# LITTLE OUSE HEADWATERS PROJECT

DRAINAGE AND SOILS STUDY

**ADAMS LAND MANAGEMENT LTD**

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# *LITTLE OUSE HEADWATERS PROJECT*

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## *REPORT*

**Contents**



## BACKGROUND

The purpose of this report is to provide information as set out in the document Brief for a Water Level Survey in the Thelnetham Floodplain produced by LOHP. This to assist with the restoration plans for an area of land known as New Fen. This area of land is in the process of acquisition by LOHP.

## SURVEY

A detailed survey of the New Fen area was carried out as part of the work for this project. The results of the survey are illustrated on the plans at Appendices 3 and 4 and reflected in the cross sections and longitudinal sections produced at Appendices 6 and 7 and also the other information presented to meet the objectives of the study.

## SOILS

The soils of the locality are mapped at 1:250000 scale and comprise broadly four main soil types. The higher land within the catchment comprises soils of the Beccles and Burlingham soil associations. These are fine loamy soils over chalky boulder clay and drift material. On the flanks of the fen, sandy soils of the Newport association are mapped and the fen itself predominately comprises soils of the Isleham association. This description is a very generalised representation of the soil types occurring and a detailed survey would identify considerable variation within the main associations. This level of survey has not been carried out.

As part of the study, soil sampling was carried out at a number of locations within the New Fen area. Three survey points, shown on Appendix 4, were used for sampling top and upper subsoil for a range of minerals and also texture. The results of this sampling are as follows:

| No | Details | pH | P | K | Mg |
|---|---|---|---|---|---|
| | | | Index and mg/l (Available) | | |
| **1** | Pit 1 Topsoil | 7.3 | 0 (9) | 1 (107) | 3 (106) |
| **2** | Pit 1 Upper Subsoil | 7.6 | 0 (4.6) | 0 (58) | 2 (67) |
| **3** | Pit 2 Topsoil | 7.5 | 0 (4.6) | 1 (105) | 2 (95) |
| **4** | Pit 2 Upper Subsoil | 7.3 | 0 (4.6) | 1 (77) | 2 (77) |
| **5** | Pit 3 Topsoil | 7.0 | 0 (6) | 1 (87) | 3 (142) |
| **6** | Pit 3 Upper Subsoil | 6.2 | 0 (4.2) | 1 (63) | 3 (133) |

It is clear from the above results that the soils sampled, which were all from the eastern section of the New Fen area, are very low in P and K. The high Mg level is likely to be attributable to the organic content of the soils which can lock up Mg, particularly at higher pH levels.

The pH of the samples was high, with only the subsoil of pit 3 indicating any acidity.

As a guide the following gives the index and ranges for the analysis carried out. This indicates how the results compare to the index range.

| Index | Phosphorus (P) | Potassium (K) | Magnesium (Mg) |
|---|---|---|---|
| | | Mg/l | |
| **0** | 0-9 | 0-60 | 0-25 |
| **1** | 10-15 | 61-120 | 26-50 |
| **2** | 16-25 | 121-240 | 51-100 |
| **3** | 26-45 | 241-400 | 101-175 |
| **4** | 46-70 | 401-600 | 176-250 |
| **5** | 71-100 | 601-900 | 251-350 |

The soil texture was also analysed for a representative soil sample to give some baseline information. Excluding the organic fraction, the soil sample was assessed as a sandy clay loam both in the topsoil and upper subsoil. The results of the analysis are shown in the table below. In brackets the typical analysis for the Isleham soil association are shown, which is the mapped soil within the area.

| Texture | Topsoil | Upper Subsoil |
|---|---|---|
| **Sand (2.00 – 0.063mm) %** | 58 (79) | 55 (90) |
| **Silt (0.063 – 0.002mm) %** | 16 (13) | 19 (7) |
| **Clay (<0.002mm) %** | 26 (8) | 26 (3) |
| | | |
| **Textural Classification** | Sandy Clay Loam | Sandy Clay Loam |

The textural classification is interesting in the context of the soils occurring in the area. The texture has a greater clay content than would be expected, both in the topsoil and upper subsoil. The profile has a greater association with the Shotford soil series, however at depth, (greater than 600mm) the soil was wet, usually bleached, sand which is not typical of the Shotford soils. Although no detailed analysis or further soil assessment was carried out, if the soils were of the Shotford series, then they are at risk from acid sulphate conditions.

The soils were assessed to 1.5 metres using a 2metre Edelman soil auger but no greater depth could be achieved due to the unstable nature of the soils and high water tables causing the auger holes to slump. The soils were relatively consistent, being an organic/peaty sandy clay loam over a peat (partly humified) with sand (grey and black) to depth.
Individual soil profiles are as follows:

**Pit 1**

| Soil Profile Layer | Description |
|---|---|
| **0-35 cm** | Organic Sandy Clay Loam becoming siltier |
| **35-70 cm** | Raw peat |
| **70-150 cm** | Mixture of black and grey medium sand occasionally bleached |

**Pit 2**

| Soil Profile Layer | Description |
|---|---|
| **0-35 cm** | Organic Sandy Clay Loam becoming siltier |
| **35-70 cm** | Raw peat |
| **70-150 cm** | Mixture of black and grey medium sand occasionally bleached |

**Pit 3**

| Soil Profile Layer | Description |
|---|---|
| **0-35 cm** | Organic Sandy Clay Loam becoming siltier |
| **35-70 cm** | Raw peat |
| **70-150 cm** | Mixture of black and grey medium sand occasionally bleached |

**Pit 4 – west of ditch (higher ground)**

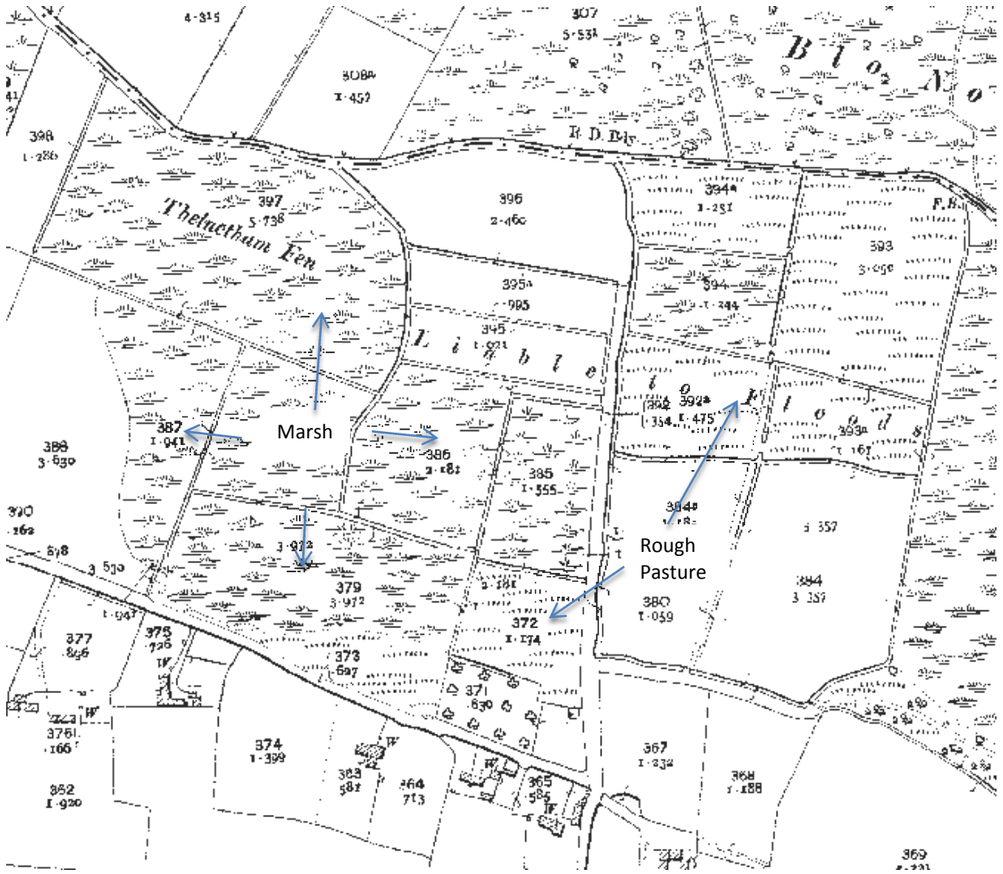
| Soil Profile Layer | Description |
|---|---|
| **0-35 cm** | Organic Sandy Clay Loam becoming silty |
| **35-60 cm** | Raw peat |
| **60-80 cm** | White bleached sand |
| **80-120 cm** | Mixture of black and grey medium sand occasionally bleached |

## DRAINAGE

The drainage of this area is typical of many systems in Norfolk and Suffolk relying on a network of ditches and watercourses to transport drainage water to the river systems. The catchment which relies on this study area for outfall is predominately agricultural but also includes hard development.

Whilst the existing drainage system was considered as part of this study some research was carried out into former systems. The main source of information for this was historic maps of the area and, in particular, those from 1903/04 and 1976/77.

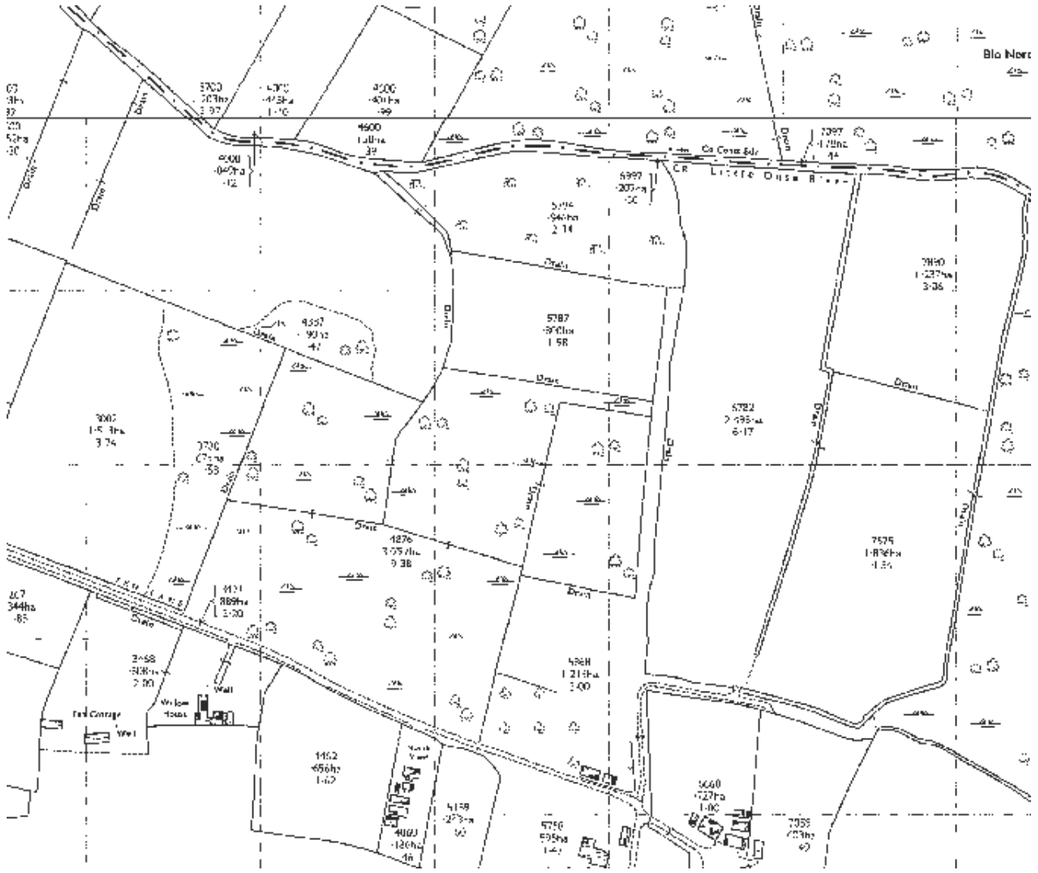
The 1904/05 map, extract below, shows a network of ditches within the fen area. The majority of the ditchers are shown as typical fen dykes or ditches at least 1 metre wide, based on Ordnance Survey mapping protocol. The ditches serve a drainage function and also a carrier function in the case of those running north to south and outfalling into the Little Ouse.




**Extract from 1903/04 Ordnance Survey Plan – Land use marked**

Land use was defined as marsh or rough grassland and although not specifically defined these definitions follow survey protocol and illustrate that a difference in land use was noted.

The 1976/77 map, extract below has a very similar layout of ditches, with very few having been removed despite attractive grant encouragement for field rationalisation and drainage prior to this date.




**Extract from 1976/77 Ordnance Survey Plan**

In drainage terms two main points are particularly relevant to the soils found in the area and follow the general outline set out above. The soils derived from boulder clay have a requirement for drainage to allow the land to be farmed effectively. The drainage systems for the heavier soils require outfalls which should be free to discharge without surcharge or interruption. Outfalls typically discharge into ditches which have a carrier function, which is to transport water away through the hierarchy of water management of the area. The second drainage requirement is that to intercept water flows and this can be for surface and subsurface flow. For agricultural drainage, the most important ditch in this landscape is often that which is the boundary between higher and

lower lying land or the cut-off ditch. The location of this ditch, its maintenance and profile is often one of the major issues where competing or differing views about drainage requirements are involved. Ditches within the low lying areas have either a carrier function and, in agricultural land uses, may also have a drainage function, but this is dependent on the land use regime and any outfall limitation.

The main drainage outfalls located as part of the survey are marked on the plan at Appendix 2 with comment about their function.

## DIPWELLS AND GAUGEBOARDS

As part of the project the levelling in of a number of dipwells and gauge boards was required. The results of this work are shown in the table below. The following points should be noted:

- Several of the gauge boards do not indicate correct levels, with as much as 125mm difference from actual levels recorded. Whilst these may not be relied upon for accurate recording they do give a misleading impression to landowners and interested parties.

- The grid references for the dipwells are not accurately plotted. The accurate plotting was not part of the survey but might be considered for the future.

| Location | Asset | Level |
|---|---|---|
| **Blo Norton Fen** | TM07/258a | 23.348 – top of pipe<br>22.457 – ground level |
| | TMO7/258B | 23.345 – top of pipe<br>22.459 – ground level |
| | TM07/167 | 23.343 – cover of dipwell |
| **Parkers - Bleyswick** | P1 | 22.778 – top of pipe<br>21.883 – ground level<br>21.733 – water level close by |
| | P2 | 21.663 – water level<br>21.68 – reading on board |
| | P3 | 21.098 - water level<br>21.38 – reading on board |
| **Webbs Fen** | W1 | 23.114 – top of pipe<br>22.498 – ground level |
| | W2 | 22.665 – top of pipe<br>22.025 – ground level |
| | W3 | 22.633 – top of pipe |
| | | 22.010 – ground level |
| | W4 | 21.323 – water level<br>21.15 – reading on board |
| **Bleyswyck's** | B1 | 22.265 – top of pipe<br>21.755 – ground level |
| **Broomscot Common** | B1<br>B2 | 22.77 – top of pipe<br>21.90 – ground level<br>20.980 – water level<br>21.08 – reading on board |
| **Scarfe Meadows** | S1<br><br>S2<br><br>S3 | 19.225– water level<br>19.32 – reading on board<br>19.225– water level<br>19.39 – reading on board<br>19.065– water level<br>19.22– reading on board |

## LANDOWNERS' VIEWS

A number of landowners were visited as part of the study and discussions held with regard to drainage and the impacts on their land.

The concerns expressed by the farmers/landowners interviewed are summarised below but reproduced in bullet point format at Appendix 8

The main concern was the lack of management of the river section, especially that from the Mill Road bridge/ford eastwards to Hinderclay Fen and to the outfall of the watercourse flowing into the river from the south and south west. Associated with this were concerns about the drainage links between the higher ground and the river systems. The concerns arose mainly from landowner knowledge of drainage systems and how they had functioned in the past.

There was a general suspicion of the work of LOHP and the Wildlife Trust and lack of understanding of the function and aims of each. A lack of confidence that land uses and drainage systems which were not in accord with the project objectives would be maintained or allowance made for outfall and flows was also expressed.

## COMMENT

Detailed comment about the drainage and key points of the area is included in a table at Appendix 4 to this report. Description is made of each feature including its condition and comment is made about function and potential. No detailed design is included at this stage as this is not part of the remit for the report.

## FUTURE WORK

There is potential for further work to establish drainage routes and provide the basis for potentially conflicting objectives to be addressed. It is recommended that, at an early stage, an improved dialogue needs to be established with the farmers and landowners to seek some closer working relations and a greater understanding of objectives.

**Andrew Adams**

***2nd May 2014***


Appendix 1

LOHP
Drainage Survey

**A-Z** Annotation points referenced in explanatory text.

| | |
|---|---|
| Drawn By: | AJA |
| Date: | 1/5/2014 |
| Revision No: | 1 |
| Scale: | 1:3000@A3 |

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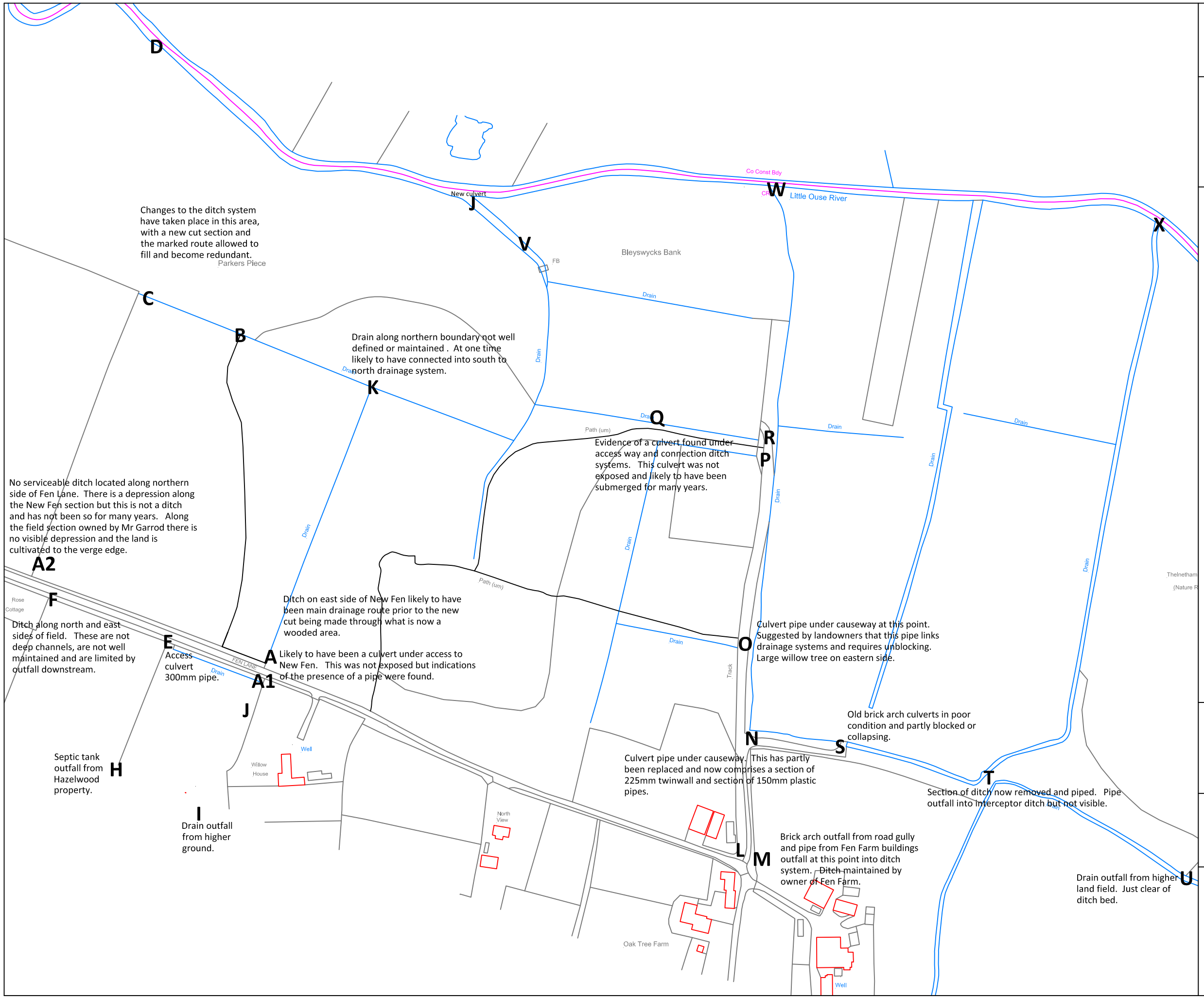
Appendix 2

LOHP
Drainage Survey




Drawn By: AJA
Date: 1/5/2014
Revision No: 1
Scale: 1:2000@A3

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Appendix 3

LOHP
New Fen

Land levels taken within the New Fen area. All levels are relative to Ordnance Datum

72. 22.01 TP
21.21 IV
21.38 DB
22.26 TB RHS
22.26 TB LHS

75. 22.778 TP
21.88
21.733 WL

Parkers Piece

46. 22.25 TB
45. 21.85 WL
22.324 21.50 HB
47. 22.54
44. 22.379
49. 22.84
21.26 SB
78. 22.09
21.85 WL
48. 22.44
20.82 HB
43. 22.07
82. 2
40. 21.93
79. 22.04 RHS
21.71
22.09
51. 22.95
50. 22.71
38.
21.97
80. 21.80 LL
21.66 DB
Drain
81. 21
52. 22.74
36. 22.00
37. 22.25
21.87 WL
53. 22.82
21. 22.05
21.27 SB
54. 22.72
20. 22.09
20.67 HB
55 22.73
35. 22.25
21.84 WL
22. 22.25
21.17 SB
20.64 HB
32. 22.30
23. 22.51
22.22 TB
56. 22.87
21.84 WL 30. 21.95
19. 22.17
57. 22.68
21.34 SB 31. 21.94
58. 22.71
20.89 HB
34. 21.97
24. 22.26
25. 22.00 TB
17. 22.30
21.83 WL 29. 22.31
18. 22.10
21.08 SB 28. 22.03
Drain
16. 22.5
20.83 HB
15. 22.45
27. 22.45
59. 22.70
64. 22.61
26. 22.19 TB
21.85 WL
13 22.45
21.50 SB
60.
62. 22.60
14. 22.39
21.05 HB
22.85
63. 22.54
10 22.87
61. 22.58 DB
23.02
9 22.86
11 22.57
12. 22.40
22.96
8 22.81
Rose
Cottage
22.94
7 22.78
22.86
6 22.77
1 22.75
22.84
5 22.68
22.74
4 22.69
FEN LANE
22.78
3 22.84
Drain
22.83
2 22.75
22.76
Well

Drawn By: AJA
Date: 1/5/2014
Revision No: 1
Scale: 1:1000@A3

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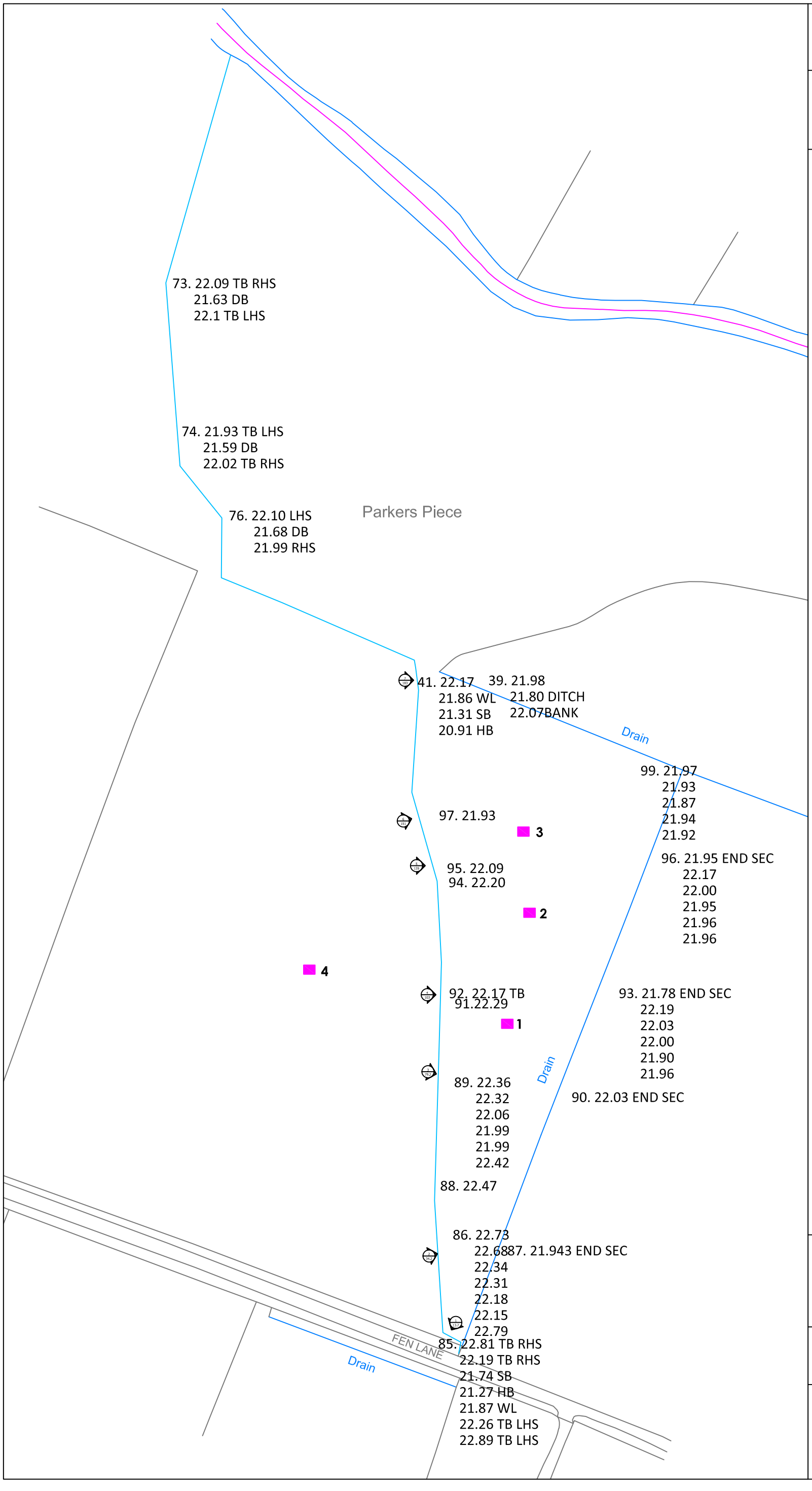
Appendix 4

LOHP
New Fen




1
101 Cross Sections

Soil Pits

Drawn By: AJA
Date: 1/5/2014
Revision No: 1
Scale: 1:1000@A3

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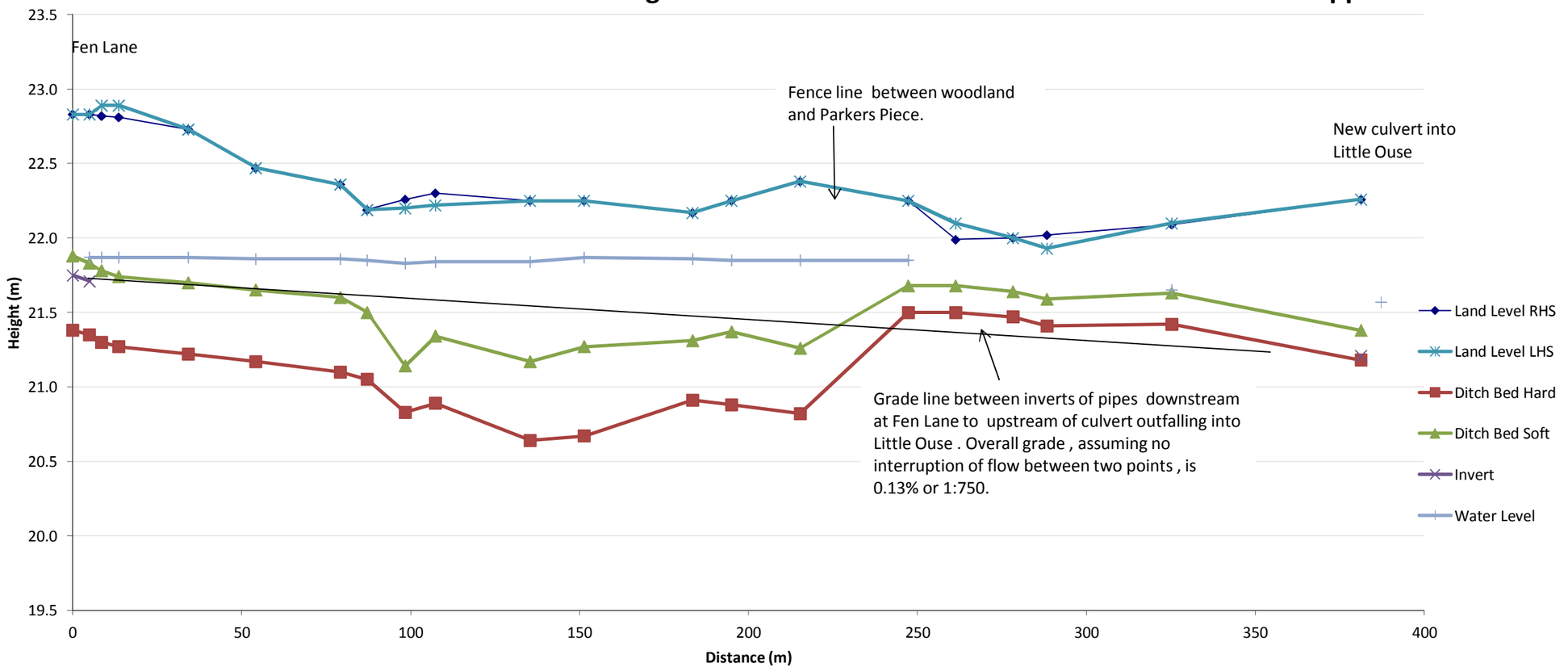
| Section | Description | Comment |
|---|---|---|
| A1 -A | Clay pipe culvert under Fen Road. Inlet and outlet clear but water builds up to submerge outlet and this has an impact on upstream flows. | Improvements to the downstream system will give benefit, but based on existing land use and drainage requirements, it would be possible to manage water levels and risk to meet all requirements through water control and some ditching works. |
| A - D | This is the ditch system between Fen Lane and the Little Ouse River and includes new cut sections. A longitudinal section is included at Appendix 5 to this report which highlights that a fall is possible between A and D but there are hold ups within the system. | The longitudinal section illustrates that with some improvement, especially at point C and between C and D, a flow could be achieved. Point C could also be used as a control structure point if water level control was required. |
| E | Culvert under entrance to Fen Cottage. | Culvert appears reasonably clear but evidence of polluted material within the ditch was noted. The culvert depth and the invert level relative to land level indicates that there is little opportunity for improvement unless significant work was carried out downstream and this would be new work and not replacing existing. |
| E – A1 | Ditch section along northern boundary of Hazeldene. | Ditch in average condition and would benefit from improvement which would assist in storage and more efficient flow. Sluggish ditch has benefits in maintaining polluted material within the system. |
| E – F | Ditch section on northern boundary of field owned by Mr Garrod. A small ditch which depends on points E and A1 for outfall. | No obvious land drains outfall into this ditch and opportunity for improvement is limited by culvert at Hazeldene and not levels downstream. |
| F | Access culvert to field. | Culvert not visible and, from appearance, not maintained for many years. Could take water from Water Lane Farm and Rose Cottage but not well maintained to allow free flow or to suggest that hold ups downstream are limiting the functioning of the system. |
| H | Septic tank outfall from Hazeldene. | Direct outfall into ditch system. |
| I | Land drain outfall. | Drain outfall from land to the south within the ownership of Messrs Orford of Fersfield. Drain clear of ditch bed and running at the time of inspection. (4th March 2014) |
| J | Outfall from new waste treatment unit. | Although discharging directly into the ditch, water appeared clean. Test results would confirm water quality from this outfall. |
| A – A2 | Ditch along southern boundary of New Fen. | Ditch more a depression than a defined ditch and it could be argued that it has always been in this condition, at a lower level than Fen Lane. There are indications, however, which suggest it has served a drainage function with a culvert access into the wooded area. The land falls from A2 to A. |
| A2 – A3 | No ditch visible with land cultivated to narrow road verge. | Possible that a ditch extended from A2 to A3 in the past but this has been filled. There is also a possibility that a culvert exists across Fen Lane between points B and E, flowing into a former ditch. This, however, cannot be confirmed without further investigation. |
| A – K | Ditch section which has become silted or has been filled. | This ditch, which borders Middle Fen, was at one time the main carrier ditch from the culvert at point A. The carrier function of the ditch has largely been replaced by the section A –D and this route may be preferred. There is a culvert at the head of the ditch and some bunding has occurred, the function of which is uncertain, but it appears as a result of the creation of a scrape area on the eastern side of the ditch.<br>Ditches within the Middle Fen area, although visible, have been allowed, presumably through design, to silt up and therefore serve little drainage function. |
| L | Brick culvert, being the outfall from the grating at the junction of Fen Lane and Loggers Lane. | This culvert is not in good condition and is located well into the ditch bank and enclosed by vegetation. The culvert does function, albeit probably not very effectively, and the open grating represents the only provision for surface water drainage from Loggers Lane. This Lane is quite steeply sloping with high banks and, therefore, in times of high rainfall, high flows are directed to the single grating. Inevitably the drainage system overtops and some flooding and overtopping into the causeway and ditch system will occur. Surface water flows from Oak Tree Farm and Fen Farm also contribute to the flow capacity.<br>This outfall is likely to be a source of high silt volumes within the ditch system and this is confirmed by evidence of cleansing of the ditch and the views of Mr Webb. |
| M | Outfall from Fen Farm Buildings. | The actual source of this pipe is not known, but it is likely to be the yards and buildings of Fen Farm. The pipe is below the ditch bed but evidence of flow was noted and the ditch is maintained. Fen Farm has previously been a pig unit but now ducks are kept within the buildings. Runoff from the yards and buildings |

| | | |
|---|---|---|
| | | into the pipe is likely to be polluted and some evidence of this is clearly visible in the ditch M – N. |
| N | Sections of 225mm twinwall and 150mm plastic pipe. | The invert of the inlet into the twinwall pipe is at ditch bed level. There is some silt build up but flow is occurring. The junction between the 225mm and 150mm pipes is not visible and so the condition cannot be reported upon. There is a fall between the inverts of the inlet and outlet pipes and the preferred flow direction appears to be towards point O, although towards point S would also be possible. |
| N –O - R | Ditch section. | This is a ditch section on the eastern side of the causeway. There appears some disagreement about ownership and past management of the ditch. Mr Green is adamant the ditch is not his and that Mr Webb has maintained it for many years whilst in his ownership. Mr Webb has confirmed this. LOHP now own the land to the east but do not consider the ditch to be within their responsibility. There appears to be no local custom for the management of ditches. Such customs, which are common in many fen or marsh areas, might include:<br>• Responsibility runs with the landowner on the left or right of the ditch and this follows throughout the area.<br>• The boundary runs along the centre line and each adjoining landowner, therefore, has joint responsibility with maintenance shared.<br>The ditch is not in good drainage condition with several willow trees blocking flow and no evidence of maintenance in the recent past. |
| O | Culvert under the causeway taking water from Mr Green's land to the west. | An open pipe and evidence of clearance was visible but no outfall was found into the ditch on the eastern side. A mature willow tree is located at the likely outfall point of the pipe and so any effective outfall is doubtful - a situation that has likely to have been so, or a high risk of being so, for many years.<br>The ditch systems on the western side of the causeway are not well maintained. Whether this is by design or because of outfall limitation is difficult to give a categorical opinion. It is clear, however, that the ditch systems within this are require an outfall and this could be at points O, R or P, all of which appear to be blocked. |
| P | Possible culvert under causeway as for point O. | No pipe visible and any outfall in to the eastern ditch is restricted. |
| Q | Possible culvert under access. | Possible link for drainage system and some evidence of a pipe was located. It is clear that any pipe has been silted and below ditch levels for many years. The east –west ditch on the northern side of the access in this location is in poor drainage condition, again a situation that is unlikely to have changed for many years and influenced by the management of Middle Fen and other associated ditches. |
| R | Possible culvert under causeway as for points O and P. | No culvert pipe located, but possibly in place historically to provide ditch linkage. |
| N-S | Ditch section leading to brick culvert providing access into Webbs Fen. | The culvert at point S is not in good condition and there is at least 300mm of silt within the ditch. The ditch can flow from point S to point N or point T, although the original design was likely to be both ways as this ditch acts as a cut-off between higher ground and the lower fen.<br>At, or around, point S a pipe from the south outfalls which takes water from a former ditch dividing two parcels of land at Fen Farm. This pipe was not located. |
| S – T | Ditch section from culvert at point S towards point T and then on to point X. | This ditch section appears in better drainage condition than other ditches which transport water towards the river, in this case outfalling at point X. |
| T | A brick arch culvert connecting drainage ditches from higher ground into the fen system. | This is an important culvert but appears to be in poor condition, although water was flowing into the ditch system which outfalls at point X. |
| U | Drain outfall from agricultural land to the south within the ownership of Mr Aves. | The drain was close to the ditch bed and, therefore, at risk from submergence if levels build up within the ditch. It is understood that the ditch section U-T is maintained by Mr Aves, but there has been some correspondence about this. It is, however, important that this drain outfall is kept clear, but some monitoring of flows may be required to confirm water quality and any silt loading. |
| V | Ditch section to recently installed culvert at J. | This ditch section was running relatively well in the lower reaches, although a fallen tree had partially blocked the channel and a section cut out to allow flow. The culvert providing outfall had an upstream invert level of 20.64m. Upstream sections were less well defined. |
| W | Outfall into river. | Culverted outfall into river not investigated. |

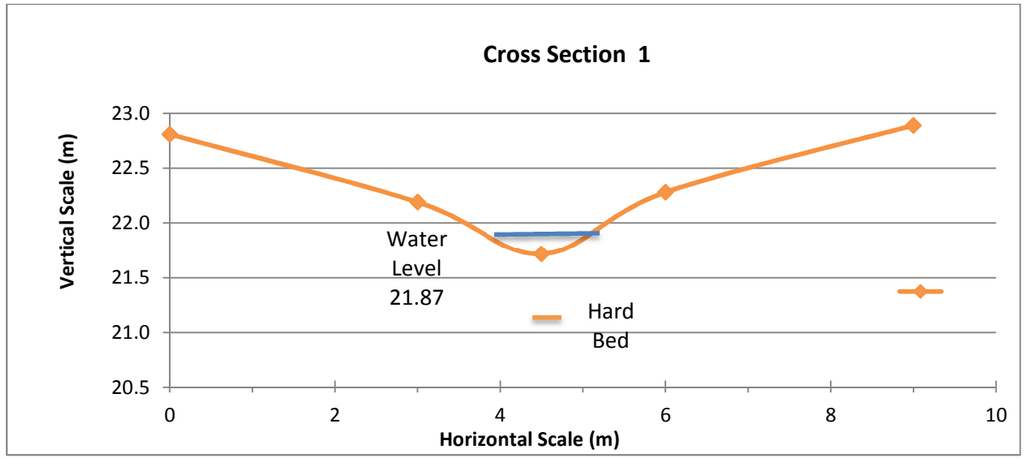
| | | |
|---|---|---|
| X | Outfall into river. | Outfall directly into river. Evidence of silting and restriction of flow into the river was apparent. Water was tending to find its own pathways. |
| Y | Outfall into river. | Main outfall into river from significant watercourse taking water from large catchment to the south and west. Significant evidence of silting at the junction of river and watercourse. The source of the siltation and reason for this needs further investigation. |
| Z | Watercourse. | |
| | | |

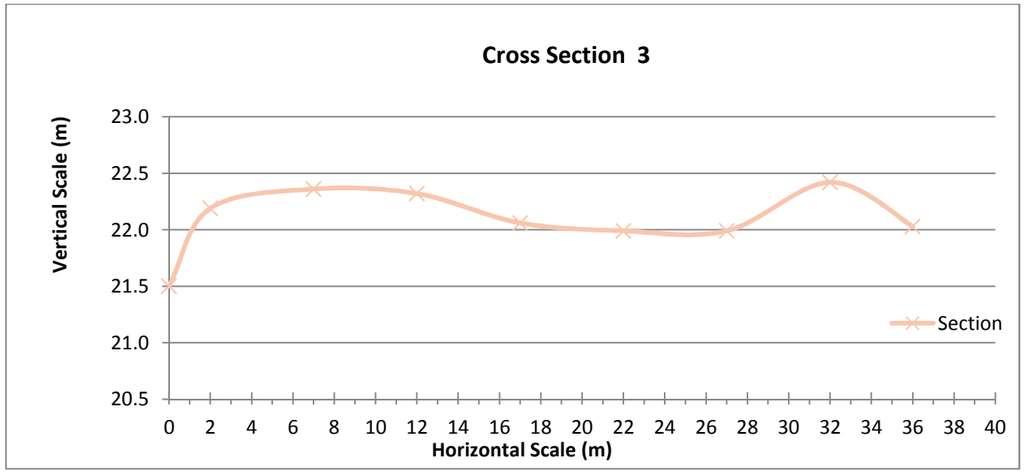
# Longitudinal Section

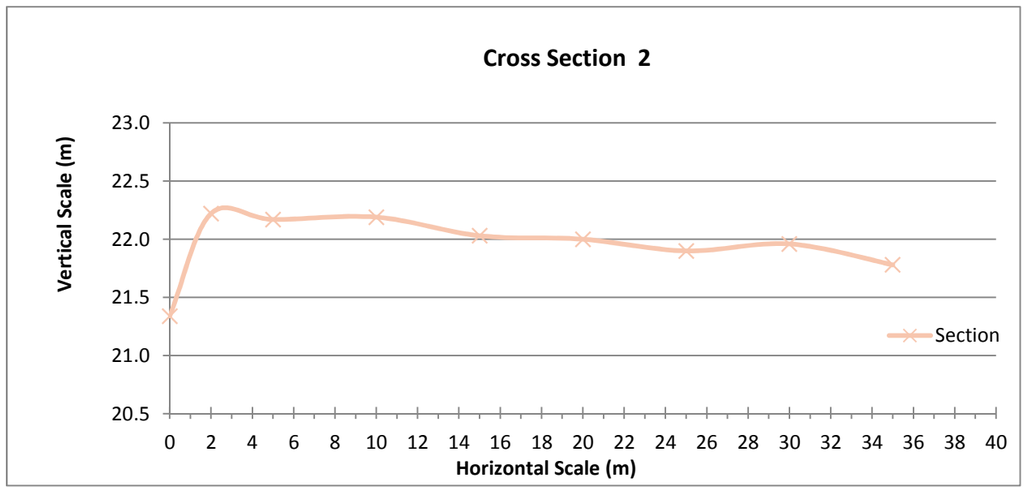
**Appendix 6**

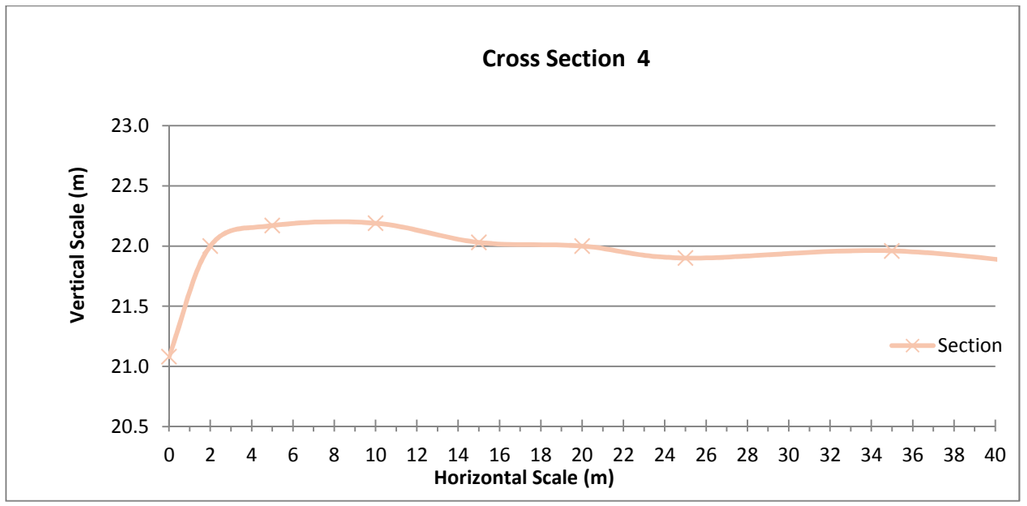


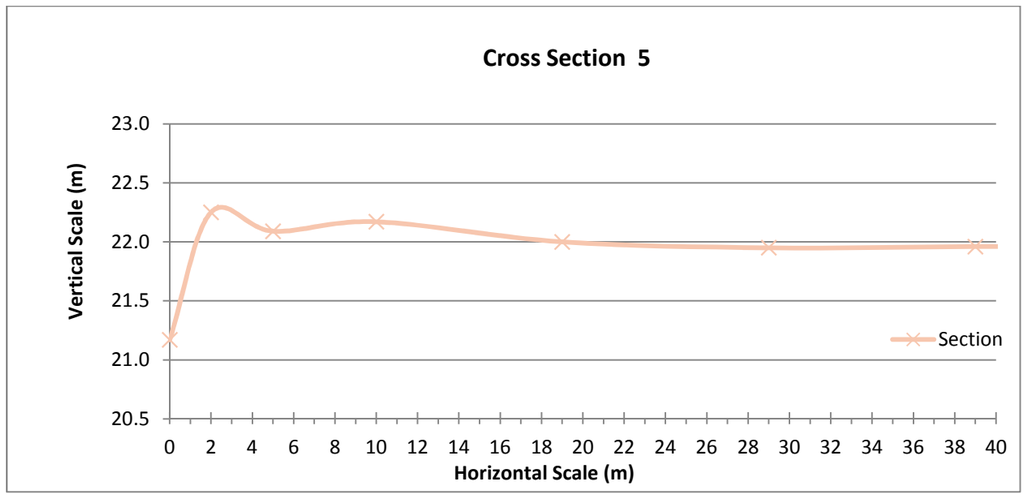

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance** | **0.0** | **5.0** | **8.6** | **13.7** | **34.2** | **54.2** | **79.2** | **87.2** | **98.4** | **107.4** | **135.4** | **151.4** | **183.4** | **195.0** | **215.3** | **247.3** | **261.3** | **278.3** | **288.3** | **325.3** | **381.3** | **387.3** |
| **Land Level RHS** | 22.83 | 22.83 | 22.82 | 22.81 | 22.73 | 22.47 | 22.36 | 22.19 | 22.26 | 22.30 | 22.25 | 22.25 | 22.17 | 22.25 | 22.38 | 22.25 | 21.99 | 22.00 | 22.02 | 22.09 | 22.26 | |
| **Land Level LHS** | 22.83 | 22.83 | 22.89 | 22.89 | 22.73 | 22.47 | 22.36 | 22.19 | 22.20 | 22.22 | 22.25 | 22.25 | 22.17 | 22.25 | 22.38 | 22.25 | 22.10 | 22.00 | 21.93 | 22.10 | 22.26 | |
| **Ditch Bed Hard** | 21.38 | 21.35 | 21.30 | 21.27 | 21.22 | 21.17 | 21.10 | 21.05 | 20.83 | 20.89 | 20.64 | 20.67 | 20.91 | 20.88 | 20.82 | 21.50 | 21.50 | 21.47 | 21.41 | 21.42 | 21.18 | |
| **Ditch Bed Soft** | 21.88 | 21.83 | 21.78 | 21.74 | 21.70 | 21.65 | 21.60 | 21.50 | 21.14 | 21.34 | 21.17 | 21.27 | 21.31 | 21.37 | 21.26 | 21.68 | 21.68 | 21.64 | 21.59 | 21.63 | 21.38 | |
| **Water Level** | | 21.87 | 21.87 | 21.87 | 21.87 | 21.86 | 21.86 | 21.85 | 21.83 | 21.84 | 21.84 | 21.87 | 21.86 | 21.85 | 21.85 | 21.85 | | | | 21.65 | | 21.57 |
| **Invert** | 21.75 | 21.71 | | | | | | | | | | | | | | | | | | | 21.21 | |

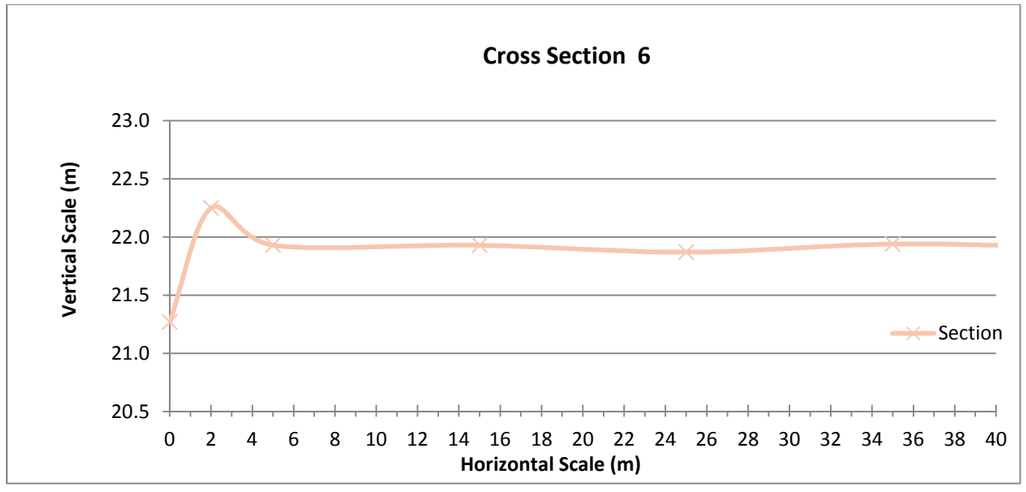

Cross Section 1
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0
2
4
6
8
10
Horizontal Scale (m)
Water
Level
21.87
Hard
Bed


Cross Section 3
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Horizontal Scale (m)
Section


Cross Section 2
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Horizontal Scale (m)
Section


Cross Section 4
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Horizontal Scale (m)
Section


Cross Section 5
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Horizontal Scale (m)
Section


Cross Section 6
Vertical Scale (m)
23.0
22.5
22.0
21.5
21.0
20.5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Horizontal Scale (m)
Section