Recreation Field Cowling

Preliminary Drainage Investigation

Final Report

February 2018

www.jbaconsulting.com

Cowling Parish Council
6 Roeburn Close
Bradford
West Yorkshire
BD6 3EF

JBA Project Manager

David Barton
Bank Quay House
Sankey Street
Warrington
Cheshire
WA1 1NN

Revision history

Revision Ref/Date	Amendments	Issued to
Rev 1 / Feb 2018	Final Report	A Mallinson

Contract

This report describes work commissioned by Andrew Mallinson, on behalf of Cowling Parish Council, by a letter dated June 2017. Cowling Parish Council's representative for the contract was Andrew Mallinson, Parish Council Clerk. David Barton and Howard Keeble of JBA Consulting carried out this work.

Prepared by ..... David Barton MEng CEng MICE

Senior Civil Engineer

..... Tim Diesner BEng (Hons) GMICE

Engineer

Reviewed by ..... Howard Keeble MPhil BEng BSc CertBusStud CEng CEnv CSci MICE MCIWEM C.WEM

Technical Director

Purpose

This document has been prepared as a Final Report for Cowling Parish Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Cowling Parish Council.

Acknowledgements

JBA thank representatives of Cowling Parish Council, North Yorkshire Council and Craven District Council for information provided to inform this assessment.

Carbon footprint

A printed copy of the main text in this document will result in a carbon footprint of 58g if 100% post-consumer recycled paper is used and 73g if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex.

JBA is aiming to reduce its per capita carbon emissions.

Contents

Appendices

List of Figures

List of Tables

1 Introduction

1.1 Scope of Assessment

JBA Consulting were commissioned by Cowling Parish Council in 2017 to carry out a preliminary drainage investigation study to develop an understanding of surface water flooding issues affecting their recreation field located in Cowling, North Yorkshire. This initial investigation comprised a walkover visual inspection of affected areas, topography and drainage systems, and a preliminary discussion of drainage issues. The findings of this preliminary assessment recommended further specific investigations to fill gaps in current knowledge and assist in informing suitable options for resolving current drainage issues.

Following internal consideration of the recommended scope Cowling Parish Council commissioned JBA Consulting to carry out the following investigations:

Item C – Verify drain connectivity and outlet of an existing culvert that has potential use as an outlet for field drainage:

The following tasks were proposed:

- Task 1 - CCTV condition survey to assess the capacity of the culvert and any structural defects that may prevent its re-use. Also, to trace the alignment and depth to the outfall.
- Task 2 – Estimate culvert capacity based on capacity tables and assuming limited river ingress at outfall. Review requirements for any modelling following initial consultations and CCTV.
- Task 3 – Verify ownership and consent to receive surface runoff.
- Task 4 - Confirm greenfield runoff rates to limit impact on Ickornshaw Beck and assess requirement for a Flood Risk Assessment to demonstrate that downstream flooding issues are not made worse.
- Task 5 – The investigation will assess the feasibility of using the drain, should it exist, to convey field drainage to Ickornshaw Beck and comment on any wider issues.

The following report details the findings of the above assessment and makes recommendations for potential land drainage improvement options.

2 Summary of Drainage Issues

The following section describes the recreation field and the key drainage issues which impact potential land drainage improvement options.

2.1 Cowling Recreation Field

The Recreation field is located in Cowling, West Yorkshire on the northern side of the A6068-Keighley Road. Photographs of the area are included in Appendix A. Owned and managed by the local Parish Council, the 1.4Ha recreation field consists primarily of a steeply sloping grassed area with a more level area of surfaced hardstanding (tennis courts) to the east. The managed grass area incorporates a children's rope slide and football pitch and a skate ramp and is bounded on all sides by a stone wall. A line of trees runs along the western and north western boundary with an unsurfaced informal path providing access to a bench at the top of the slope. A formalised asphalt footpath follows the southern and eastern perimeters providing access to Royd Street in the west and the toilet block and Keighley Road to the south.

Ground levels across the recreation field fall steeply in a generally easterly direction, reducing from around 198 mAOD to around 188 mAOD in the east. The field is located on the slopes of the valley side with ground levels falling towards the Ickornshaw Beck to the north and rising steeply through the town to the south.

This investigation has identified that the Gibb Syke Ordinary Watercourse flows from the hills to the south and enters a culvert in the Carr Mill Mews area, south of Keighley Road. This culvert flows in a generally north westerly direction, before diverting north adjacent to the playground. Immediately north of the field boundary, the culvert doglegs east before discharging to an open section of watercourse north of the Mill Croft residential cul-de-sac. From here the Syke flows north towards Ickornshaw Beck via a steep section of open channel and a further short section of culvert. Ickenshaw Beck is a Designated Main River.

Reference to historical mapping indicates a boundary to the recreation field as far back as 1892 and it appears to be associated with the adjacent Royd and Croft Mills. Mapping from 1909 indicates that the recreation field was a cricket ground with photographs from 1949 indicating allotments to the north west of the site.

Carr Mill was located on the southern side of Keighly Road in the vicinity of where Gibb Syke enters culvert and given the location of the three mills, it is assumed that the watercourse was culverted to provide a water supply. The reason for the current dog leg alignment of the culvert through the recreation field is unconfirmed, however it may have been associated with the demolition of Croft Mill and the construction of the later residential properties.

2.2 Localised Surface Water Issues

With reference to Figure 1, following periods of heavy rainfall general waterlogging across the field and ponding of water in localised areas such as the children's play area restricts access to, and enjoyment of, recreation equipment and the field in general.

Whilst there are specific areas of ponding it was apparent following heavy rainfall during the site inspection in November 2017 that all areas of the field generally experience waterlogging which is most likely caused by poor soil drainage.

Whilst gradients across the field are relatively steep, localised depressions occur which are prone to standing water. It is reported that this ponding of water can occur after rainfall events in any season. This ponding is most evident beneath the children's zip wire and on the footpath adjacent to the eastern boundary. In this area it is reported that overland flow results in water ponding against the boundary wall which may potentially impact the adjacent residential area of Mill Close). Further ponding was evident in the narrow plateau at the top of the field in the area of the bench.

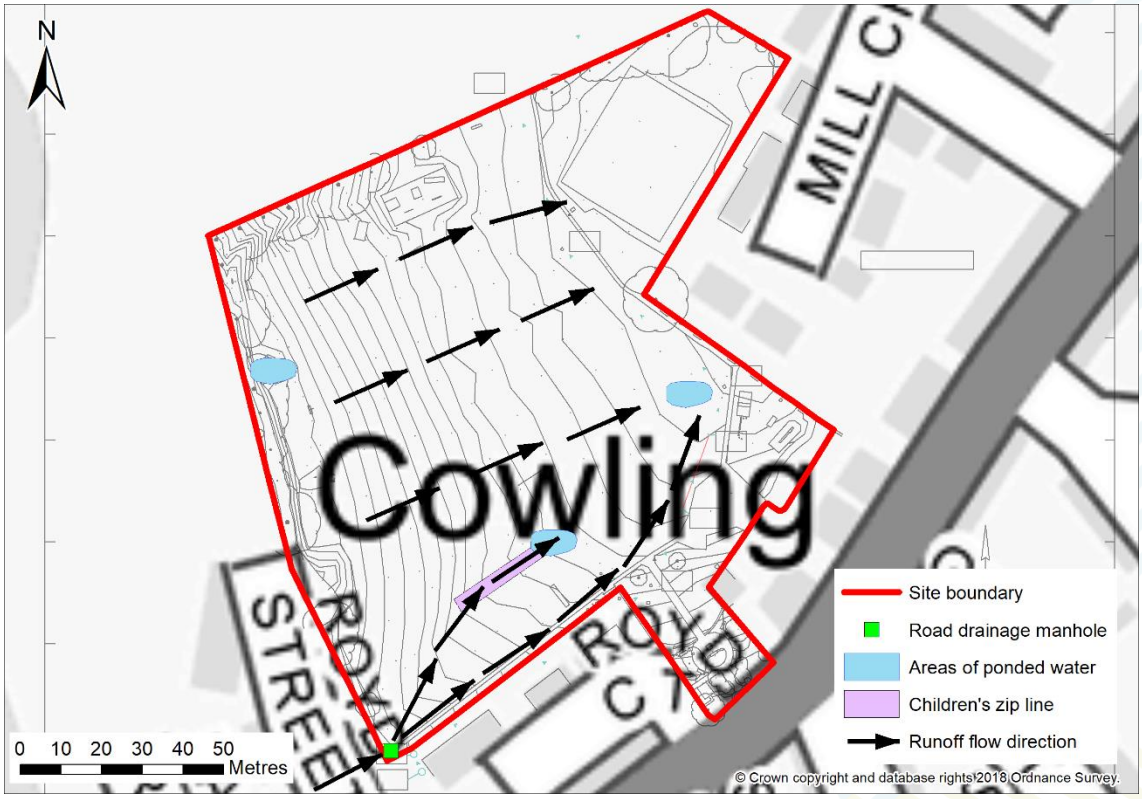
It is also reported that runoff from Royd Street to the west contributes to the localised flooding, issues within the recreation field. Royd Street is understood to be an un-adopted road with little or no surface water drainage. For unconfirmed reasons it is understood that Yorkshire Water previously blocked off a drainage manhole which collected water discharging from a concrete channel adjacent running adjacent to the footpath leading from Royd Street. Whilst these inflows contribute to the recreation field drainage issues it is unlikely to be the root cause of waterlogging due to the limited flow path. However, it contributes to the volume of water that needs to be drained in the vicinity of the children's play area / rope slide and may cause issues in terms of standing water for users of the southern footpath, especially during winter months.

Surface runoff from the field gravitates towards the eastern boundary wall which adjoins the gardens of the adjacent Mill Croft residential estate.

There is anecdotal evidence that the field contains a system of land drains which were damaged locally during the recent installation of the children's rope slide. It is unconfirmed if these were repaired at that time. No details of the extent and condition of any land drainage are available. However, it is noted that no connections to the Gibb Syke culvert from the direction of the potential land drainage were evident. As a result of the fields past long term usage any existing land drainage is likely to be old and potentially blocked. Combined with the long term compaction of the clay soil above, the effectiveness of the underlying drainage is likely to be significantly reduced.

In summary, it appears that drainage problems are primarily caused by poor soil drainage characteristics across the entire recreation field. In localised areas, this general waterlogging is exacerbated by the occurrence of localised ground depressions where runoff naturally collects after rainfall events and also the overflow from the Royd Street drainage channel.

Figure 1 - Site Runoff and Drainage Issues

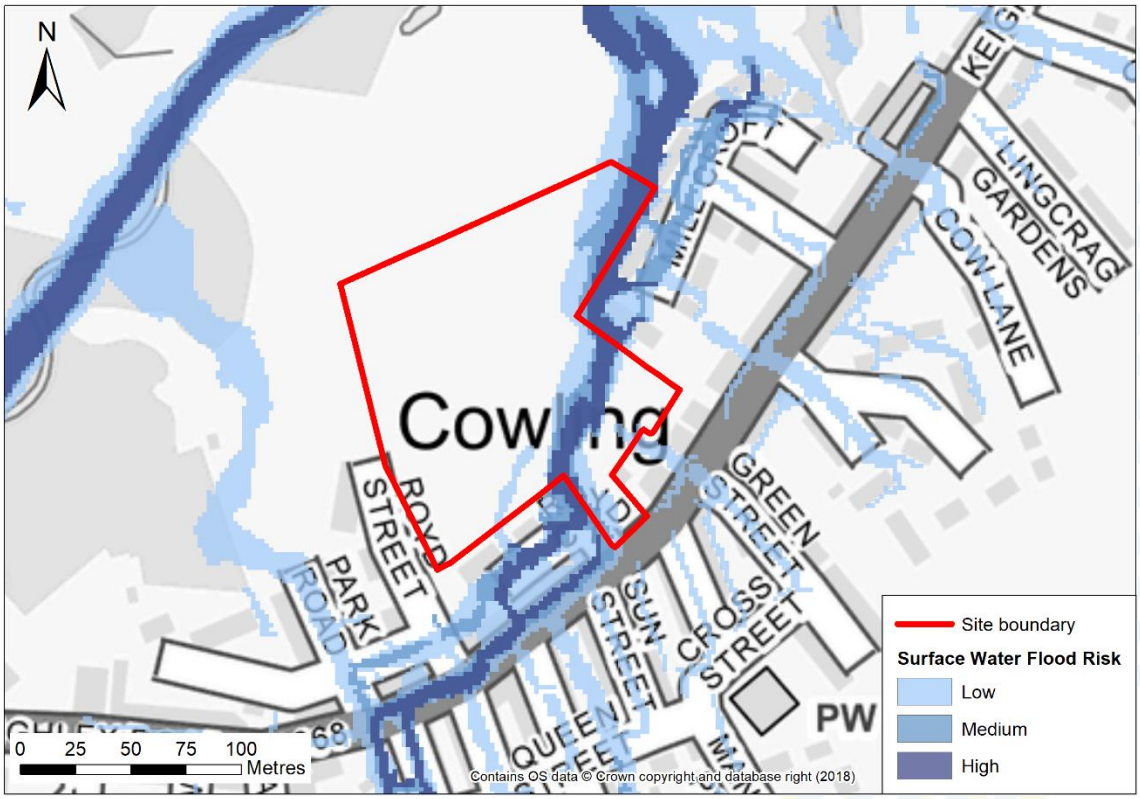


2.3 Wider Surface Water Issues

With reference to the Environment Agency National Surface Water Flood Mapping (Figure 2) it is evident that in addition to the general land drainage issues, there is a potential flood risk to the recreation field as a consequence of overland surface water flow from the upstream Gibb Syke catchment. Whilst the surface water outlines do not appear to have incorporated the existing Gibb Syke culvert, mapping provides an indication of the likely flow routes and extent of flood risk should the culvert become blocked. This indicates a flow route and flood risk to the north-eastern area of the recreation field under each of the three mapped flood events (1 in 30 (High Risk) 1 in 100 (Medium Risk) and 1 in 1000 (High Risk) Return Period flood events). In these scenarios flow depths across the recreation field are indicated to be generally shallow (less than 300mm) although given the topography the flow velocities are indicated to be in excess of 0.25m/s, meaning that the flood hazard rating would be high.

However, it is noted that with the exception of localised flooding in Woodland Street no further records of historic flooding have been provided and this indicates that the culvert is currently conveying flow beneath Cowling. Residual flood risk during extreme events combined with culvert blockage is currently undetermined. Whilst outside the scope of this assessment which is limited to localised drainage issues within the recreation field, given the potential flood risk associated with upstream culvert blockage the Parish Council may wish to liaise with the Lead Local Flood Authority in relation to the condition and maintenance arrangements for culvert upstream of their land.

Figure 2 - Surface Water Flood Risk



3 Site Assessment

3.1 Culvert Assessment

3.1.1 Initial Desk-based Assessment

The initial stage of the assessment was to undertake suitable investigation to assess the feasibility of utilising the existing culvert within any proposed land drainage improvement scheme. At the outset of the assessment there was little or no information on either the route or condition of the culvert. Historic mapping and consultation with the Local Authority was used to gather preliminary information about the asset and from this it is determined that the culvert conveys Gibb Syke.

Historic OS mapping[1] from the period 1852-1854 shows Gibb Syke as an open watercourse passing through the study area. In mapping dated 1891 Royd Mill and Croft Mill had already been completed and no open watercourse is shown. It is assumed that the watercourse was culverted to provide water to the Royd Mill and Croft Mill sites. The current alignment of the culvert in the vicinity of the recreation field was potentially modified following demolition of the Croft Mill as part of the construction of the adjacent Mill Croft residential properties.

3.1.2 Culvert CCTV Survey & Condition Assessment

IWJS were commissioned by JBA as part of this study to survey the route and confirm the condition of the Gibb Syke culvert from where it enters the recreation field, downstream to its outfall. These investigations were undertaken in December 2017 and concluded in January 2018. The CCTV report and inspection videos are referenced within Appendix C and provided under separate cover.

The culvert was determined to be a 900mm diameter concrete pipe from where it enters the recreation field (at MH1/1A beneath the rear garden of the property in Royd Court) and discharges to open channel adjacent to Mill Croft.

The survey confirms the route of the culvert through the site, which is indicated Figure 3 overleaf with accurate survey of the manholes in the Survey Report drawings. The culvert, which follows the southern boundary of the site, doglegs along the eastern boundary and exits the recreation ground to the north. The culvert at this point makes another dogleg east, following the boundary of the Mill Croft residential area. The culvert discharges to open watercourse downstream of Mill Croft (shown in Figure 4). The culvert flows through a series of 8 manholes beneath the recreation ground and downstream area to where it joins a masonry outfall of unconfirmed dimensions. CCTV survey of the outfall was not possible due to a vertical drop in alignment at a buried chamber, however it appears that the culvert joins perpendicular to the masonry structure. This further substantiates the view that the current alignment was modified to accommodate the housing.

The inspected sections of concrete culvert were found to structurally be in a fair condition beneath the recreation ground. However, the culvert between MH1B and MH2 was significantly blocked with stone resulting in an inability to fully inspect this section. The settled stone deposits have reduced the cross sectional area by up to 50% over the inspected sections which would significantly reduce the culverts flow capacity as shown on the Photographs in Appendix B. This length is indicated on Figure 3. An intruding flowing pipe connection was seen to enter the culvert 2.2m upstream of MH2.

Downstream of the recreation field the only structural / serviceability issue identified relates to a gushing infiltration over part of the pipe joint 1m upstream of MH5. Whilst

[1] www.old-maps.co.uk

a full inspection of the outfall was not possible, from visual inspection there was some evidence of washout of material from the wall of the masonry culvert (see Photograph 8 in Appendix B).

Figure 3 - Plan of Surveyed Culvert Alignment in Recreation Field and Blockage

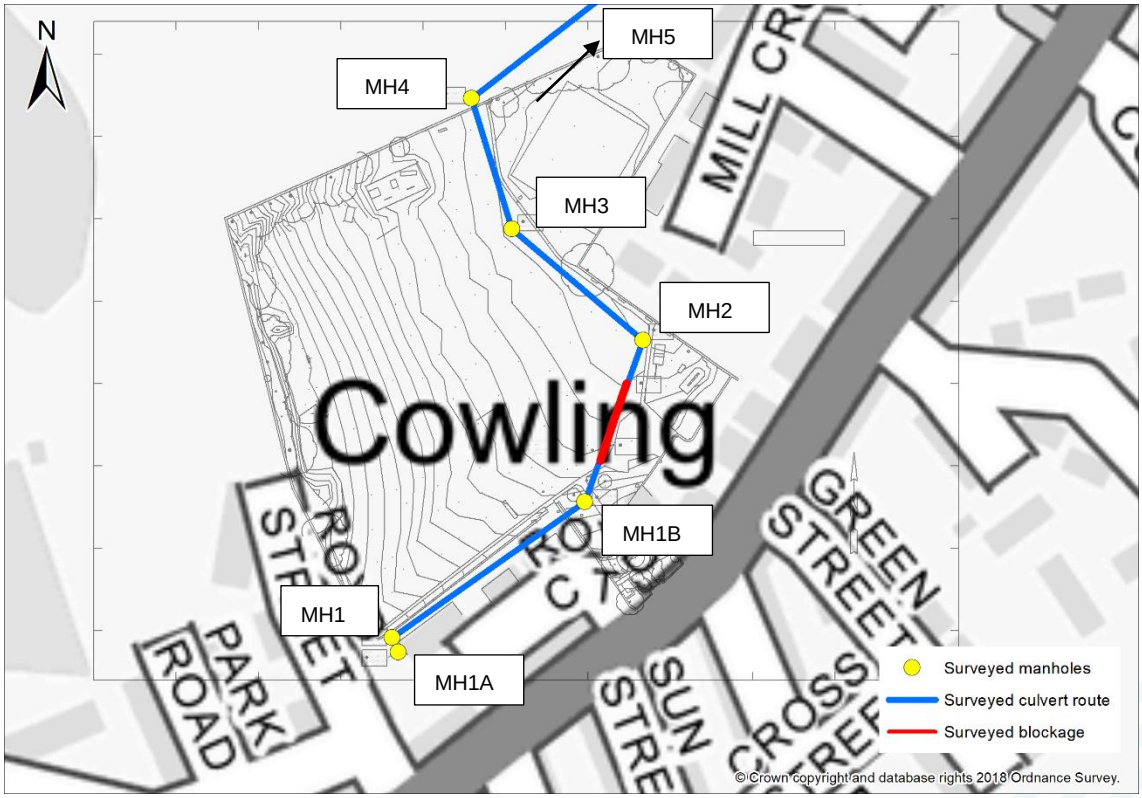
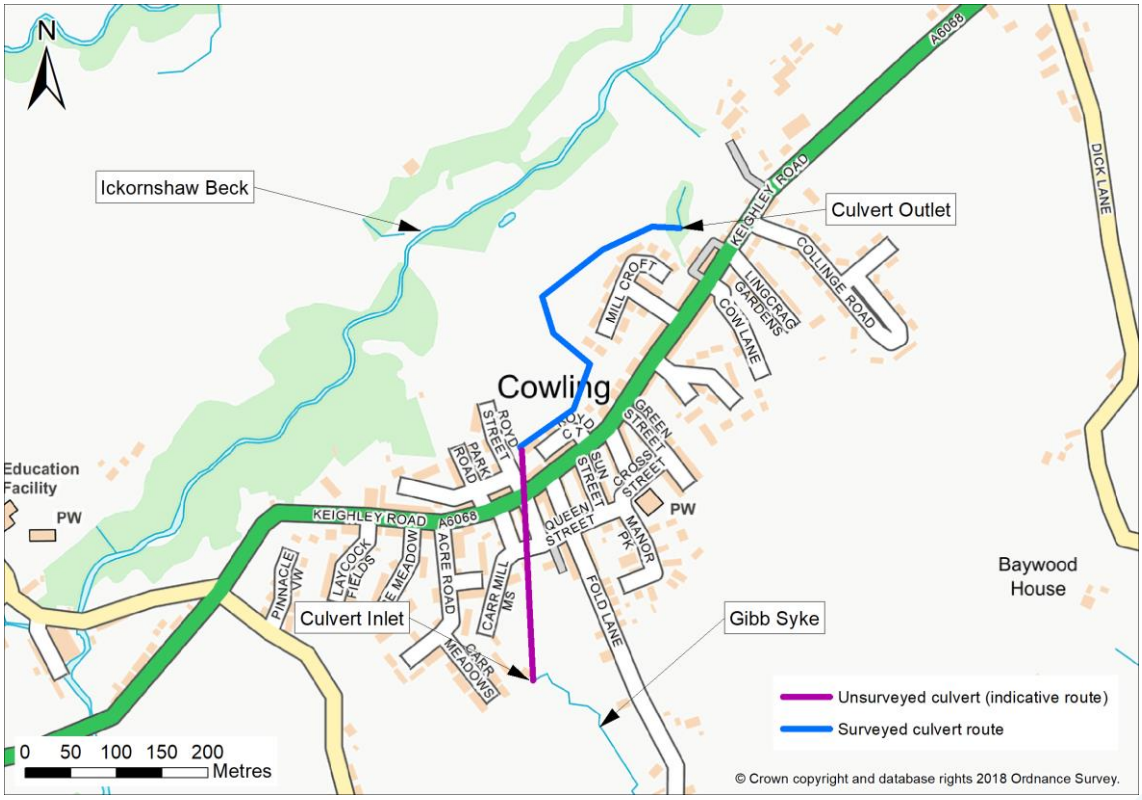


Figure 4 - Plan of Culvert Route and Local Watercourses



3.1.3 Ownership Responsibility

At the outset of this study it was not known who owned the culvert and is responsible for its maintenance.

Yorkshire Water were contacted to obtain utility plans for the area. These plans (see Appendix A) indicate a separate system (a 300mm diameter combined sewer) following the southern side of the park. Whilst a similar alignment to the culvert, the identified difference in size, type and manhole location and the fact that it is combined system leads to the conclusion that it is separate to the culverted watercourse. It is noted that the utility records indicates a potential surface water inflow to the Culvert Manhole 1B from Royde Court, however this could not be positively identified from the culvert CCTV inspection

JBA contacted North Yorkshire County Council (Lead Local Flood Authority) and Craven District Council to source further information. The following feedback was provided by North Yorkshire County Council (NYCC):

- NYCC provided a map indicating ordinary watercourses in Cowling (see Appendix C). NYCC indicated that they don't have any further information on layout and condition of culvert and the maps may not be strictly accurate. It is noted that the mapping provided does not correlate with the on-site understanding of the culvert alignment.
- NYCC identified that there is no requirement for ordinary watercourse consent to put clean water in to a watercourse, though there is a need to check with the riparian owner before doing so. (Although NYCC have identified no requirement for consent, we note the need to consider flood risk impacts on the watercourse (whether culverted or open channel)).
- NYCC advise that the local Highways offices should be contacted to seek permission for any works beneath highways.

The following feedback was provided by Craven District Council (CDC):

- CDC indicated that they don't hold further information relating to the layout and condition of culvert. Their records indicate that there was a collapse of the culvert in the recreation field in 2012 and this was passed back to Cowling Parish Council. Subsequent investigation has identified that the collapse may have been on a separate culvert on Gibb Syke, located approximately 50m downstream of the recreation field culvert.
- CDC identified land downstream is possible landfill and may have been subject to previous culvert collapse.
- CDC identify that agreement to discharge to the culvert is likely to primarily involve permission from the Riparian owner, however they also identify that the culvert discharges into Ickornshaw Beck that runs into Lumb Mill Beck and eventually into Glusburn Beck/Holme Beck. Glusburn Beck/Holme Beck is understood to be an ordinary watercourse and has been the source of flooding in the past. There is an active flood group and they are currently trying to source funding with the Environment Agency and NYCC to undertake a further study to try and address the risk of flooding from this watercourse. Therefore CDC identify that any additional loading on this watercourse will come under scrutiny and should be considered. Consultation with the EA is recommended.

Based on CCTV survey findings, Cowling Parish Council, as owners of the recreation field, have riparian ownership of the culvert where it passes beneath their land. This brings with it specific responsibilities to maintain and manage conveyance without increasing the risk of flooding elsewhere. Further information can be found on the following webpage:

https://www.gov.uk/guidance/owning-a-watercourse

Notably in relation to the culvert blockage there are responsibilities to let water flow naturally and remove blockages that could cause flooding.

Downstream and upstream of the of the recreation field the culvert will be under riparian ownership of the landowner. Details of land owners can be obtained through the Land Registry.

If discharge to the culvert is proposed it is recommended that further consultation with the Lead Local Flood Authority (LLFA) is undertaken. In addition, further consultation may be required with the Environment Agency to confirm no increased risk to downstream properties if additional flow is diverted to the culvert. However, as further described below given the low level of additional flow that is anticipated when compared to the wider catchment the impacts are likely to be negligible.

3.1.4 Culvert Capacity Assessment

The culvert CCTV survey undertaken for this study established the cover levels of the manholes present on the culvert downstream of Royd Street, and also recorded the depth to the culvert invert at each manhole. This information, along the with the distances recorded between each manhole, was used to estimate the pipe-full capacity of the culvert between each manhole.

Using an assumed conservative pipe roughness equating to between a fair and poor condition culvert (Ks = 0.3 mm) it was estimated that the culvert capacity increases downstream from Royd Street to the northern extent of the recreation ground, from 3.2m^3/s to 4.0m^3/s. Downstream of the recreation ground the culvert pipe-full capacity increases to an estimated 6.9m^3/s. This does not take into account the blockage between MH 1B and 2 which would significantly reduce culvert capacity.

3.1.5 Site Rainfall Runoff Rates

The rainfall runoff rates for the recreation field have been calculated using the FEH Statistical methodology (Environment Agency preferred method for planning related matters). Based on the site runoff area (1.4 ha) and the characteristics of the site, the following greenfield runoff rates have been estimated:

Table 1 - Greenfield Runoff Rates (m^3/s)

Qbar	0.020
1 in 1 years	0.017
1 in 30 years	0.035
1 in 100 years	0.042

3.1.6 Watercourse Peak Flow Rates

To put the runoff rates which may discharged to the culvert from the recreation ground into context they can be compared to the equivalent flows on both Gibb Syke and Ickornshaw Beck. QMED flows (a flood with a return period of 1 in 2 years) has been calculated to the downstream extent of the Gibb Syke catchment and on Ickornshaw Beck adjacent to the recreation field:

Table 2 - QMED (m^3/s)

Gibb Syke	0.420
Ickornshaw Beck	8.900

The Flood Studies Report (FSR) suggests a relationship between Qbar and QMED where:

QBAR = 1.07 * QMED

Any future site drainage systems will be focussed on reducing the frequency of standing water on site; as such their capacity will be limited to managing more frequent flood events, and would not be designed to convey more extreme flood events.

On the basis of QMED, the addition to frequent flood event flows on Gibb Syke from site drainage to the culvert would constitute a small percentage increase in flows. The site drainage would not convey the additional flow from more extreme flood events. As such, the site drainage as proposed in this report would be considered to have a negligible impact on downstream flood risk.

4 Options to Manage Localised Surface Water Issues

4.1 Limitations

We have identified three approaches which could be adopted to manage the localised surface water ponding issues local to the recreation field.

These options focus on preventing significant surface water ponding but will not address the generally waterlogged or boggy ground conditions across the field. These ground conditions result from the poorly draining and over-compacted clayey ground.

These ground conditions would only be improved by remediating the top layer of the ground across the site (i.e. incorporating media to improve infiltration and percolation rates) and by incorporating land drains to continually drain this ground.

This has been ruled out as an option at this initial stage as it is considered that this will be prohibitively expensive and also disruptive to the local residents (amongst other constraints, including site access).

4.2 Overview of Options

The approaches have been identified as followed and are discussed in greater detail within the following sub-sections:

- **Approach 1 – Ground Raising**
- **Approach 2 – Ground Raising + Field Runoff Interception**
- **Approach 3 – Ground Raising + Field Runoff Interception + Royd Street Drainage Overflow Interception**

Each of the three approaches proposed incorporate more drainage elements and will manage more of the issues on site, but at increased cost and design complexity.

It is emphasised that these options are designed to manage the local land drainage issues and are not designed to manage the wider flood risk to the site associated from the upstream watercourse including culvert failure and exceedance.

4.3 Approach 1 – Ground Raising

This option is to target localised areas where runoff currently pools by raising the existing ground levels in these areas. This would include:

- Infilling depressions in the field
- Raising paths

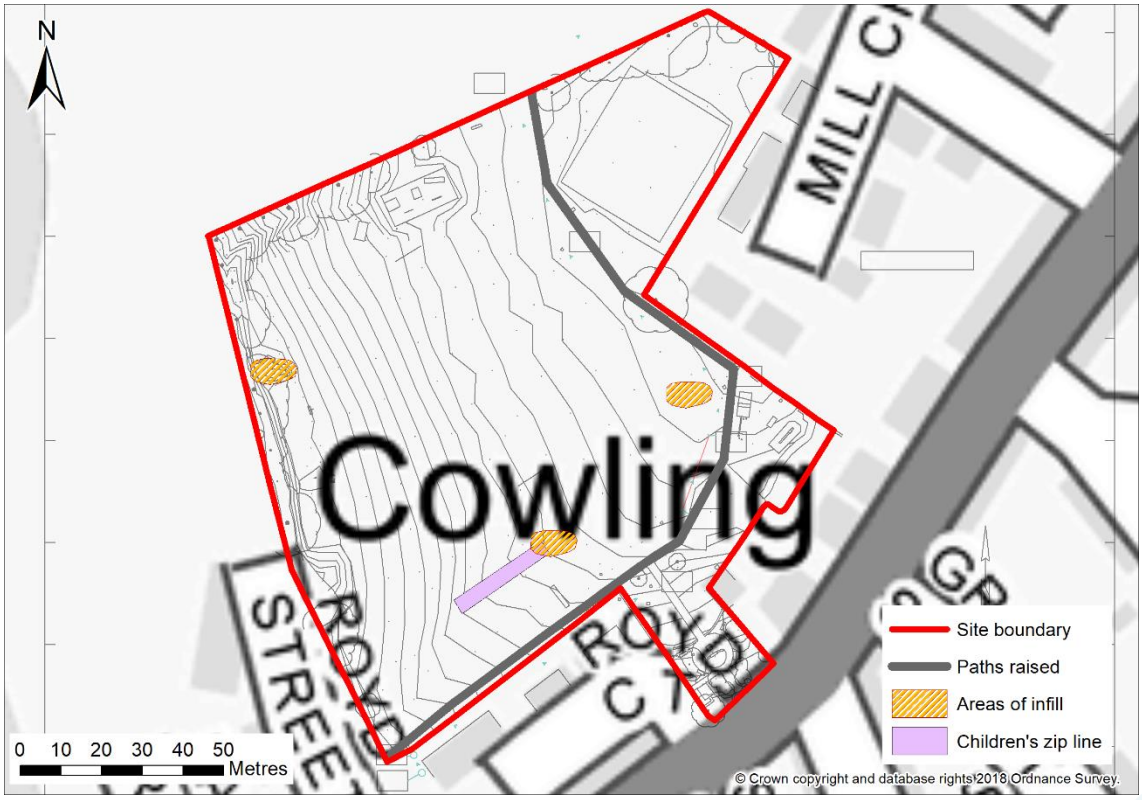
Infilling the existing depressions in the field (Figure 5) would prevent rainfall runoff filling these areas during a rainfall event, and would direct runoff downhill and away from these areas.

Raising the paths within the recreation ground would also prevent runoff from the field flowing directly onto these surfaces. This work in itself may be sufficient to prevent the runoff flow route into the children's playground area, however raising the children's play area would prevent the build-up of runoff.

Approach 1 will manage the issues in the areas above but will do this by directing runoff elsewhere. As such, this approach would not on its own manage the ponding which has been observed at the eastern extent of the field. Raising paths could indeed worsen the ponding at this location because the paths would act as a barrier preventing runoff from flowing away from this area.

Approach 2 incorporates elements to manage this re-directed runoff and to manage the ponding observed at the eastern extent of the field.

Figure 5 - Indicative Plan of Areas for Ground Raising



4.4 Approach 2 – Ground Raising + Field Runoff Interception

This approach combines Approach 1 with the addition of measures to intercept the rainfall runoff from the field and prevent/ control the ponding at the eastern extent of the field.

We foresee two potential options in this area to intercept and drain away the field runoff:

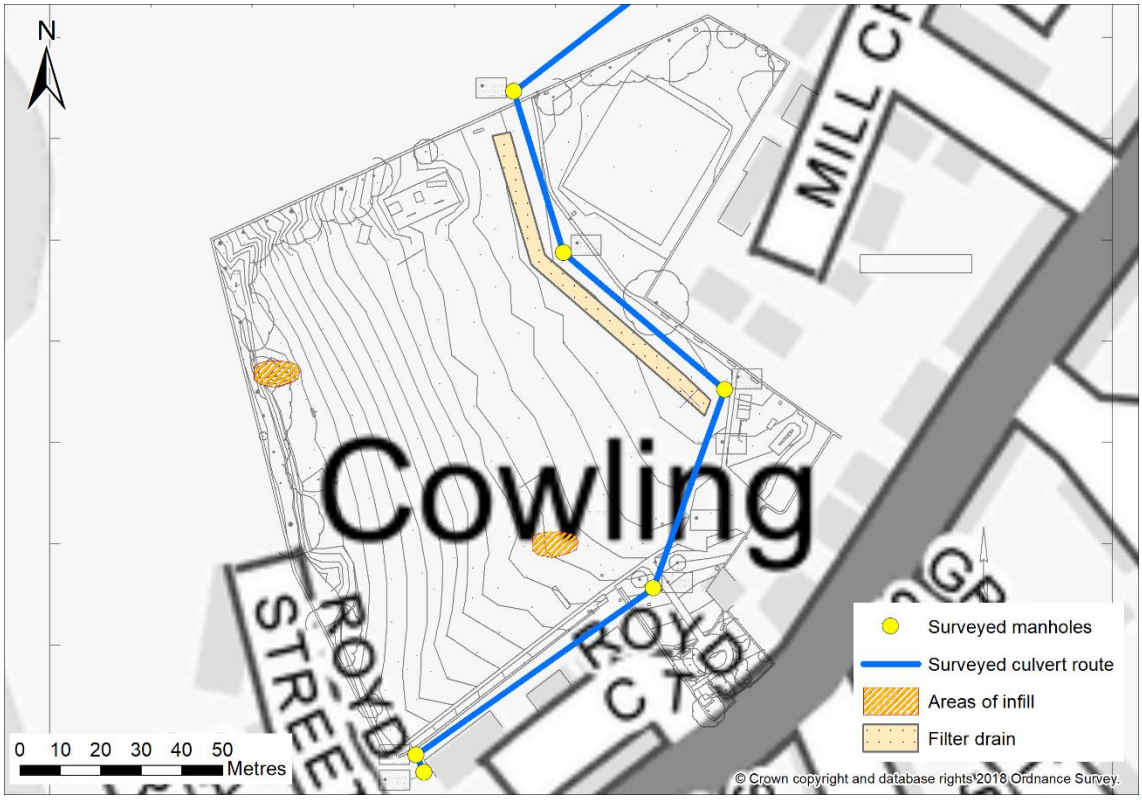
A) a shallow grass swale running parallel to the eastern boundary of the field, which would intercept the overland pluvial runoff. Collected runoff in the swale would be drained into the culverted watercourse by connecting pipework. A sluice could be used to manually drain down the swale, or alternatively a flapped outfall would drain the swale without intervention.

B) a filter drain running parallel to the eastern boundary of the field, which would intercept the overland pluvial runoff from the field. Flow intercepted by the drain would be discharged into the culverted watercourse running through the field.

We have developed a high level indicative design of this approach based on a filter drain (B) due to the advantages this offers with respect to runoff storage volumes, safety and reduced maintenance/operation requirements.

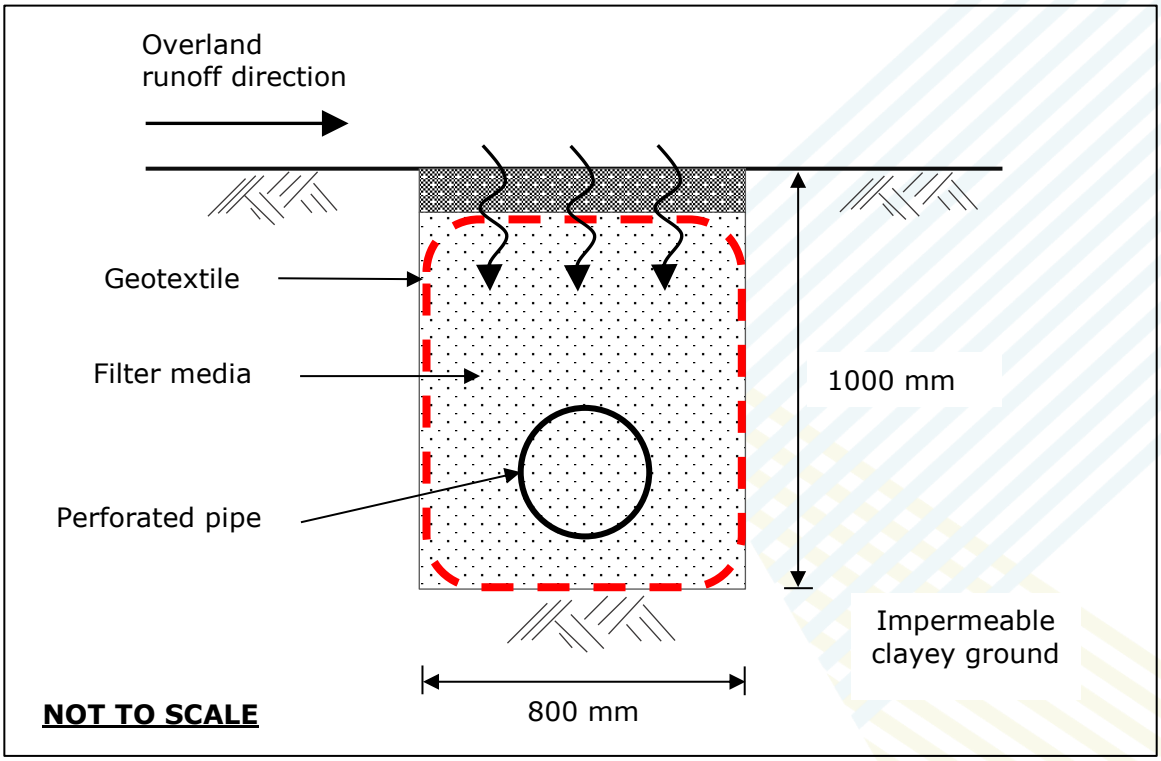
An indicative plan of the potential route of the filter drain, combined with the areas of infill, is provided in Figure 6 below.

Figure 6 - Indicative Plan of Filter Drain and Areas of Infill



We have reviewed the levels across the site based on the collected topographic survey and based on LIDAR topography, and consider that a filter drain could be installed level along the approximate route as indicated in Figure 6.

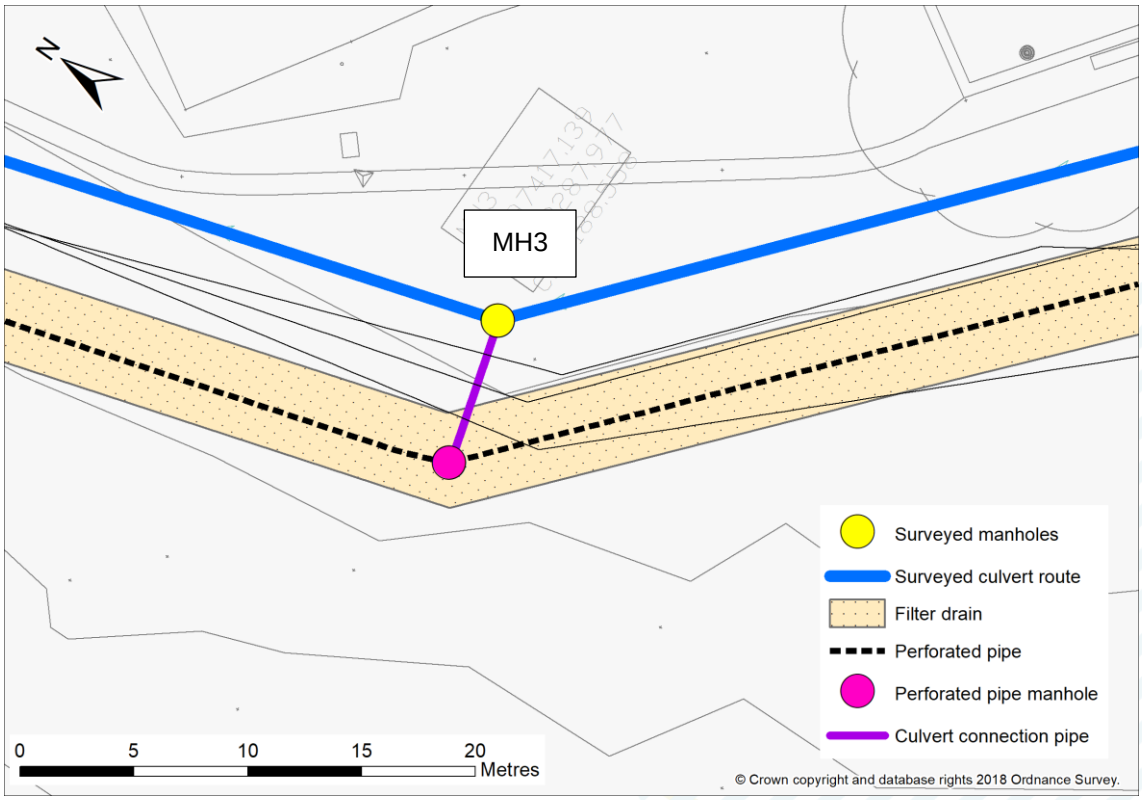
Figure 7 - Indicative Section through Filter Drain



To illustrate how the filter drain would function, an indicative section through the filter drain has been presented in Figure 7. Runoff from the field would be intercepted and drained through the permeable filter media of the drain. Sediment in the runoff is prevented from clogging the drain by a geotextile layer. When runoff fills the base of the trench to a sufficient level it will enter into the perforated pipe, which would transfer runoff into the culvert. The top layer of the filter media would require replacing at infrequent intervals to remove trapped sediment.

We assume at this stage that the filter drain could be connected to the culverted watercourse on site by making a connection into one of the existing manholes. The culvert soffit at MH3, for example, we have estimated at a depth of over 2.5m below existing ground level (using the information collected by CCTV survey). A connection from the filter drain could be made at this location. This could require a new manhole on the filter drain perforated pipe, and a PVC pipe connection to MH3 on the culvert (illustrated in Figure 8). A flap on this connecting pipe would ensure that filter drain does not transfer flow to the culvert when the culvert is running full.

Figure 8 - Indicative Arrangement of Filter Drain to Culvert Connection



We have estimated the volumes of runoff for a range of rainfall events which the filter drain would need to store to prevent flooding at the eastern extent of the field. Taking a conservative approach, based on drainage being discharged to the existing culvert at the 1 in 1 year site greenfield runoff rate of 0.017m^3/s (see Table 1) the estimated volumes that would be required are included in Table 3. This is based on the Rational Method and assumed that the surface runoff is limited to 50% and excludes any future increases in rainfall intensity due to climate change.

Table 3 - Runoff storage volumes required

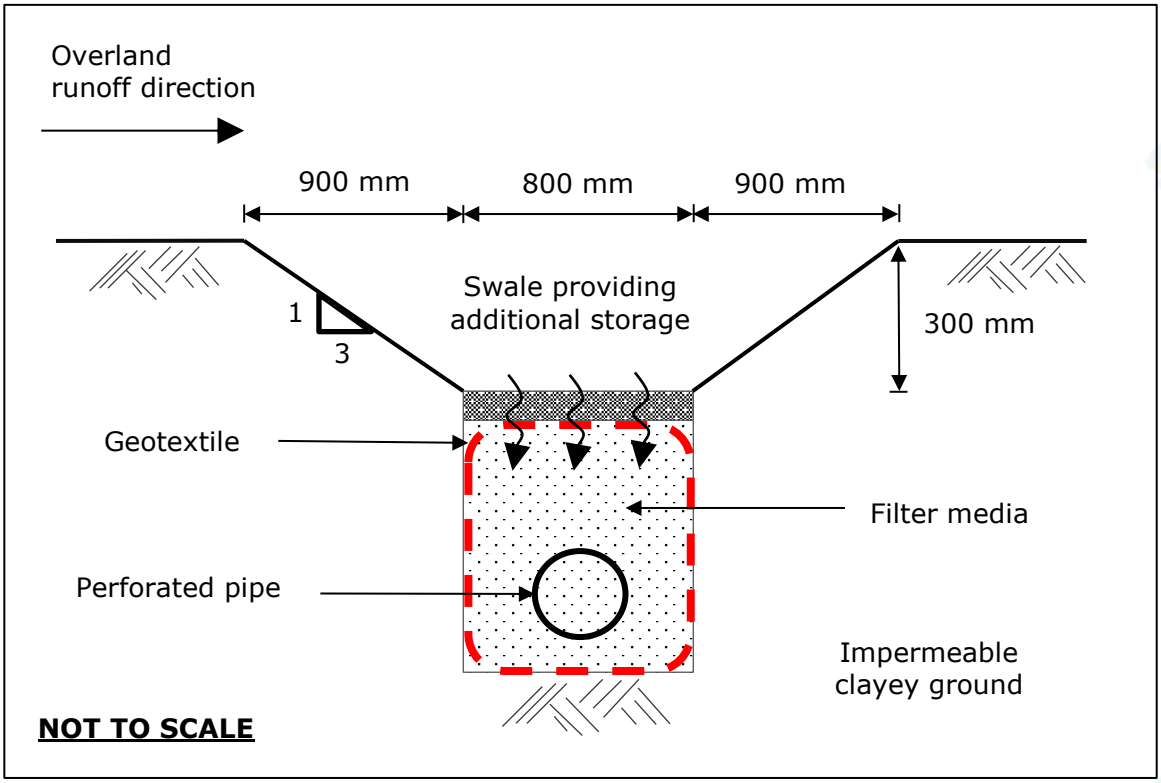
Rainfall Event	Storage Volume Required (m3)
1 in 2 years	60
1 in 5 years	100
1 in 10 years	140
1 in 30 years	220

Assuming a 90 m long filter drain to a depth of 1 m across the site, incorporating a 300 mm diameter perforated pipe and filter media with a 50% porosity, it is estimated that a storage volume of approximately 35 m^3 could be provided. This is assuming that the drain is dry unless in use. Based on Table 3 this would be insufficient to store the 1 in 2 year rainfall event, meaning some flooding would occur on site.

If a swale were included above the filter drain, with a depth of approximately 300mm and side slopes of 1 in 3, a total storage volume of 80m^3 could be achieved. This would be sufficient to attenuate the 1 in 2 year rainfall event without surface water flooding, but would be insufficient to attenuate rainfall events of greater magnitude. The swale would only be wet when storing water during a storm.

An indicative section through the filter drain combined with a swale is provided in Figure 9 below. There is estimated to be sufficient depth to the culvert to achieve the additional excavation required in this option.

Figure 9 - Indicative Section through a Combined Swale & Filter Drain



In addition to increasing the storage capacity of the drainage solution, for larger rainfall events, another benefit of Approach 2 is that the spoil which is generated could be in part used to provide the infill to the areas identified for ground raising.

This option on its own will not completely address the issues resulting from the Royd Street drainage overflow, which would continue to spread across the zip line area and across the footpaths. The inclusion of path raising as per Approach 1 could prevent the paths from flooding from this source of surface water, however would not mitigate the issues to the zip line area, and would not solve potential scour issues caused by the overland flow from this source. Approach 3 incorporates additional measures to manage this issue.

4.5 Approach 3 – Ground Raising + Field Runoff Interception + Royd Street Drainage Overflow Interception

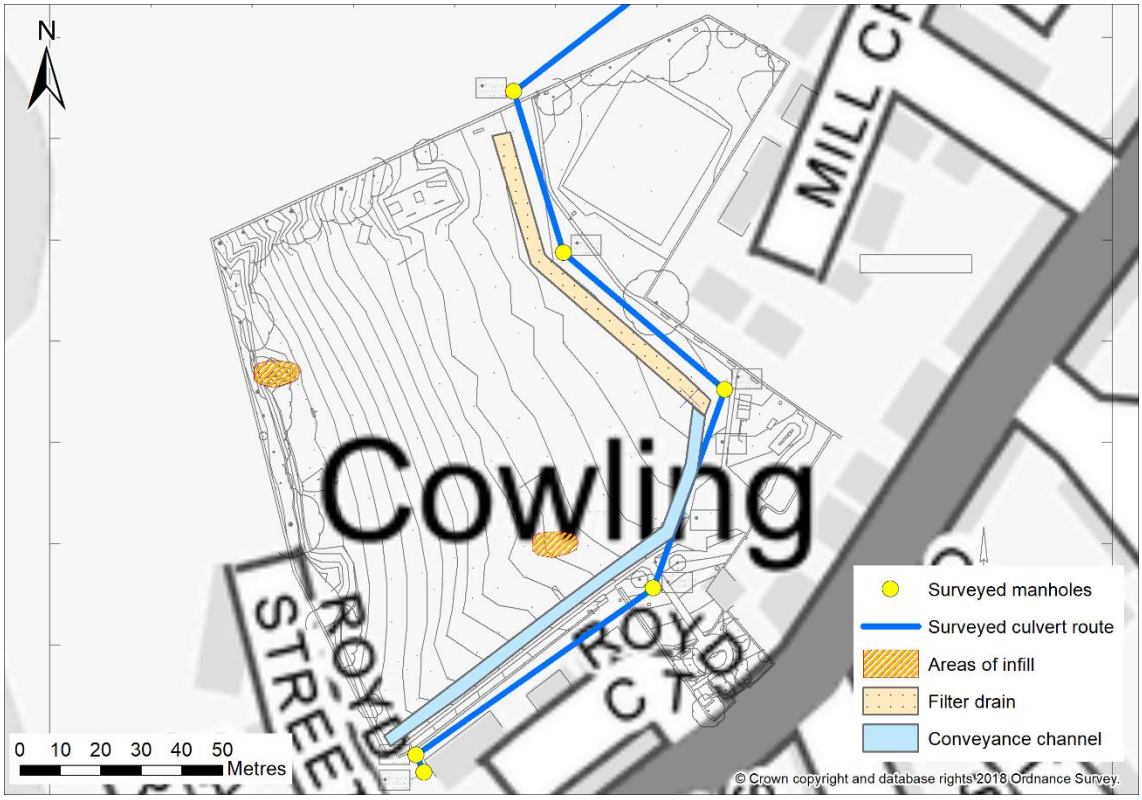
Approach 3 combines Approach 2 with the addition of a conveyance channel to intercept the drainage overflow from Royd Street and direct it into the filter drain at the eastern extent of the field.

The overflow from the Royd Street drainage reportedly spreads downhill through the field, along the pavements and contributes to the pooling issue at the eastern boundary of the field.

It is recommended that a shallow swale is constructed to intercept and direct runoff from this specific area. The grassed swale would ideally follow a route running parallel to the footpath along the southern site boundary. Runoff off would then be directed into the proposed filter drain at the eastern extent of the field.

An indicative plan of Approach 3 is presented in Figure 10 below.

Figure 10 - Indicative Plan of Approach 3



5 Recommendations & Likely Next Steps

5.1 Priority Work

Irrespective of the options developed or ultimately implemented to address the drainage issues local to the recreation field, it is recommended that the blockages identified within the culvert by the recent CCTV investigations are removed as a short term priority.

As riparian owner of the reach of the culverted watercourse through the recreation field, the Council is responsible for its maintenance. The existing blockages will impact the capability of the culvert to convey flow, and could increase the risk of fluvial flooding on the watercourse.

In addition to managing the local flood risk, removing the blockages will also allow for improved conveyance of flows from any future drainage connections to the culvert.

5.2 Localised Surface Water Issues

Following your review of this report, we will liaise with you to confirm your preferred way forward.

At this stage we would recommend that the next steps to manage the site surface water issues would be based upon Approach 3 as detailed in Section 4; this option provides the most comprehensive management of surface water.

With your instruction we would proceed to detailed design based on your preferred approach. We would develop detailed design drawings, a works specification and an activity schedule which could be used to approach contractors for pricing. We would also contact the LLFA to reconfirm their views on the impact of site drainage connection to the Gibb Syke culvert on downstream flood risk following completion of the assessment.

Any further design work field should include for ground investigation and soil sampling to confirm the site ground conditions and presence of contaminants. Should contaminants be found this may necessitate above-ground only surface water management options; i.e. ground raising.

5.3 Wider Flooding Issues

We have identified options to address the localised surface water issues as set out in Section 2. Although a separate issue to the recreation ground, a wider surface water flood risk issue to Mill Croft has been identified and could be investigated in further detail. This could potentially form a combined flood protection solution with the improved drainage of the recreation ground.

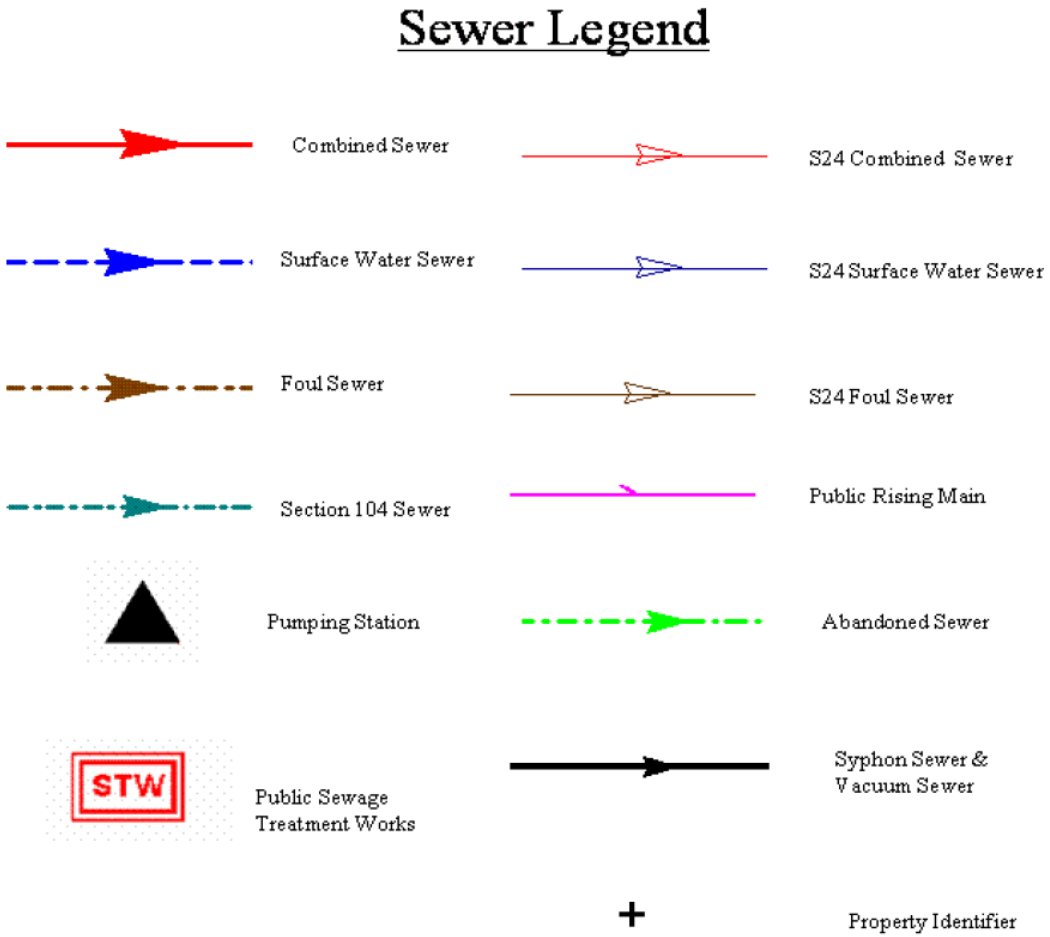
From a fluvial flood risk perspective, we also note that maintenance of the culverted Gibb Syke through Cowling is important to the flood risk to the site.

Topography indicates that a blockage at the culvert inlet would result in river flows being directed overland into Cowling and through the site of the recreation field. Therefore maintenance at the culvert inlet, and the need for a debris screen, may need to be reviewed.

Although the Council is not riparian owner of the final reach of the culvert to its outfall, we draw attention to the poor condition of the masonry brick arch (as shown in Appendix B photograph 8). If this section of the culvert were to collapse, this could result in significant conveyance issues upstream on the culvert, resulting in the surcharging of the culvert through the site, and the inability of any future site drainage to discharge to the culvert.

Appendices

A Yorkshire Water Sewer Plans




Cowling
Recreation Ground
Playground
Tennis Courts
Scar View
Path
Fernwood
Lyndale Barn
Old Village Hall
Royd Way
ROYD STREET
PARK ROAD
The Bungalow
Garage
Rosebud House
GIBB STREET
SUN STREET
QUEEN STREET
WALTON STREET
CROSS STREET
GREEN STREET
KEIGHLEY ROAD
VICTORIA ROAD
MILL CROFT
SPRINGWELL CLOSE
LINGCRAG
COW LANE
Bank Ings
Sycamore House
Orchard Ho
187.8m
War Meml
Old Coach House
Craiglands
St Andrews Methodist Church
Wks
PH
ESS
397152 : 443117
Map Name : SD9743SW
Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
Dobson
Contact Tel :
Title
Notes
Partial Key
Foul Sewer = F
Combined Sewer = C
Surface Water Sewer = SW
Trade Sewer = TD
Partially Separate = PS
Date Req : 15/02/2017, 15:45:39
Date Gen : 15/02/2017, 15:46:16
Source : Sewer Network Enquiry
UPN: Undefined
Originator: Dobson, ,


Cowling
Recreation Ground
Playground
Tennis Courts
Scar View
Path
Fernwood
Lyndale Barn
Old Village Hall
Royd House
Royd Way
ROYD STREET
ROYD COURT
PARK ROAD
WOODLAND ST
GIBB STREET
FOLD LANE
SUN STREET
WALTON STREET
GREEN STREET
CROSS STREET
QUEEN STREET
KEIGHLEY ROAD
MILL CROFT
SPRINGWELL CLOSE
Sycamore House
Orchard Ho
Bank Ings
ROAD
Craiglands
St Andrews Methodist Church
Garage
Rosebud House
War Meml
ESS
TCB
201.2m
187.8m
196.3m
397152 : 443117
Map Name : SD9743SW
Title
Notes
Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
Dobson
Contact Tel :
Partial Key
Water mains up to 4" in diameter
Water mains over 4" in diameter
Raw water mains
Private water mains
The position and depths of apparatus shown on this plan are approximate only. The exact positions and depths should be obtained by excavation trial holes.
Scale : 1:1250
Drg No :
Maris No :
Date Req : 15/02/2017, 15:47:01
Date Gen : 15/02/2017, 15:47:20
Source : Water Network Enquiry
UPN: Undefined
Originator: Dobson, ,

B Site Visit Photographs and Culvert CCTV Images

Photograph 1 – Panorama of the recreation field looking south west from the eastern field boundary

Photograph 2 – Panorama of the recreation field looking north from the Royd Street entrance to the field

Photograph 3 – Looking north across the play area towards Mill Croft

Photograph 4 – Looking west across the recreation field

Photograph 5 – Looking north-west across the recreation field from the Royd Street access to the field

Photograph 6 – Standing water on the path leading to the tennis courts

Photograph 7 – CCTV image of the culvert blockage


Photograph 8 – Photograph of the brick masonry arch at the culvert exit

C CCTV Inspection Report & Video

Report and CCTV provided under separate cover.

Video filenames as follows:

Reach	Video Reference
MH1A – MH1	124551
MH1 – MH1B	125736
MH1B Downstream -Blockage	133100
MH2 Upstream – Blockage	110443
MH2 - MH3	115745
MH3 – MH4	120746
MH4 – MH5	123056
MH5 – MH6	130715
MH6 – Outlet	105220

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
South Barn
Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:

Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007