Holmwood Drive, Langholm

Flood Alleviation - Options Report

08/08/2016 IBE1209





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Holmwood, Langholm

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1 INTRODUCTION

1.1 BACKGROUND

In 2007, Dumfries & Galloway Council commissioned a Strategic Flood Risk Assessment Study to gain a better understanding of the risk of flooding and the potential socio-economic consequences across the entire council area. This study used the indicative River & Coastal Flood Map to identify properties at risk of flooding and estimate the long-term economic costs associated with this flood risk.

According to this Strategic Flood Risk Assessment, Langholm (Figure 1) had more properties at risk of flooding than any other town in Dumfries & Galloway, with 524 properties situated within the 0.5% AEP flood inundation zone. In response to this analysis Dumfries and Galloway Council appointed RPS to undertake a detailed fluvial Flood Risk Assessment for the urban area of Langholm. This assessment examined the flood risk to Langholm associated with its location at the confluence of three main rivers, the River Esk, Wauchope Water and Ewes Water.

In 2011, in order to further understand the flood risk to Langholm, Dumfries and Galloway Council appointed RPS in 2011 to carry out a detailed fluvial Flood Risk Assessment for the urban area of Langholm. In the latter stages of this study, Dumfries & Galloway Council extended the RPS commission to include an assessment of a pluvial flooding issue affecting an area at Holmwood Drive (Figure 2) and flooding from a number of minor watercourses and culverts within the town, principally in the Ashley Bank / Hallpath Road area.

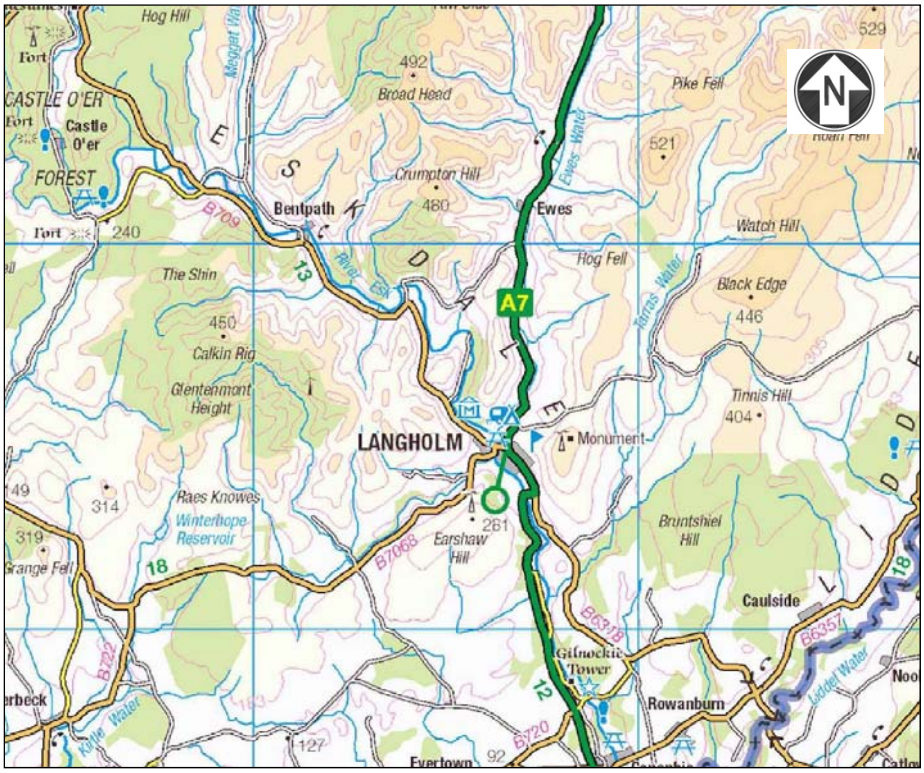


Figure 1 - Location of Langholm

Figure 2 - Holmwood Drive, Langholm

It has been reported that flooding to properties and gardens on Holmwood Drive and Meikleholm Side has become more frequent and severe. In 2016, Dumfries and Galloway Council appointed RPS to further consider overland flow flood mitigation options for Holmwood Drive and Meikleholm Side.

1.2 AIMS AND SCOPE

In order to produce an agreed detailed design proposal to alleviate flood risk at Holmwood Drive, Landholm, the following information and analysis was reviewed and incorporated:

- Review of historical flooding incidents in Langholm

- Review existing RPS Draft Culvert Investigation Report
- Review existing (2012) CCTV Survey of 'Culvert E1' and 'Culvert E2' (See Figure 1.2)
- Determine the location of 'Culvert F' and consider the culvert for receipt of conveyed flows.
- Determine the location of the watercourse to the South-West of Meikleholm Side and consider as a potential discharge location.
- Obtain LiDAR data.
- Procure a Topographical survey of the project area.
- Complete a site walkover investigation.

1.3 CONSIDERATION AND REVIEW OF AVAILABLE INFORMATION

1.3.1 Culvert E1 and Culvert E2 CCTV Survey

The CCTV inspection highlighted that much of the existing culvert pipework in Langholm is in poor structural condition with many instances of deformed and broken pipes being reported.

Due to the poor condition, line and location of the existing culvert pipework, RPS propose that any flood alleviation option considered should protect the existing culverts by maintaining or reducing existing storm water flows. To increase flows would only lead to further deterioration of the culvert pipelines condition. Any option for replacement of the existing culverts would prove costly and difficult due to the line and location of the existing culverts.

1.3.2 Culvert F

Culvert F was highlighted as a possible location for receipt of conveyed flows as a flood alleviation option. Following procurement, completion and review of a detailed topographical survey of the area, the survey highlighted a storm water manhole located in the road junction of Holmwood Drive and Thomas Telford Road. This manhole discharges, via an existing 225mm VC pipeline, to the top of the River Esk embankment. Due to the capacity and location of the existing culvert, it is determined that there is no suitable discharge culvert at this location.

1.3.3 Meiklehom Side Watercourse

The open watercourse located to the south-east of Meikleholm Side was highlighted as a possible location for discharge of flows as a flood alleviation option. Following procurement, completion and review of a detailed topographical survey of the area, it has been determined that discharge to the watercourse at this location is feasible, subject to statutory approval.

2 OPTIONEERING

When producing options, RPS have taken into account; the existing site constraints, documented historical events and existing analysis. All options and costs provided are subject to a geotechnical site investigation and statutory approvals.

Sketch drawings have been produced for each option with standard construction details provided in Appendix A for illustration.

2.1 OPTION 1 – DO NOTHING

As highlighted above, numerous reports have been received by Dumfries and Galloway Council indicating flooding to properties and gardens on Holmwood Drive and Meikleholm Side, with flooding becoming more frequent and severe.

Due to the flood frequencies and severity, this option has been discounted.

2.2 OPTION 2 – INTERCEPT AT HIGH LEVEL (WESTERN BOUNDARY) AND DISCHARGE TO WATERCOURSE

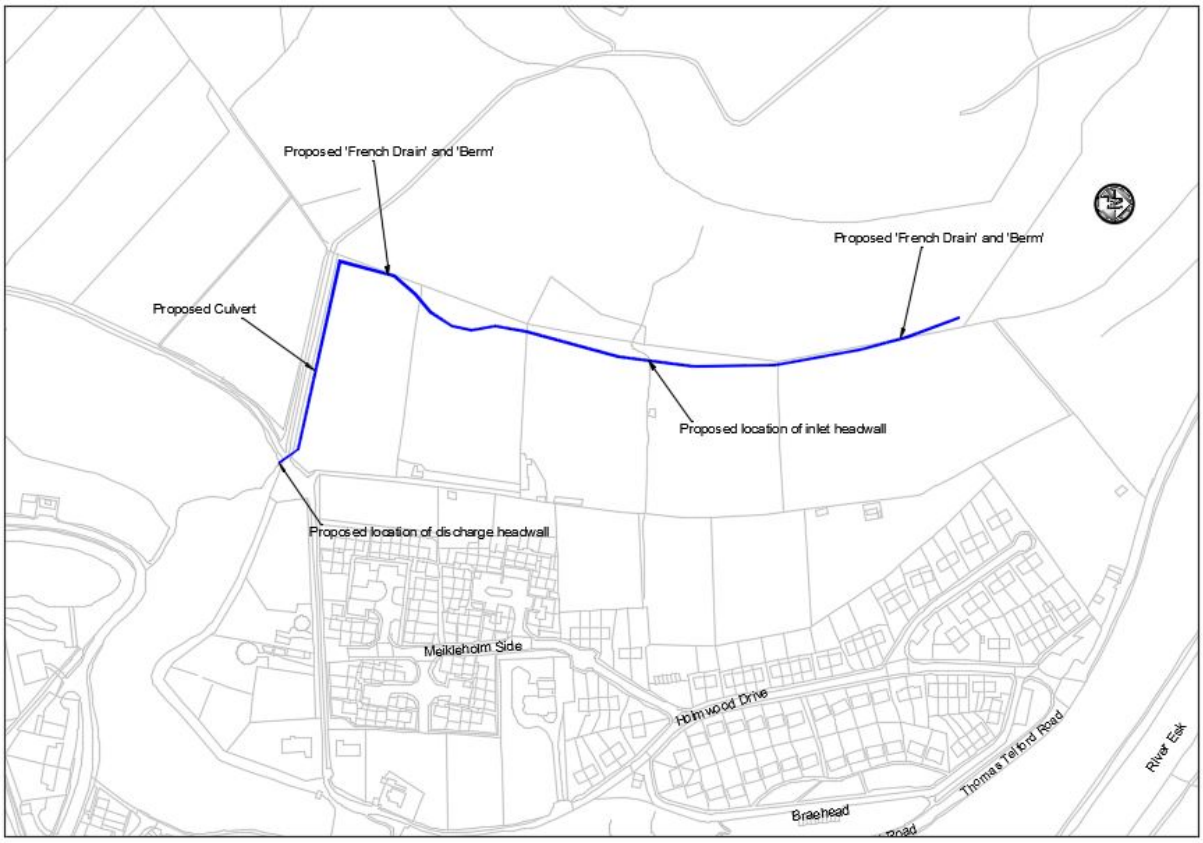


Figure 3 – Option 2 Layout

This solution attempts to intercept overland flows at the high level (Western Boundary) by means of a 'French Drain' and 'Berm' and discharge the flows to the Meikleholm Side watercourse. The combination of 'French Drain' and 'Berm' is considered essential, as, either element considered on its own would risk overtopping when experiencing significant overland flow. This proposal involves providing:

- A 'French Drain' and 'Berm' parallel to the existing field boundary above Holmwood Drive and Meikleholm Side.
- An inlet headwall to divert the upper catchment of the existing watercourse flows away from existing 'Culvert E1'.
- A culvert to convey flows for the 'French Drain' perforated pipelines to the discharge headwall.
- A discharge headwall from the proposed culvert to the existing Meikleholm Side watercourse.

Estimated Construction Cost: £350k

This option is not feasible due to restricted constructability and cost. The topography of the land at the western boundary and is quite steep. This will increase the area of excavator working platform to be formed, in order to construct the pipeline. (See Figure 4) This will increase the construction costs.

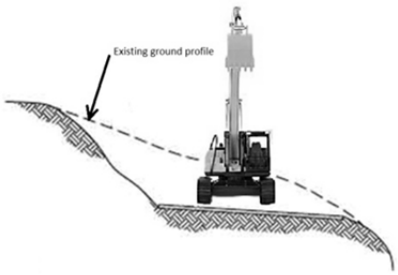


Figure 4 – Excavator Working Platform Illustralion

Discharging to the River Esk using an intercept drain from this same high level boundary was also considered. The Meikleholm Side wastercourse was chosen for this option as it provided a shorter distance.

2.3 OPTION 3 – INTERCEPT AND DISCHARGE TO THE EXISTING 'CULVERT E1'

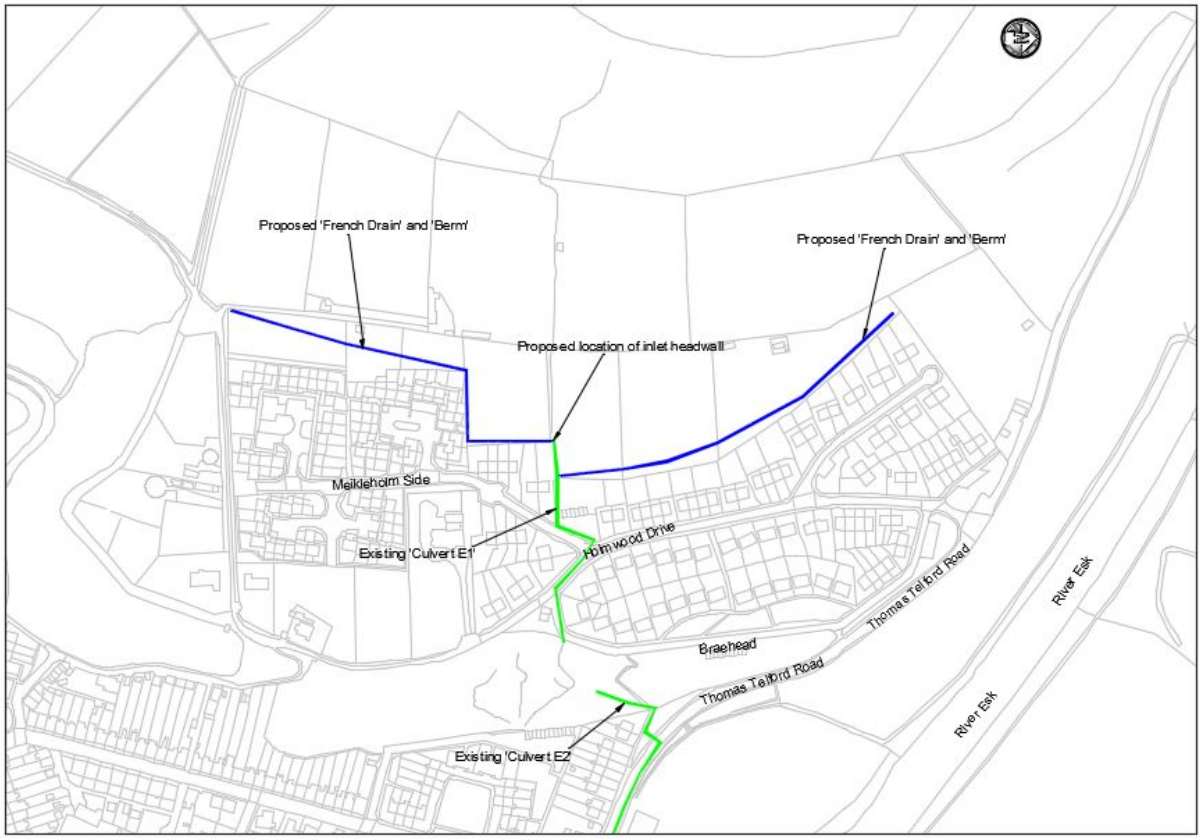


Figure 5 – Option 3 Layout

This solution attempts to intercept overland flows by means of a 'French Drain' and 'Berm' and discharge the flows to the existing 'Culvert E1'. The combination of 'French Drain' and 'Berm' is considered essential, as, either element considered on its own would risk overtopping when experiencing significant overland flow. In addition, the existing small watercourse, upstream of 'Culvert E1', is to be intercepted by means of a culvert inlet headwall. It is proposed that the following will be provided:

- A 'French Drain' and 'Berm' parallel to the existing field boundary above Holmwood Drive.
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Meikleholm Side.
- An inlet headwall to divert the upper catchment of the existing watercourse flows away from existing 'Culvert E1'.
- A culvert to convey flows for the 'French Drain' perforated pipelines to the discharge with 'Culvert E1'.

This option is not feasible due to reduced hydraulic capacity and the poor structural condition of the existing culvert.

2.4 OPTION 4 – INTERCEPT AND DISCHARGE TO 'CULVERT E1'. REPLACE 'CULVERT E1' AND 'CULVERT E2'.

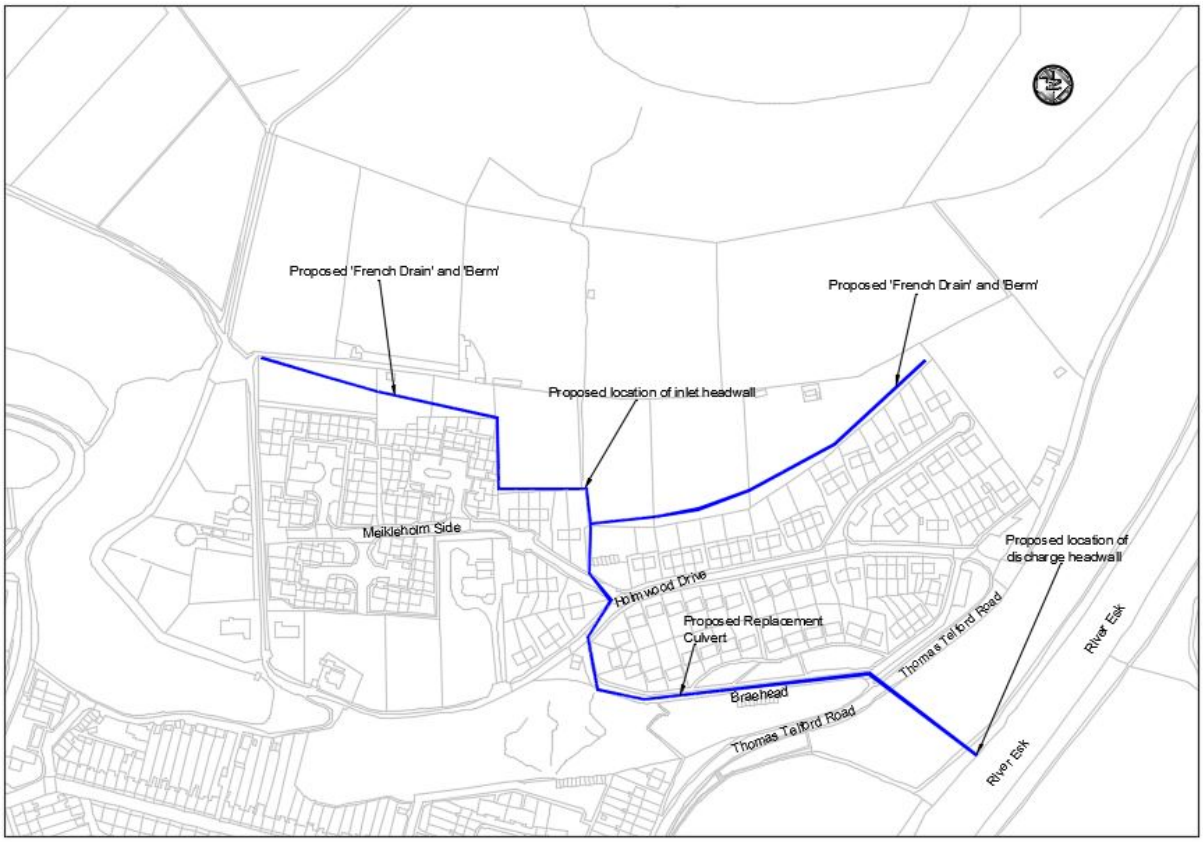


Figure 6 - Option 4 Layout

This solution attempts to intercept overland flows by means of a 'French Drain' and 'Berm' and discharge storm flows to a replacement culverts 'E1 & E2'. The combination of 'French Drain' and 'Berm' is considered essential, as, either element considered on its own would risk overtopping when experiencing significant overland flow. Due to the line and location of the existing culverts 'E1 and E2', an alternate route would have to be followed via Braehead, before discharging to the River Esk. In addition, the existing small watercourse, upstream of 'Culvert E1', is to be intercepted by means of a culvert inlet headwall. It is proposed that the following will be provided:

- Replacement of existing 'Culvert E1' and 'Culvert E2'
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Holmwood Drive.
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Meikleholm Side.
- An inlet headwall to divert the upper catchment of the existing watercourse flows away from existing 'Culvert E1'.
- A culvert to convey flows for the 'French Drain' perforated pipelines to the discharge headwall.
- A discharge headwall from the proposed culvert to the existing Meikleholm Side watercourse.

Estimated Construction Cost: £450k

This option is not feasible and should not be carried forward due to the cost implications of constructing the proposed replacement culvert along a roadway.

2.5 OPTION 5 – INTERCEPT OVERLAND FLOWS AND DISCHARGE TO THE RIVER ESK VIA A NEW HOLMWOOD DRIVE CULVERT.

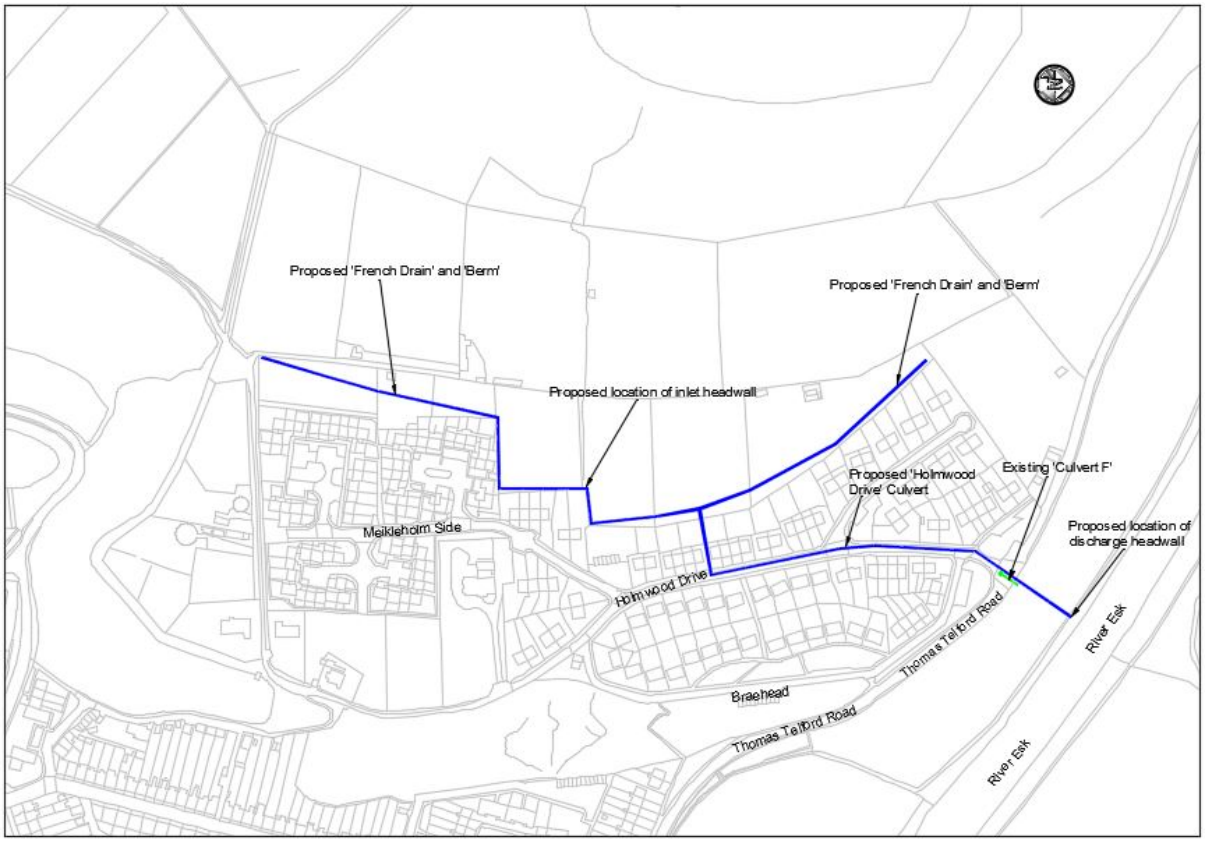


Figure 7 - Option 5 Layout

This solution attempts to intercept overland flows by means of a 'French Drain' and 'Berm' and discharge the flows to the River Esk via a new culvert provided along Holmwood Drive The combination of 'French Drain' and 'Berm' is considered essential, as, either element considered on its own would risk overtopping when experiencing significant overland flow. In addition, the existing small watercourse, upstream of 'Culvert E1', is to be intercepted by means of a culvert inlet headwall. It is proposed that the following will be provided:

- Provision of a culvert
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Holmwood Drive.
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Meikleholm Side.
- An inlet headwall to divert the upper catchment of the existing watercourse flows away from existing 'Culvert E1'.
- A culvert along Holmwood Drive to convey flows for the 'French Drain' perforated pipelines to the discharge headwall.
- A discharge headwall from the proposed culvert to the River Esk.

Estimated Construction Cost: £400k

This option is not feasible and should not be carried forward due to the cost implications of constructing the proposed replacement culvert along a roadway.

2.6 OPTION 6 – INTERCEPT OVERLAND FLOWS AND DISCHARGE TO MEIKLEHOLM SIDE WATERCOURSE

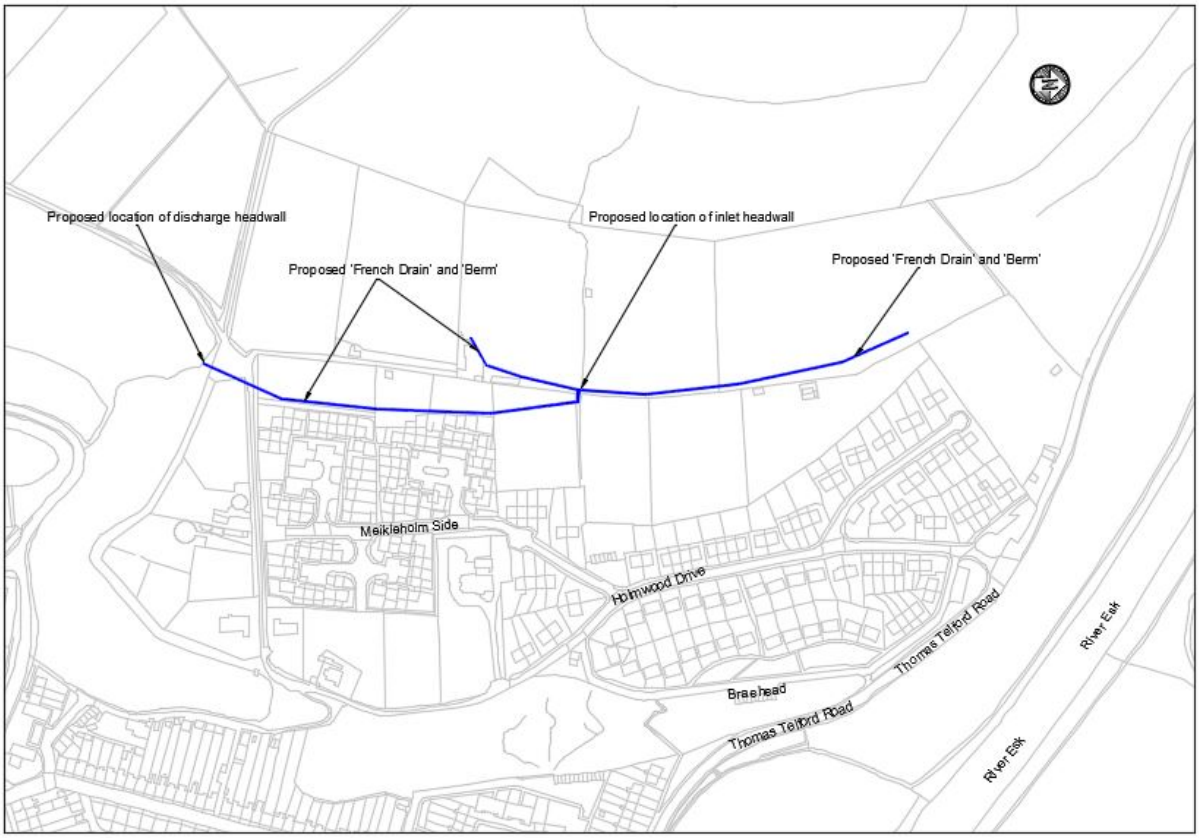


Figure 8 - Option 6 Layout

This solution attempts to intercept overland flows by means of a 'French Drain' and 'Berm' and discharge the flows to the Meikleholm Side watercourse. The combination of 'French Drain' and 'Berm' is considered essential, as, either element considered on its own would risk overtopping when experiencing significant overland flow. In addition, the existing small watercourse, upstream of 'Culvert E1', is to be intercepted by means of a culvert inlet headwall. It is proposed that the following will be provided:

- A 'French Drain' and 'Berm' parallel to the existing field boundary above Holmwood Drive.
- A 'French Drain' and 'Berm' parallel to the existing field boundary above Meikleholm Side.
- An inlet headwall to divert existing watercourse flows from existing 'Culvert E1'.
- A culvert to convey flows for the 'French Drain' perforated pipelines to the discharge headwall.
- A discharge headwall from the proposed culvert to the existing Meikleholm Side watercourse.

Estimated Construction Cost: £250k

This option is considered to be feasible and should be carried forward.

3 CONCLUSION

Dumfries and Galloway Council have identified local flooding issues in Langholm with particular consideration to the flooding to properties and gardens on Holmwood Drive and Meikleholm Side due to frequency and severity.

As outline in this report, all available information and surveys has been considered, in order to provide options for the interception of overland flows, in an effort to protect properties in Holmwood Drive and Meikleholm Side from flooding.

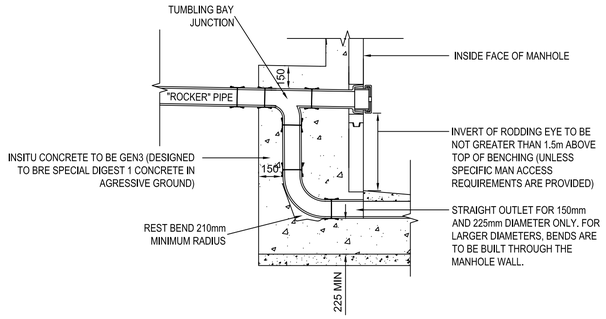
It is recommended that Option 6, 'Intercept Overland Flows and Discharge to Meikleholm Side Watercourse' is carried forward to construction phase. This option will meet Dumfries and Galloway Council requirements, it is more cost effective and is practical from a constructability standpoint.

Option	Buildability Rating*	Approximate Cost	Overall Rating
Option 1	N/A	£0	5th
Option 2	2	£350k	2nd
Option 3	0	N/A	6th
Option 4	4	£450k	4th
Option 5	4	£400k	3rd
Option 6	8	£250k	1st

** Buildability Rating from 1-10 with 1 being worst and 10 being best.*

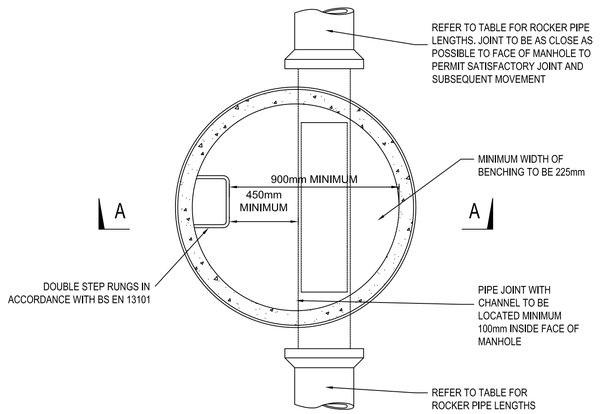
APPENDIX A

Standard Construction Details

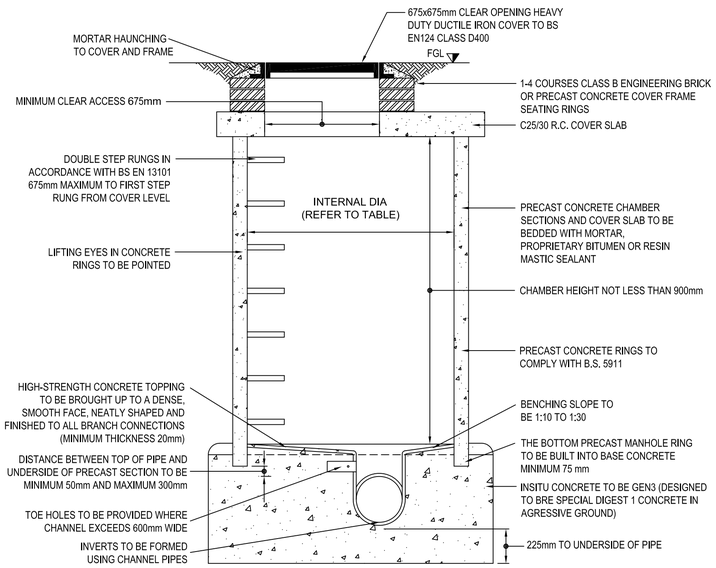


EXTERNAL VERTICAL BACKDROP
SCALE 1:20

MANHOLE DETAIL A
MAX DEPTH FROM COVER TO SOFFIT = 3.0m
SCALE 1:20

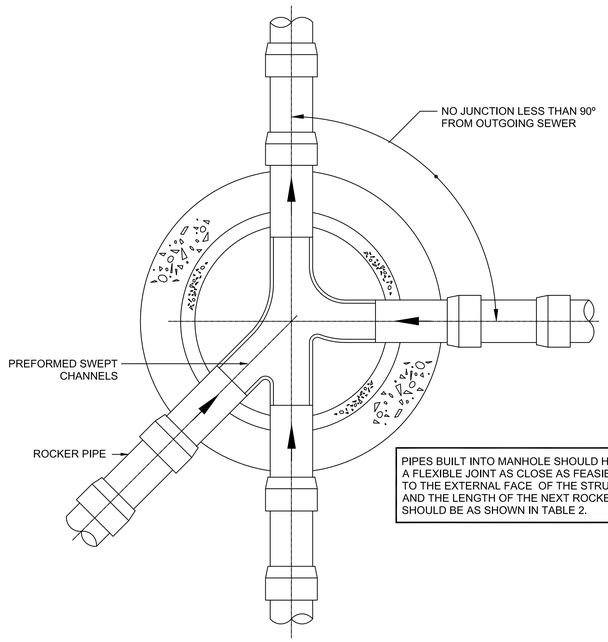


SECTIONAL PLAN



SECTION A-A

IN POOR/AGGRESSIVE GROUND CONDITIONS FULL DEPTH CONCRETE SURROUND IS REQUIRED AND SHOULD BE DESIGNED TO BRE SPECIAL DIGEST 1 CONCRETE



PIPES BUILT INTO MANHOLE SHOULD HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO THE EXTERNAL FACE OF THE STRUCTURE AND THE LENGTH OF THE NEXT ROCKER PIPE SHOULD BE AS SHOWN IN TABLE 2.

TYPICAL ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES
NOT TO SCALE

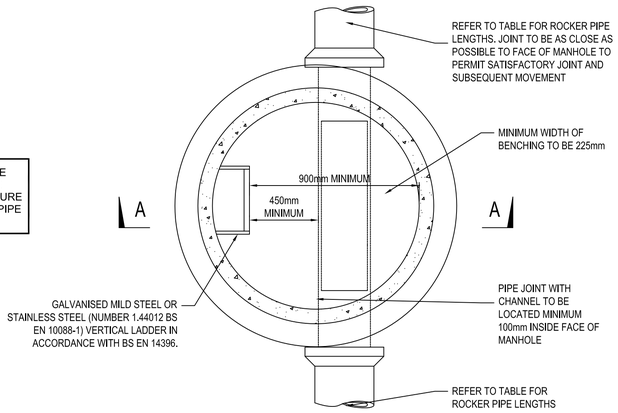
NOMINAL DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	MINIMUM NOMINAL INTERNAL DIAMETER OF MANHOLE (mm)
LESS THAN 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800
GREATER THAN 900	PIPE DIAMETER + 900

TABLE 1 - MANHOLE DIAMETERS

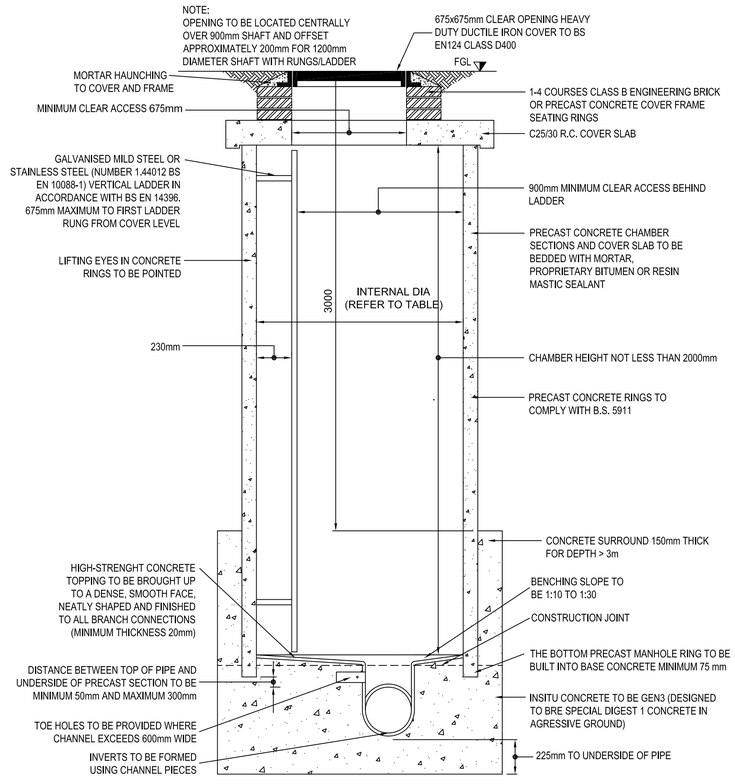
NOMINAL DIAMETER (mm)	EFFECTIVE LENGTH (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

TABLE 2 - LENGTH OF ROCKER PIPE

MANHOLE DETAIL B
MAX DEPTH FROM COVER TO SOFFIT 3.0m to 6.0m
SCALE 1:20



SECTIONAL PLAN



SECTION A-A

IN POOR/AGGRESSIVE GROUND CONDITIONS FULL DEPTH CONCRETE SURROUND IS REQUIRED AND SHOULD BE DESIGNED TO BRE SPECIAL DIGEST 1 CONCRETE

NOTES

1. Verifying Dimensions.
   The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
2. Existing Services.
   Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
3. Issue of Drawings.
   Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of un-dimensioned measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to aid the recipients drawing production, or setting out on site.

rev	amendments	drawn	date

RPS
Elmwood House
74 Boucher Road
Belfast
BT12 6RZ
T +44 (0) 28 90 667914
F +44 (0) 28 90 668286
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Client
Dumfries & Galloway Council

Project
Holmwood Langholm
Detailed Design

Title
Construction Details
Page 1 of 3

Drawing Status	Sheet Size	Drawing Scale
Preliminary	A1	As Shown

Drawing Number	Rev
IBE1209 /103	-

Project Leader	Drawn By	Date	Initial Review
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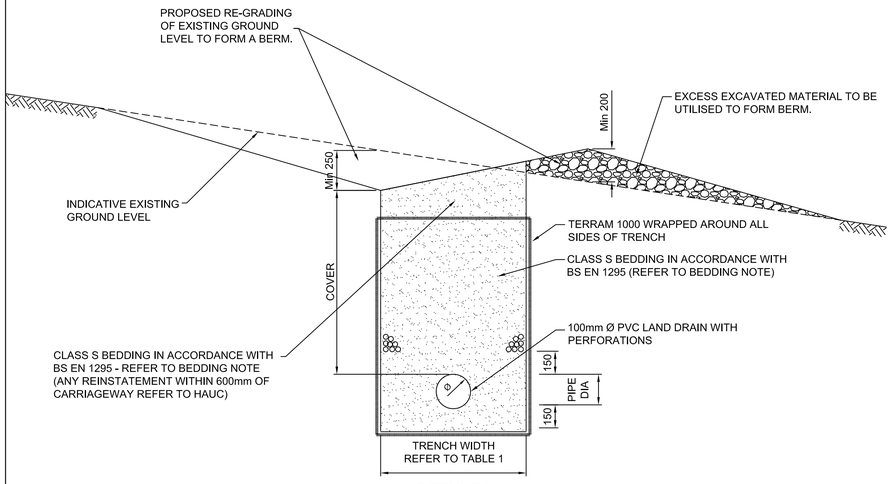
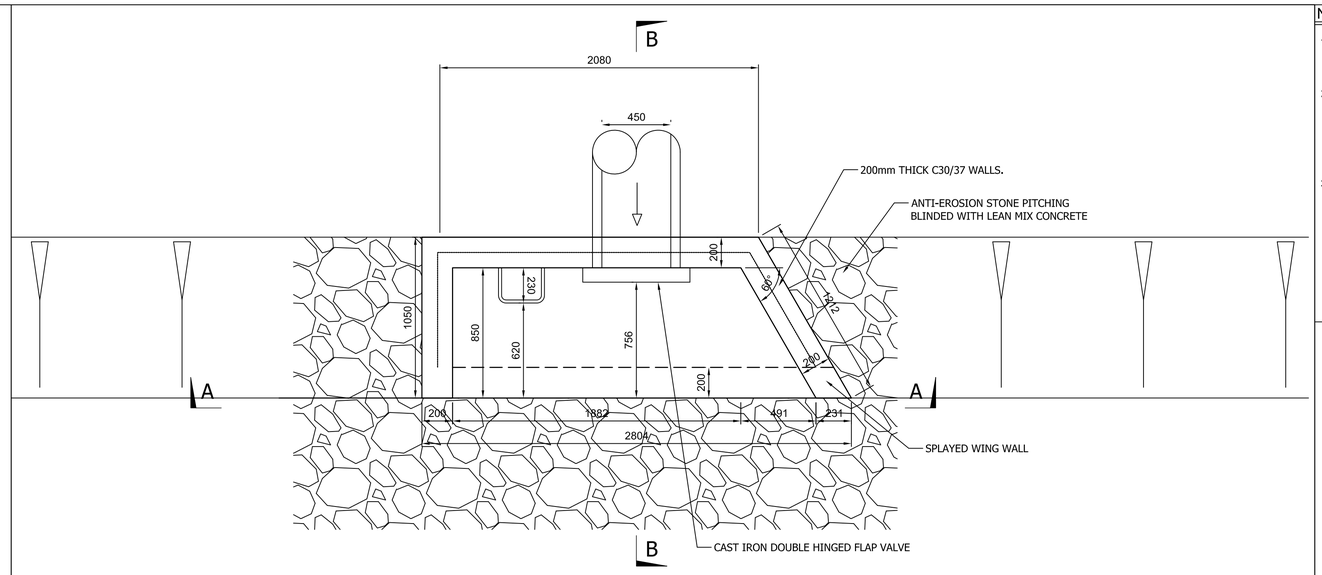


DETAIL B1
TYPICAL PIPE BEDDING IN OPEN GROUND
SCALE 1:20
FRENCH DRAIN CONSTRUCTION



OUTLET HEADWALL - PLAN
(SCALE 1:20)

NOTES

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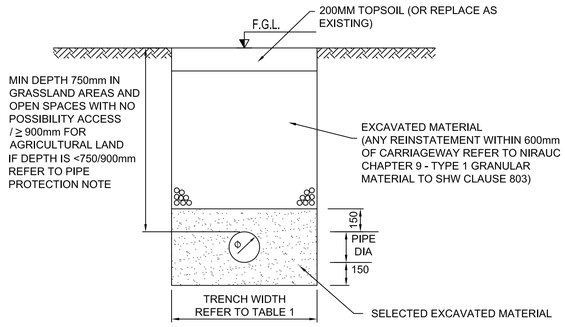
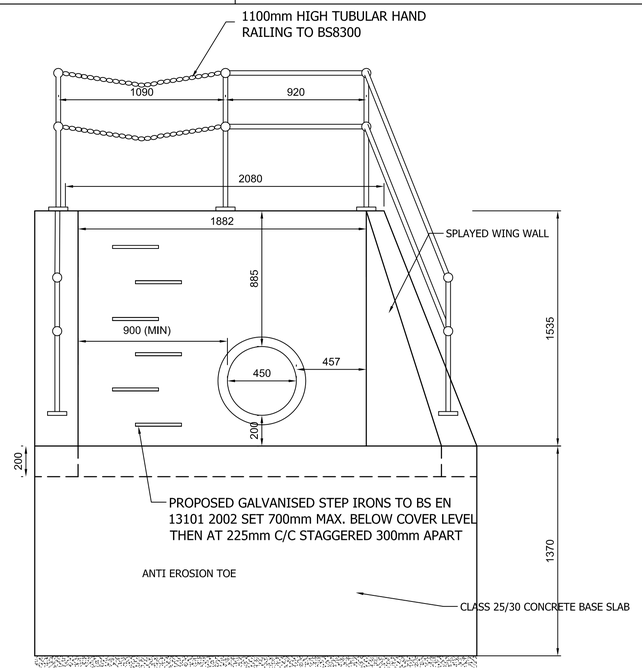
NOMINAL INTERNAL DIAMETER OF PIPE (mm)	MINIMUM TRENCH WIDTH (mm)	MAXIMUM TRENCH WIDTH (mm)
100	430	630
150	490	690
200	580	780
300	680	880
375	950	1150
450	1030	1230
525	1120	1320
600	1240	1440
675	1330	1530
750	1400	1600
825	1490	1690
900	1920	2120
1050	2100	2300
1200	2290	2490

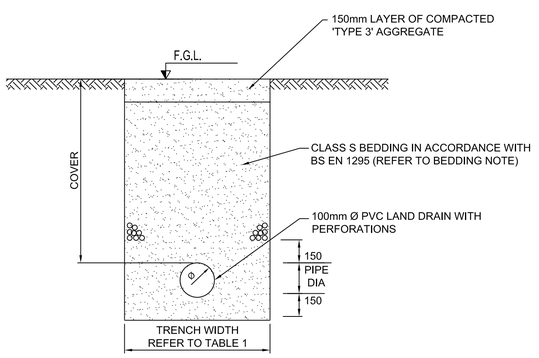
RECOMMENDED TRENCH WIDTHS



DETAIL B2
TYPICAL PIPE BEDDING AND REINSTATEMENT IN VERGE/FIELD
SCALE 1:20

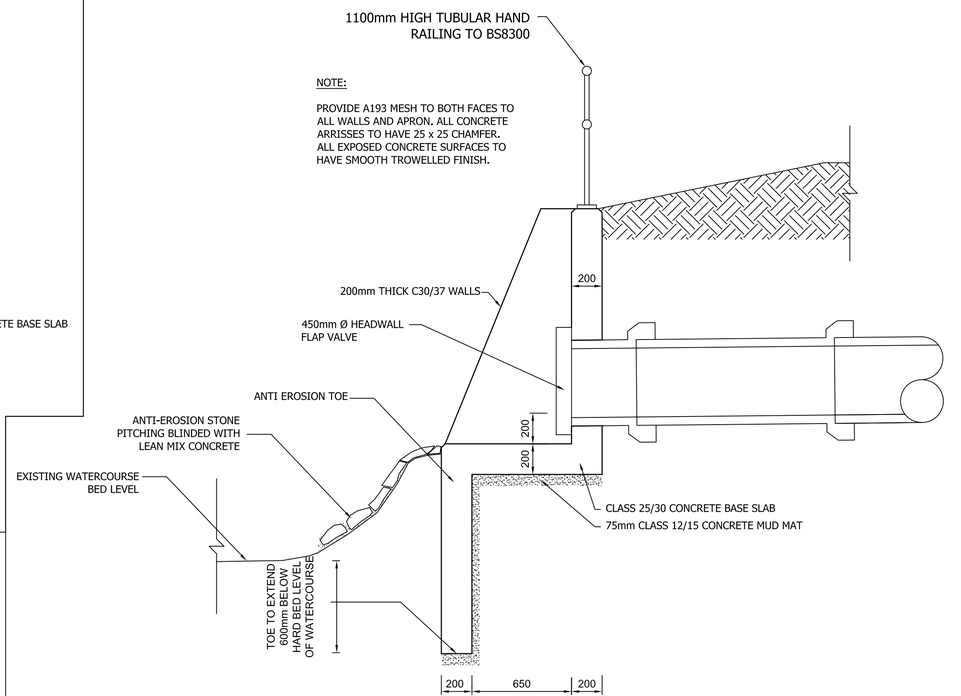


OUTLET HEADWALL
SECTION A-A
(SCALE 1:20)



DETAIL B3
TYPICAL PIPE BEDDING AND REINSTATEMENT IN GRAVEL ROADWAY
SCALE 1:20

BEDDING NOTES
- MATERIAL WELL COMPACTED 10mm NOMINAL SINGLE SIZE STONE (UP TO 100mmØ PIPE).
- MATERIAL WELL COMPACTED 10mm OR 14MM NOMINAL SINGLE-SIZE OR 14mm TO 5mm GRADED (OVER 100mm Ø PIPE AND UP TO 150mmØ PIPE).
- 10mm, 14mm OR 20mm NOMINAL SINGLE-SIZE OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED (OVER 115mm Ø PIPE AND UP TO 300mmØ PIPE).
- 14mm OR 20mm NOMINAL SINGLE-SIZE OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED (OVER 300mm Ø PIPE AND UP TO 550mmØ PIPE).
- 14mm, 20mm OR 40MM NOMINAL SINGLE-SIZE CRUSHED ROCK OR 14mm TO 5mm GRADED OR 20mm TO 5mm GRADED OR 40mm TO 5mm GRADED (OVER 550mm Ø PIPE).



OUTLET HEADWALL
SECTION B-B
(SCALE 1:20)

rev	amendments	drawn	date

RPS
Elmwood House
74 Boucher Road
Belfast
BT12 6RZ
T +44 (0) 28 90 667914
F +44 (0) 28 90 668286
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Client
Dumfries & Galloway Council

Project
Holmwood Langholm
Detailed Design

Title
Construction Details
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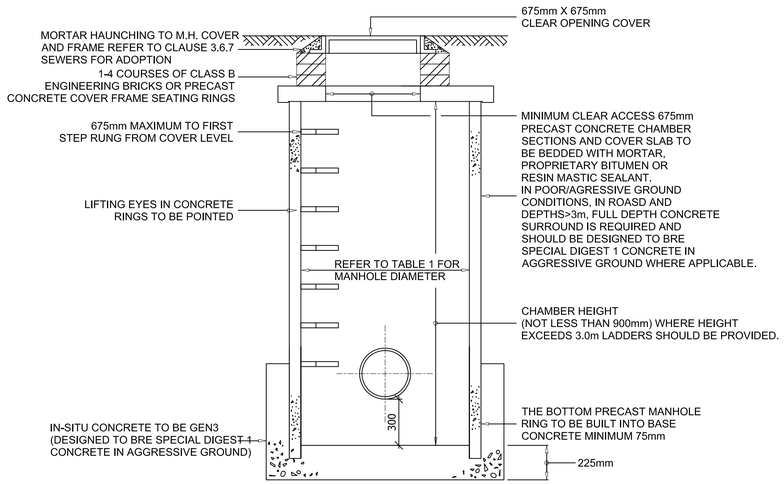
Drawing Status	Sheet Size	Drawing Scale
Preliminary	A1	As Shown

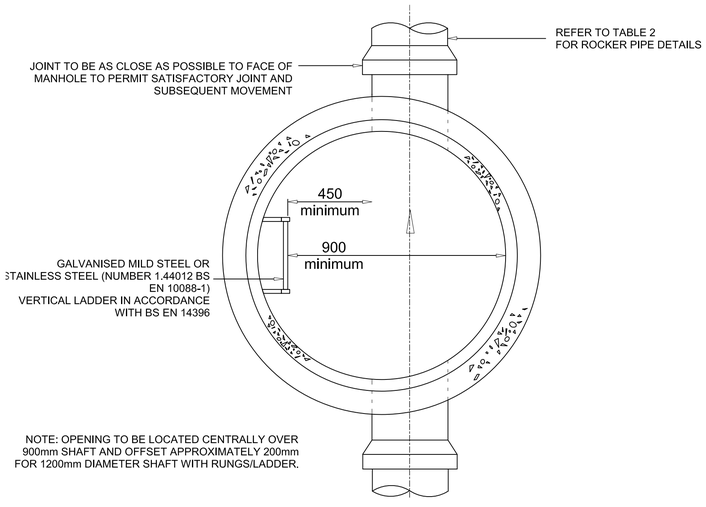
Drawing Number	Rev
IBE1209 /104	-

Project Leader	Drawn By	Date	Initial Review
BM	BA	25/07/2016	ML

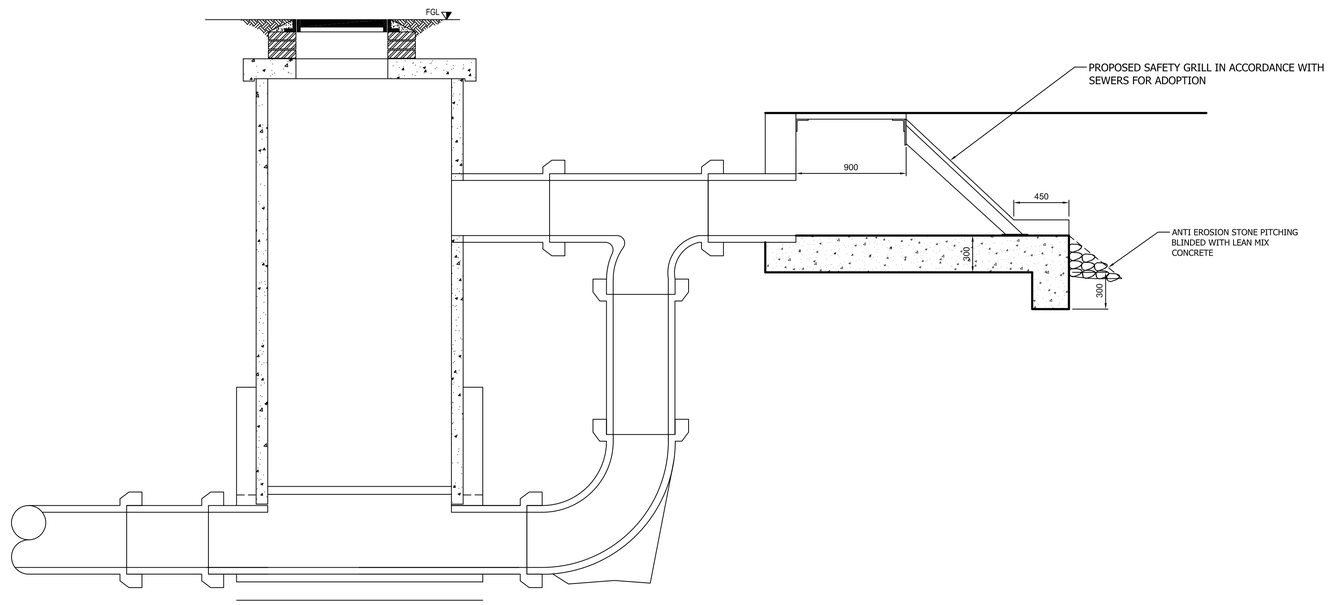


TYPICAL SILT TRAP MANHOLE DETAIL

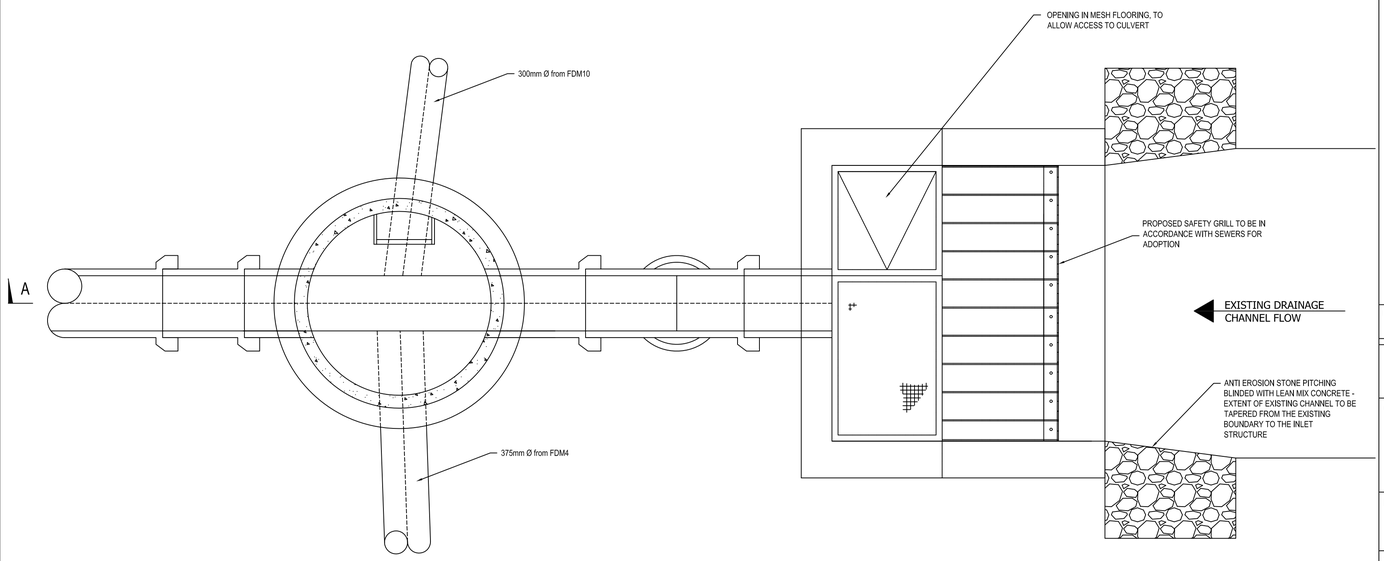
NOT TO SCALE



TYPICAL MANHOLE DETAIL
NOT TO SCALE



FDMH5 AND INLET HEADWALL - SECTION A-A
SCALE 1:25



FDMH5 AND INLET HEADWALL - PLAN VIEW
SCALE 1:25

NOTES

1. Verifying Dimensions.
   The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
2. Existing Services.
   Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
3. Issue of Drawings.
   Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of un-dimensioned measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to aid the recipients drawing production, or setting out on site.

rev	amendments	drawn	date

RPS
Elmwood House
74 Boucher Road
Belfast
BT12 6RZ
T +44 (0) 28 90 667914
F +44 (0) 28 90 668286
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Client
Dumfries & Galloway Council

Project
Holmwood Langholm
Detailed Design

Title
Construction Details
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Drawing Status	Sheet Size	Drawing Scale
Preliminary	A1	As Shown

Drawing Number	Rev
IBE1209 /105	-

Project Leader	Drawn By	Date	Initial Review
BM	BA	25/07/2016	ML