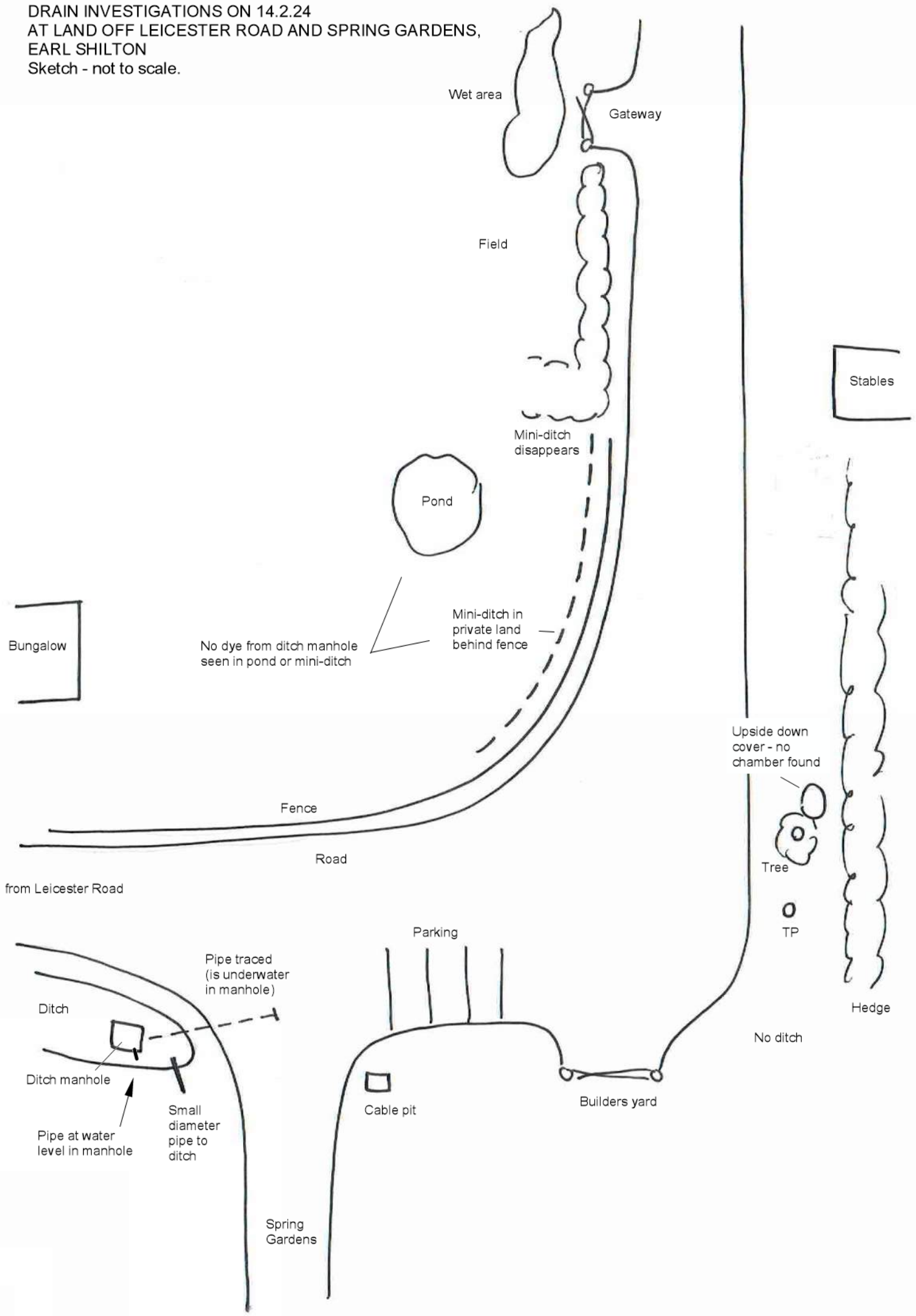
We could feel with drain rods an underwater pipe heading towards the Spring Gardens junction and were able to insert a sonde on push rod. The line was traced for a short distance, but it became impossible to push the rod any further. Enclosed photographs show the position where it stopped. We were not able to find where the ditch water was going and further works with use of a jet/suction tanker may help investigations move forward.

It was noted that the cover on the other side of the junction is for a cable pit and is not related to drainage. There is a small diameter black plastic pipe entering the ditch from Spring Gardens.

There is no ditch outside the builders yard beyond the junction or further down the road. An upside down manhole cover which appears to be abandoned lies on the verge by a tree but no chamber was evident in the vicinity. On the opposite side of the road there is a small mini-ditch in private land on the other side of a fence. No dye from the ditch manhole was seen in this mini-ditch, or in the nearby pond in the same property (all as viewed from the road). The mini-ditch disappears. Further down the road on the same side is a gateway. Here the field was noted to be very wet.

Photographs are enclosed together with a sketch plan which indicates the locations of these observations.

DRAIN INVESTIGATIONS ON 14.2.24
AT LAND OFF LEICESTER ROAD AND SPRING GARDENS,
EARL SHILTON
Sketch - not to scale.





MH location.JPG



Ditch water level to MH edge.JPG



Cables cover opp ditch i.JPG



Cables cover opp ditch ii.JPG



Cables cover opp ditch iii.JPG



Cables cover opp ditch iv.JPG



Sm open pipe side of ditch i.JPG



Sm open pipe side of ditch ii.JPG



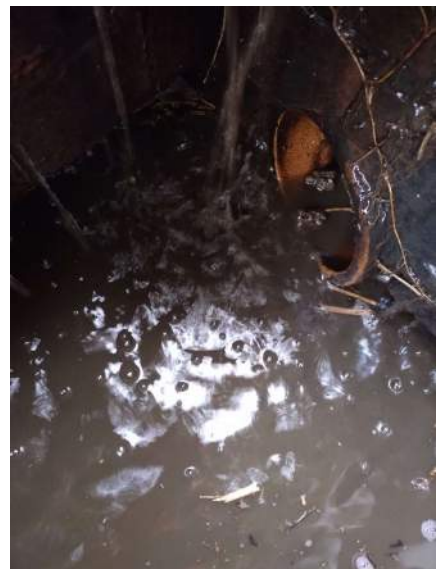
Sm open pipe side of ditch iii.JPG



Sm open pipe side of ditch top.JPG



1 pipe visible MH top corner i.JPG



1 pipe visible MH top corner ii.JPG



Ditch water dye goes to MH cover edge i.JPG



Ditch water dye goes to MH cover edge ii.JPG



Ditch water dye goes to MH cover edge iii.JPG



Ditch water dye goes to MH cover edge iv.JPG



Ditch water dye goes to MH cover edge v.JPG



Ditch water dye goes to MH cover edge vi.JPG



Line from MH traced i.JPG



Line from MH traced ii.JPG



Line from MH blocked i.JPG



Line from MH blocked ii.JPG



No ditch at Spring Gardens.JPG



No ditch behind TP.JPG



No ditch by builders entrance i.JPG



No ditch by builders entrance ii.JPG



Tree with upside down cover location i.JPG



Tree with upside down cover location ii.JPG



Tree with upside down cover.JPG



Upside down cover.JPG



Ground wet behind gateway i.JPG



Ground wet behind gateway ii.JPG



Ground wet behind gateway iii.JPG



Ground wet behind gateway iv.JPG



Ground wet behind gateway v.JPG



Ground wet behind gateway vi.JPG



Sm ditch inside NW fence i.JPG



Sm ditch inside NW fence ii.JPG



Sm ditch inside NW fence iii.JPG



Sm ditch inside NW fence iv.JPG



Sm ditch inside NW fence v.JPG



Sm ditch inside NW fence vi.JPG



Sm ditch disappears i.JPG



Sm ditch disappears ii.JPG



Pond.JPG



No dye seen in pond.JPG