Ellon Asset Condition Assessment

Final Report

16 April 2018

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Revision history

Revision Ref/Date	Amendments	Issued to
S3-P01 / 7 March 2018	Draft Report	Alistair Scotland and Lee Watson, Aberdeenshire Council
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A1-C01 / 03 April 2019	Published	Alistair Scotland and Lee Watson, Aberdeenshire Council

Contract

This report describes work commissioned by Gavin Penman, on behalf of Aberdeenshire Council, on 10 October 2017 by Purchase Order 1095192. Dougall Baillie's representative for the contract was Scott MacPhail and Aberdeenshire Council's representative for the contract was Alistair Scotland. Christina Kampanou and Stephen Farrar of JBA Consulting carried out this work.

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Purpose

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Executive summary

An Asset Survey of structures that could influence flood risk has been undertaken along the Ythan, Modley Burn, Broomies Burn, Fortree Burn and Hillhead Burn in Ellon. The visual survey locates their position, identifies their general condition, maintenance required, and if appropriate 'quick wins' that could be undertaken to reduce flood risk.

Properties with property level flood protection measures have been identified from an external visual survey.

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Abbreviations

FPS	Flood Protection Scheme
Approx.	Approximately

1 Introduction

A full walkover survey was undertaken to assess the condition of structures in Ellon in Aberdeenshire as part of the Ellon Flood Protection Study. More specifically, the walkover was undertaken in Ellon along the River Ythan, Modley Burn, Broomies Burn, Fortree Burn and Hillhead Burn. The asset condition assessment has been carried out in accordance with the Environment Agency's Condition Assessment Manual March 2012. Where information provided by the client indicates the risk of blockage is high, or where this is thought to be high this has been recorded. (no formal risk assessment/modelling has been carried out at this stage).

Category	Comments
Date of inspection(s)	28-29 November 2017
Inspector(s)	Stephen Farrar and Christina Kampanou
General inspection information	Weather at the time of the inspection was wet and relatively windy.
Scheme information	The asset survey is on behalf of Aberdeenshire Council.
Nature of inspection(s)	The inspections were walkover surveys of the structural assets in the towns, as well as logging of any PLP within the survey lines. Photographs were taken but no topographic survey work was carried out.
Nature of assets	Culverts and bridges are the main structural assets in Ellon. There are also retaining walls and outlet structures.
General condition / comments	The assets were generally found to be in good condition.

2 River Ythan

Assets are listed below from upstream to downstream, with the numbering referenced in Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4, Figure 2-5 and Figure 2-6.

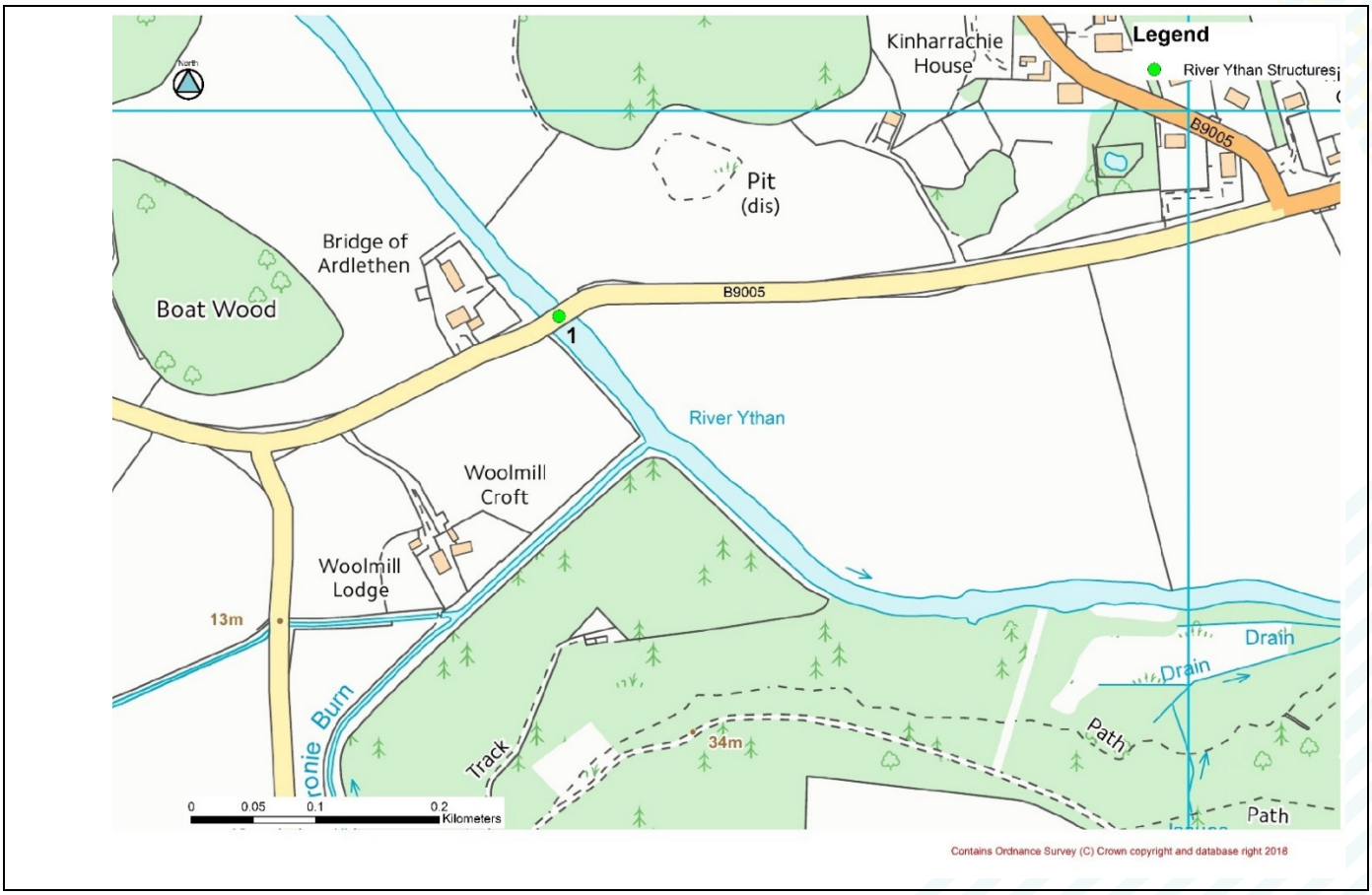

Figure 2-1: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-1 – List of structural assets shown in Figure 2-1

Number	Asset	Location
1	Bridge of Ardlethen	B9005

1- Bridge of Ardlethen B9005 (Refer to Figure 2-1)	
 ***View from upstream***	**Type**: Three-arched vehicular bridge **Upstream grid ref:** NJ 92489 30834 **Span (m):** 36.9 **Material**: Masonry **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor cracks. Some loss of mortar. No sign of deformation of arches. Potentially high risk of scour. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A

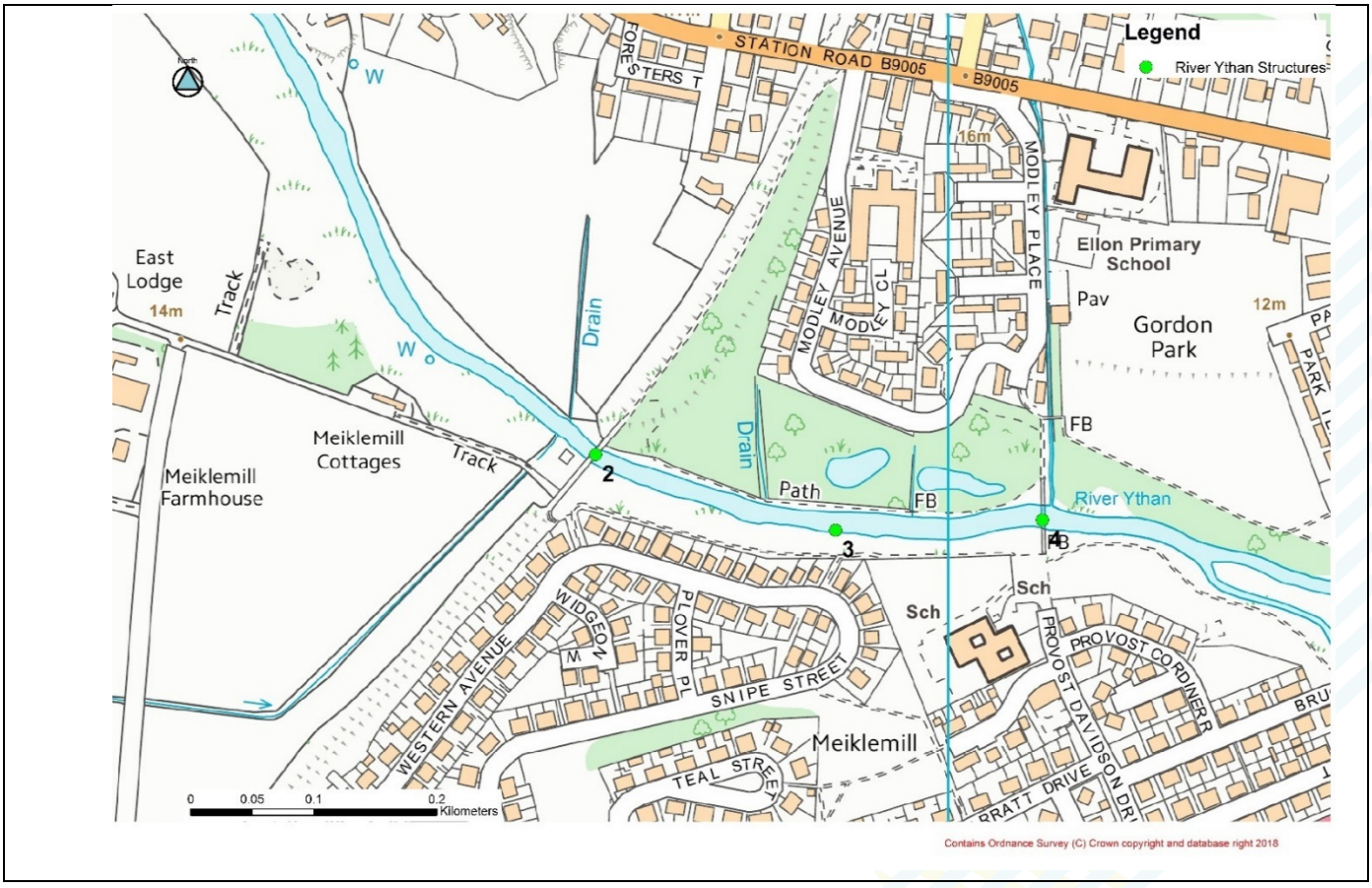

Figure 2-2: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-2 – List of structural assets shown in Figure 2-2		
Number	**Asset**	**Location**
2	Meiklemill Railway Bridge	Meiklemill
3	Meiklemill Culvert (Outfall)	Meiklemill
4	Meiklemill Culvert Footbridge	Meiklemill

2- Meiklemill Railway Bridge (Refer to Figure 2-2)

View of bridge from downstream

Type: Four-arched bridge
Upstream grid ref: NJ 94713 30323
Span (m): Unknown
Material: Masonry
Condition: Grade 3 (Fair)
Part of FPS: No
Comments:
No sign of deformation of arches.
Minor mortar loss.
Rust in arch soffits.
Erosion of right bank.
Risk of Blockage: Low
Maintenance: None Required
Quick Win: N/A

Downstream view

Upstream view

3- Meiklemill Culvert Outlet (Refer to Figure 2-2)	
 ***View from downstream***	**Type**: Outfall **Upstream grid ref:** NJ 94909 30240 **Width (m):** Unknown **Material**: Concrete **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Trash screen connection to culvert compromised by loss of fixings. Minor bank erosion downstream. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** Remove trash screen

4- Meikle Mill Footbridge (Refer to Figure 2-2)	
 ***View of bridge from downstream***	**Type**: Glulam timber bridge **Upstream grid ref:** NJ 95076 30270 **Span (m):** 55 **Material**: Timber beam and deck **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Signs of minor deterioration. Erosion at both banks. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A
 ***Downstream view***	 ***Upstream view***

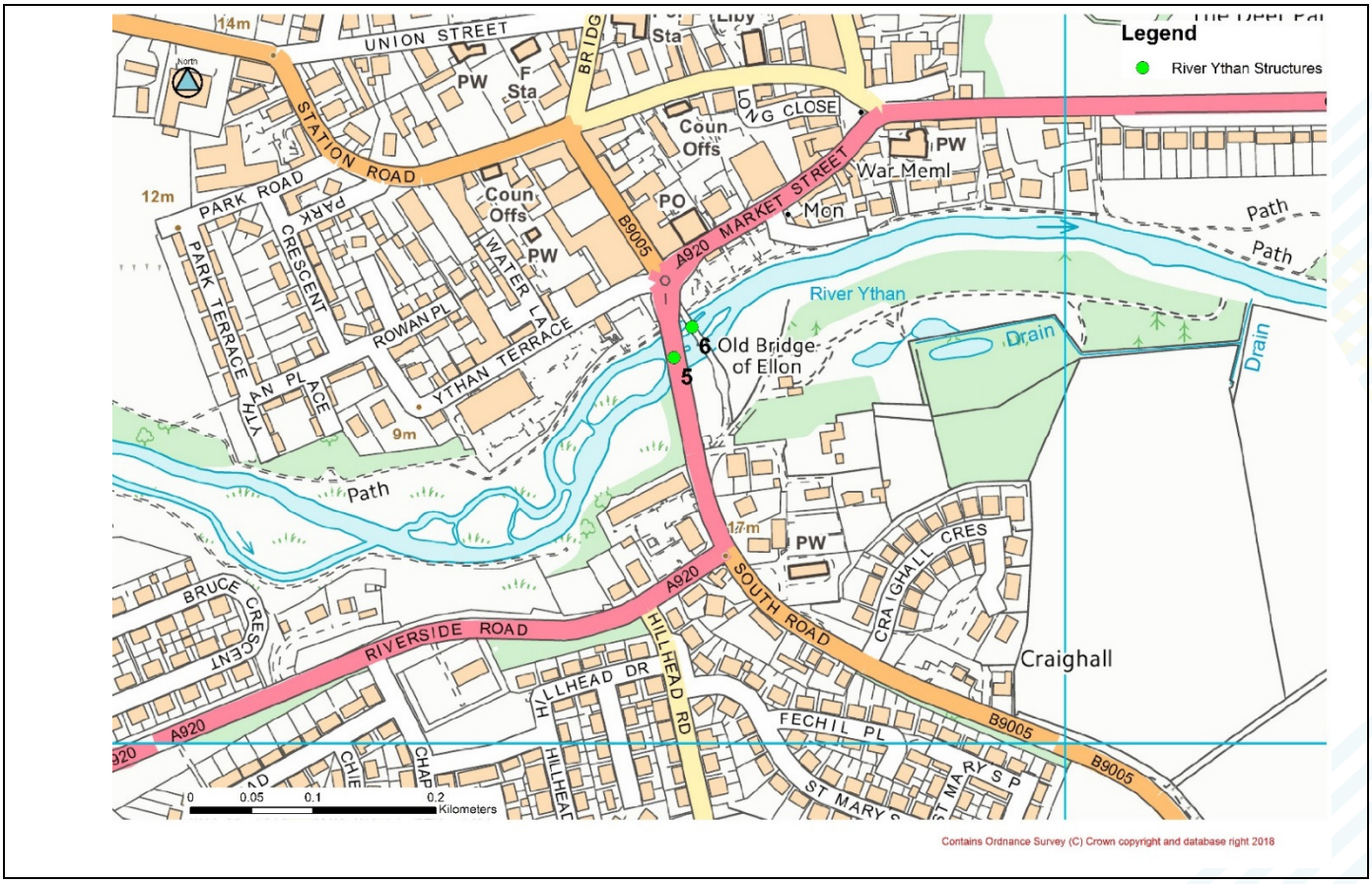

Figure 2-3: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-3 – List of structural assets shown in Figure 2-3		
Number	**Asset**	**Location**
5	Ellon bridge	A920 (South Road)
6	Old Bridge of Ellon (Footbridge)	Market Street

5- Ellon Bridge A920 (Refer to Figure 2-3)	
 ***View of bridge from upstream***	**Type**: Three-arched vehicular bridge **Upstream grid ref:** NJ 95681 30315 **Span (m):** 54.6 **Material**: Reinforced concrete **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor cracks. Slight sealant loss. No sign of deformation of arches. Abutments well founded. Minor erosion of banks. Potentially at high risk of scour. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A
 ***View of Ellon Bridge from downstream***	 ***Upstream view of River Ythan***

6- Old Bridge of Ellon (Refer to Figure 2-3)	
 ***Upstream view of bridge***	**Type:** Three-arched bridge **Upstream grid ref:** NJ 95685 30334 **Span (m):** 45.8 **Material:** Masonry **Condition:** Grade 3 (Fair) **Part of FPS:** No **Comments:** Lengthy cracks. Loss of mortar. Water stains. Bridge not open to vehicles. Increased potential flood risk upstream due to close proximity of two structures. Potentially at high risk of scour. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A
 ***View from downstream***	 ***View of bridge***

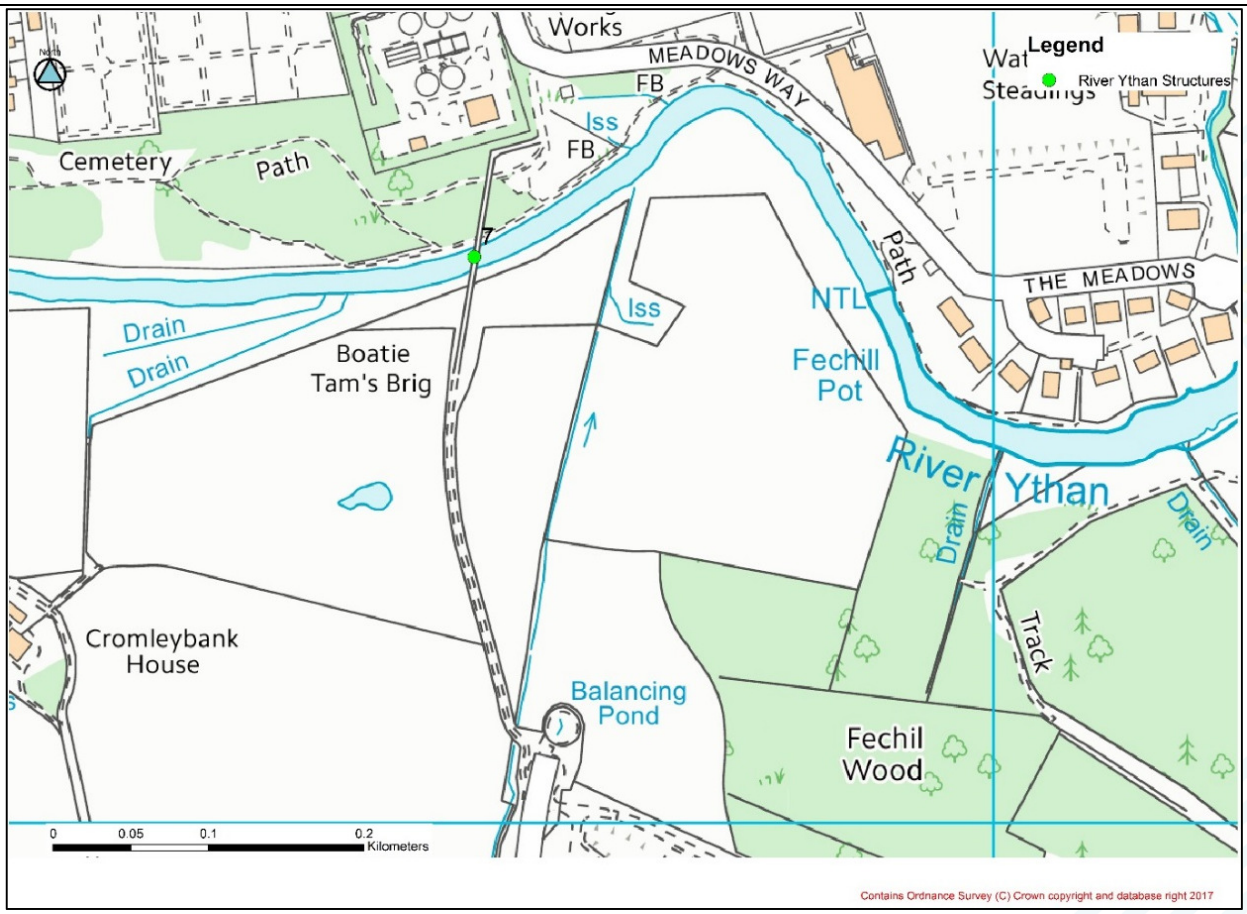

Figure 2-4: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-4 – List of structural assets shown in Figure 2-4

Number	Asset	Location
7	Boatie Tam's Brig (Footbridge)	Meadows Way

7- Boatie Tam's Brig (Refer to Figure 2-4)	
 ***View of bridge from upstream***	**Type**: Pedestrian bridge **Upstream grid ref:** NJ 96666 30364 **Span (m):** 127.5 **Material**: Steel beam / metal deck / concrete abutments **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor cracks on abutments. No sign of deformation of beams. Localised surface corrosion. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A

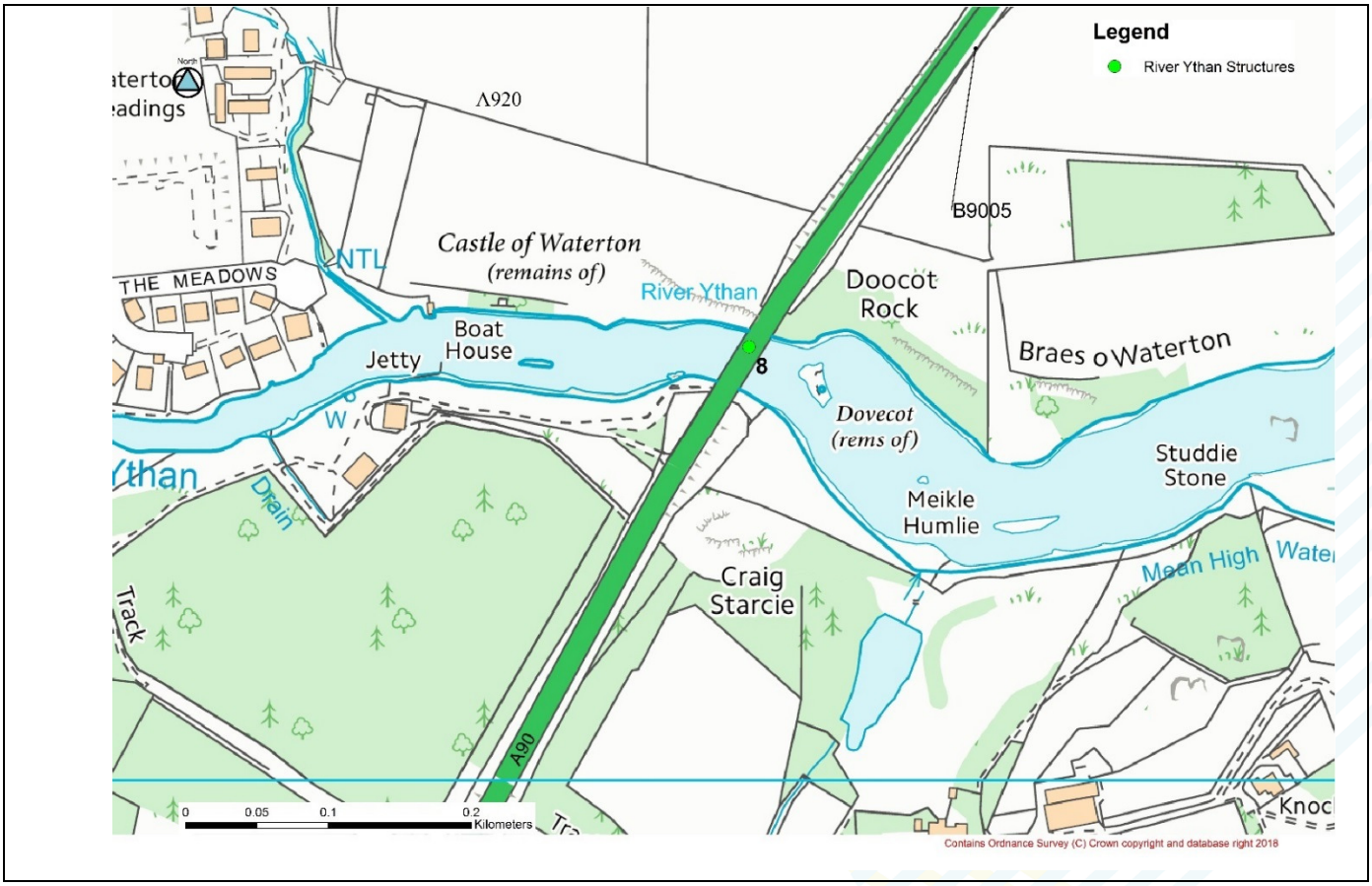

Figure 2-5: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-5 – List of structural assets shown in Figure 2-5		
Number	**Asset**	**Location**
8	River Ythan Bridge	A90 Road

8- River Ythan Bridge A90 (Refer to Figure 2-5)	
 ***View of bridge from upstream***	**Type**: Vehicular bridge **Upstream grid ref:** NJ 97460 30304 **Span (m):** Unknown **Material**: Steel beam / concrete columns **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: No sign of deformation of beams. Minor rust. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A
 ***Bridge deck, view from upstream right hand bank***	 ***View from underneath from right hand bank***

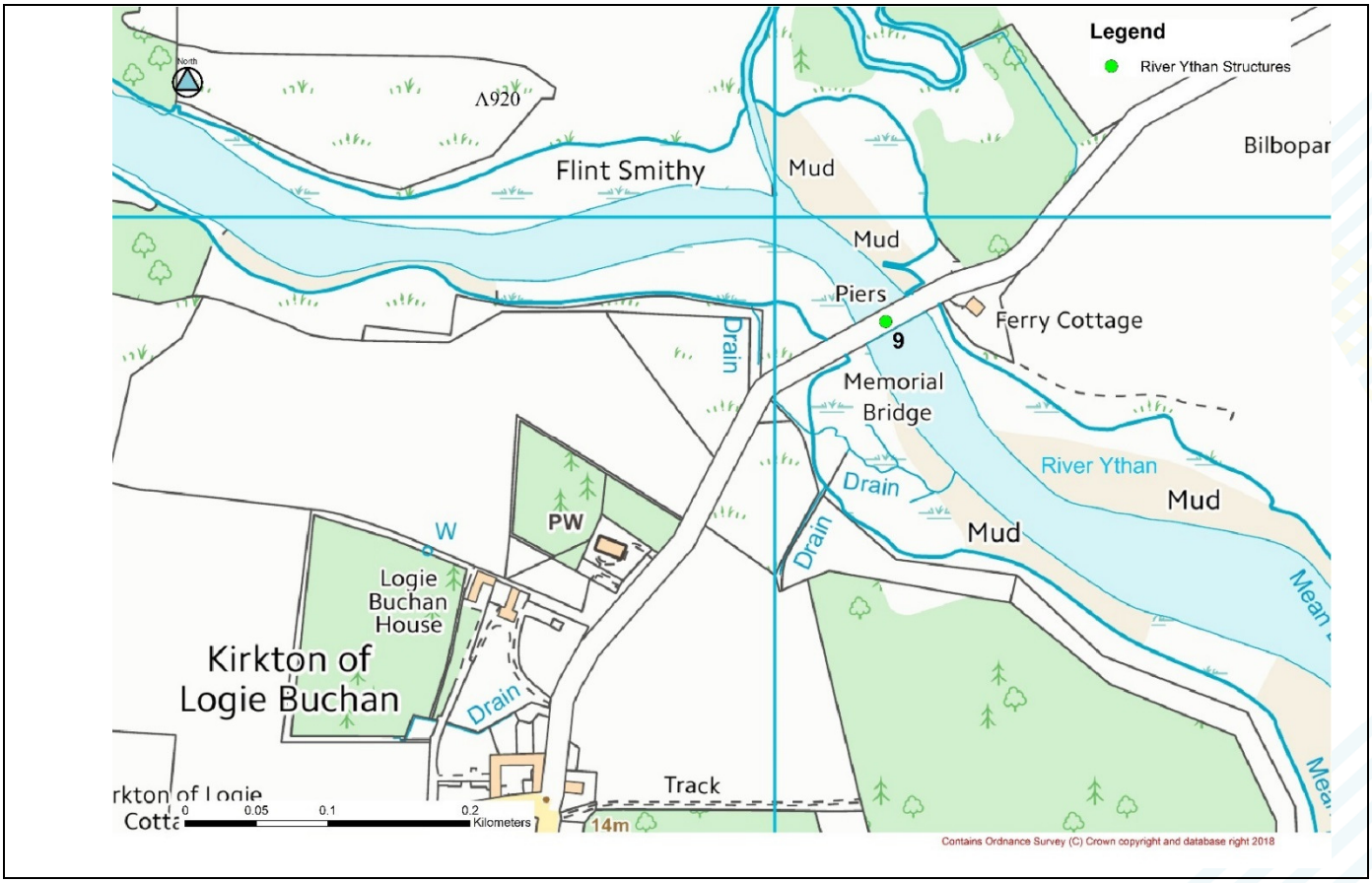

Figure 2-6: Plan showing the distribution of features identified in the asset condition assessment along the River Ythan

Table 2-6: List of structural assets shown in Figure 2-6		
Number	**Asset**	**Location**
9	Logie Buchan Memorial Bridge	Kirkton of Logie Buchan

9- Logie Buchan Memorial Bridge (Refer to Figure 2-6)	
 ***View of bridge from upstream***	**Type**: Nine-span pedestrian bridge **Upstream grid ref:** NJ 99078 29927 **Span (m):** Unknown **Material**: Reinforced concrete beam and slab **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor cracks and spalling of slab and beam. Minor cracks of piers. Erosion of left bank. **Risk of Blockage:** Low **Maintenance:** None Required **Quick Win:** N/A
 ***View of bridge***	 ***Downstream view of River Ythan from bridge***

3 Modley Burn

Assets are listed below from upstream to downstream, with numbering referenced in Figure 3-1, Figure 3-2 and Figure 3-3.

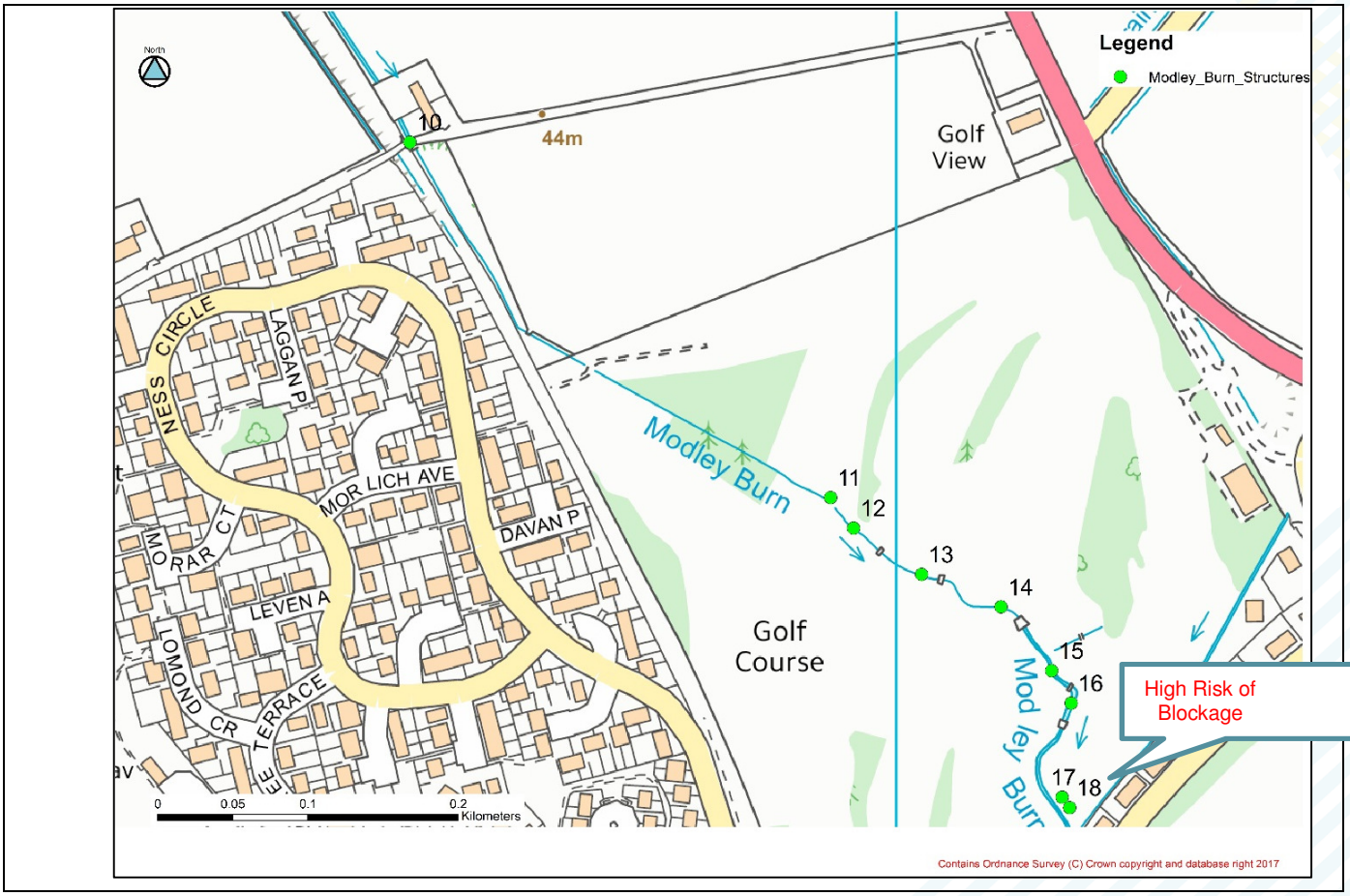

Figure 3-1: Plan showing the distribution of features identified in the asset condition assessment along the Modley Burn

Table 3-2: List of structural assets shown in Figure 3-1		
Number	**Asset**	**Location**
10	Culvert	Auchterellon Farm
11	Culvert	Golf Course
12	Culvert	Golf Course
13	Culvert	Golf Course
14	Culvert	Golf Course
15	Footbridge	Golf Course
16	Footbridge	Golf Course

Table 3-2: List of structural assets shown in Figure 3-1		
17	Footbridge	Golf Corse
18	Hospital Road Culvert (inlet)	Golf Course

10 - Simple culvert (Refer to Figure 3-1)	
 *View from downstream of culvert*	**Type**: Simple culvert **Upstream grid ref:** NJ 94676 31743 **Width (m)**: Unknown **Length (m):** 2.5 approx. **Material**: Masonry **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Culvert at side, masonry arch brick. Steep bank. Heavily vegetated channel. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris, keep vegetation growth under control. **Quick Win:** N/A

11 - Culvert (Refer to Figure 3-1)	
 *View from upstream of culvert*	**Type**: Simple culvert **Upstream grid ref:** NJ 94956 31506 **Material**: Stone **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Simple culvert at golf course. Minor erosion at bank sides. No signs of sediment deposition. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

12 - Culvert (Refer to Figure 3-1)	
 *View from upstream of culvert*	**Type:** Simple culvert **Upstream grid ref:** NJ 94977 31490 **Material:** Stone **Condition:** Grade 2 (Good) **Part of FPS:** No **Comments:** Pipe upstream of the culvert. Stable bank. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

13 - Culvert (Refer to Figure 3-1)	
 *View from upstream of culvert*	**Type**: Simple culvert **Upstream grid ref:** NJ 95018 31458 **Material**: Stone **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: None **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

14 - Culvert (Refer to Figure 3-1)	
 *View from upstream of culvert*	**Type**: Simple culvert **Upstream grid ref:** NJ 95071 31439 **Material**: Stone **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: None **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

15 - Footbridge (Refer to Figure 3-1)	
 *View from upstream of footbridge*	**Type**: Single-span footbridge **Upstream grid ref:** NJ 95112 31396 **Width (m)**: 1 (approximately) **Material**: Steel **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Eroded left bank directly upstream of the bridge. **Risk of Blockage:** Low **Maintenance:** None required **Quick Win:** N/A

16 - Steel footbridge (Refer to Figure 3-1)	
 ***View from downstream of footbridge***	**Type**: Bridge **Upstream grid ref:** NJ 95121 31370 **Material**: Steel / stone **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Steel / concrete deck. Open-jointed stone abutment. Erosion of left bank. Bridge deck flooded. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

17 - Timber footbridge (Refer to Figure 3-1)	
 ***View from upstream of footbridge***	**Type**: Timber footbridge **Upstream grid ref:** NJ 95110 31307 **Material**: Timber **Width (m):** 1 approx. **Condition**: Grade 5 (Very Poor) **Part of FPS:** No **Comments**: Timber slippery and showing signs of rot. Supports showing signs of settlement. Small amounts of sediment deposited. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

18 – Hospital Road Culvert Inlet (Refer to Figure 3-1)	
 ***View from upstream of culvert***	**Type**: Simple culvert **Upstream grid ref:** NJ 95115 31300 **Material**: Concrete **Length (m):** 245 approx. **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Significant amount of undercutting along left and right bank. Ivy on left hand side. Sediment deposition. Trash screen detached. Brickwork element. Open masonry joints. Minor cracks. Service pipe inside culvert. **Risk of Blockage:** High **Maintenance:** Keep watercourse free of debris **Quick Win:** Remove debris, remove detached trash screen
 ***Trash screen and debris in river***	 ***View from upstream of culvert. Service pipe inside culvert***

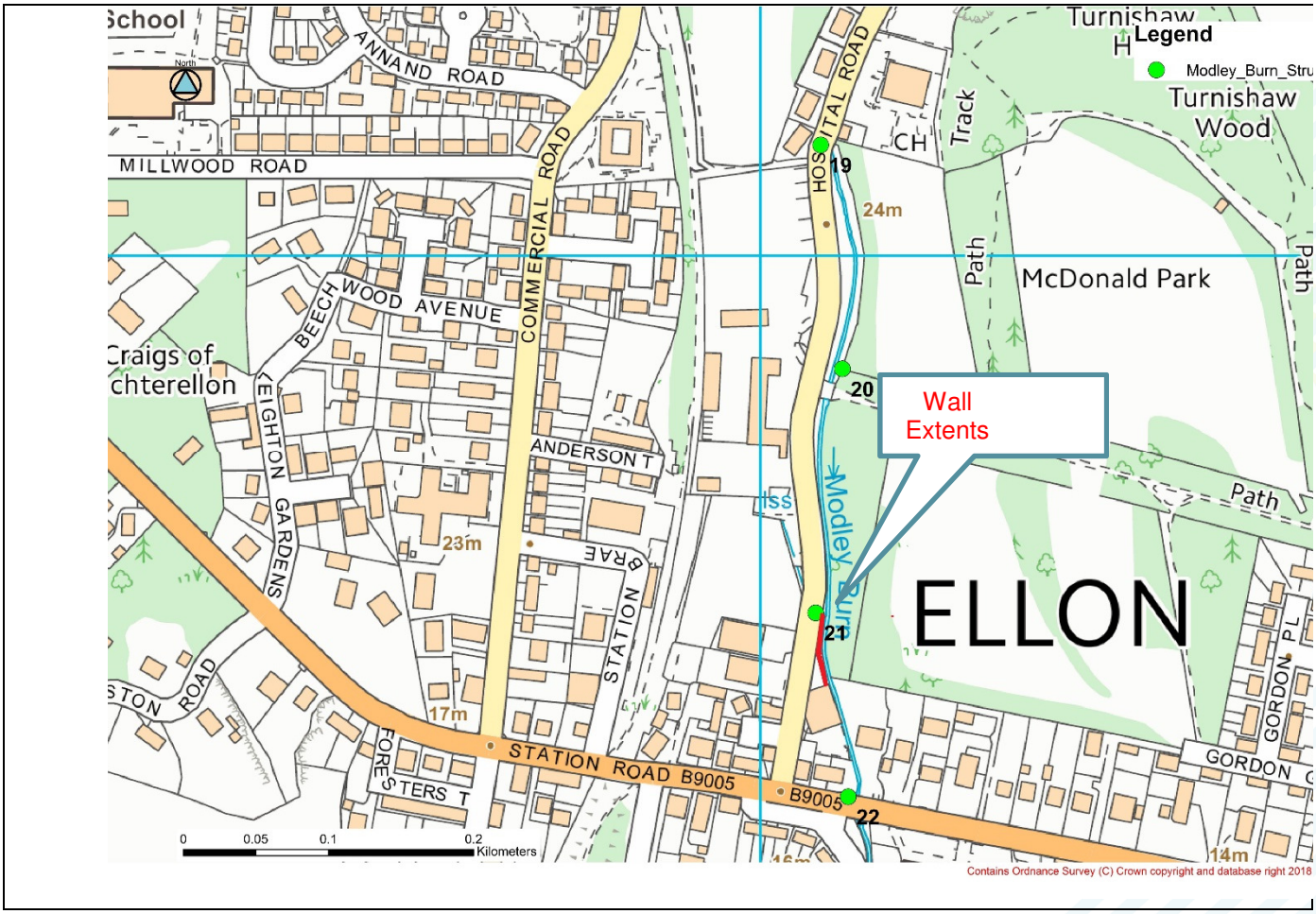

Figure 3-2: Plan showing the distribution of features identified in the asset condition assessment along the Modley Burn

Table 3-2: List of structural assets shown in Figure 3-2		
Number	**Asset**	**Location**
19	Hospital Road Culvert (Outlet)	Hospital Road
20	Culvert	Hospital Road
21	Culvert	Hospital Road
22	Station Road Culvert	B9005

19 - Hospital Road Culvert Outlet (Refer to Figure 3-2)	
 ***View from downstream of culvert***	**Type**: Masonry arch brick culvert **Upstream grid ref:** NJ 95041 31076 **Span (m):** 2.49 **Material**: Masonry **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Minor cracks. Mortar loss. Minor vegetation growth between blocks. Heavily vegetated banks. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A
 ***Downstream end of culvert***	 ***Downstream view of watercourse***

20 – Culvert (Refer to Figure 3-2)	
 ***Upstream view of culvert (inlet)***	**Type**: Simple culvert **Upstream grid ref:** NJ 95056 30922 **Height (m)**: 1.5 **Width (m)**: 1.825 **Length (m):** 3 approx. **Material**: Masonry **Condition**: Grade 2 (Good) **Part of FPS:** Yes **Comments**: Minor settlement of culvert. No vegetation through culvert walls. Minor mortar loss. Steep and slightly eroded banks at upstream side of culvert. Tree supporting right bank at upstream side of culvert. Steep and unvegetated right bank at downstream side of culvert. Severe erosion of left hand bank downstream. **Risk of Blockage:** Low **Maintenance:** Keep free of debris **Quick Win:** N/A
 ***Upstream view of watercourse***	 ***View from downstream of culvert showing eroded banks (outlet)***

21 - Retaining wall (Refer to Figure 3-2)	
 ***Upstream view of wall***	**Type**: Retaining wall **Upstream grid ref:** NJ 95052 30762 **Height (m)**: 1.5 **Length (m):** 19 approx. **Material**: Concrete **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Minor cracking. Sealant seepage through joints. Minor vegetation growth. Outfall next to wall at upstream. **Risk of Blockage:** Low **Maintenance:** None required **Quick Win:** N/A
 ***View from downstream of the wall showing water stains***	 ***Outfall next to the upstream side of the wall***

22 - Station Road Culvert B9005 (Refer to Figure 3-2)	
 ***Upstream view of culvert***	**Type**: Simple culvert **Upstream grid ref:** NJ 95060 30627 **Width (m)**: 2.185 **Length (m):** 3 approx. **Material**: Masonry **Condition**: Grade 2 (Good) **Part of FPS:** Yes **Comments**: No sign of movement. Open joints in masonry wall upstream. Overgrown and undercut banks downstream. **Risk of Blockage:** Low **Maintenance:** None required **Quick Win:** N/A
 ***Upstream view of watercourse***	 ***Downstream end of culvert***

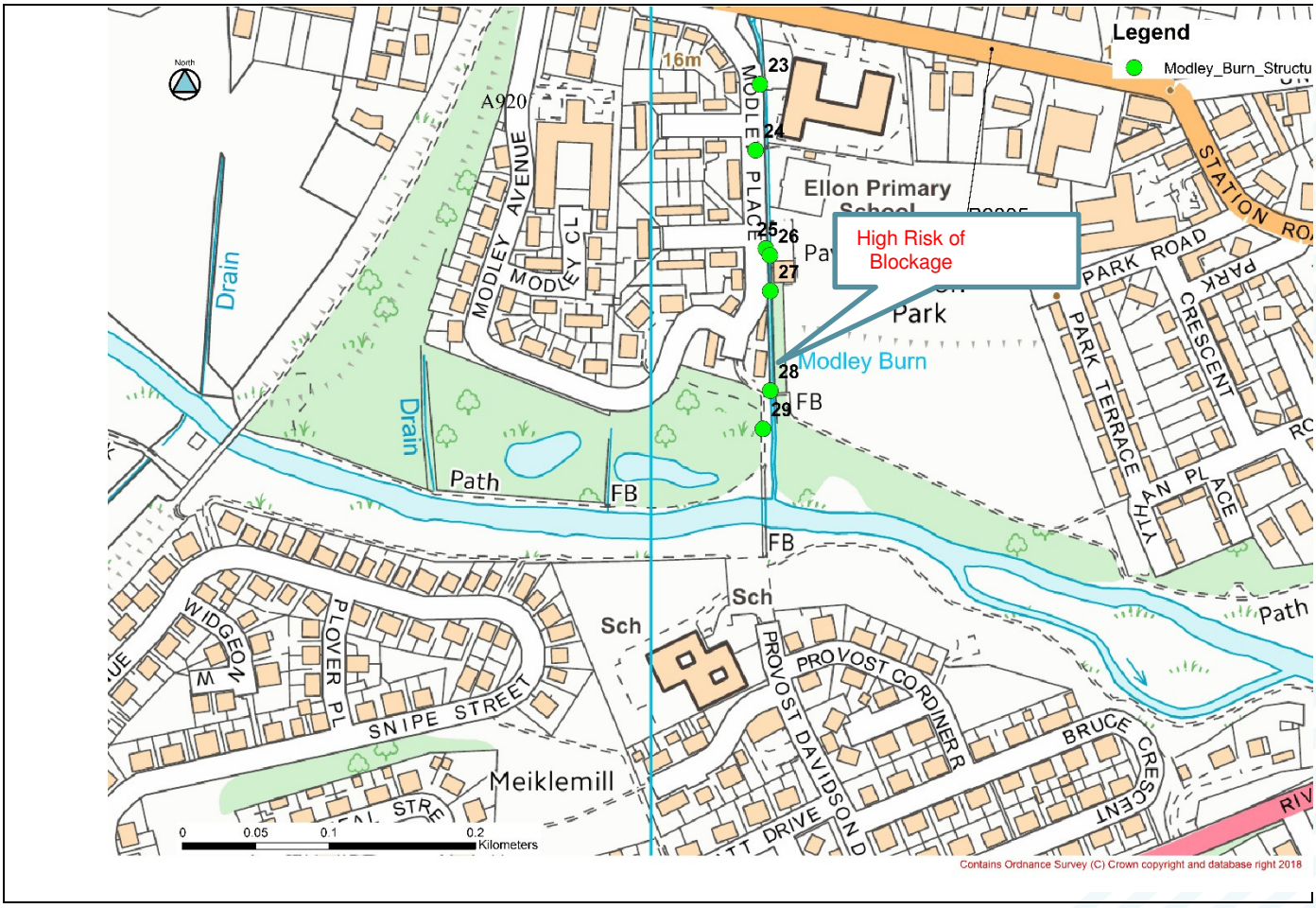

Figure 3-3: Plan showing the distribution of features identified in the asset condition assessment along the Modley Burn

Table 3-3: List of structural assets shown in Figure 3-3		
Number	**Asset**	**Location**
23	Modley Burn Bridge	Modley Place
24	Ellon Primary School Bridge	Modley Place
25	Footbridge	Modley Place
26	Masonry Wall	Modley Place
27	Gabion Baskets	Modley Place
28	Gordon Park Footbridge	Gordon Park
29	Footbridge	Gordon Park

23 - Modley Burn Bridge (Refer to Figure 3-3)	
 ***Upstream view of culvert***	**Type**: Simple arch culvert **Upstream grid ref:** NJ 95074 30565 **Span (m):** 3.5 **Length (m):** 7.3 **Width (between walls) (m):** 5.335 **Material**: Reinforced concrete **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Cracking in render. Sealant loss. Seepage through joints. Minor crest lowering. Eroded and overgrown banks. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A
 ***Modley Burn bridge***	 ***Downstream end of culvert***

24- Ellon Primary School footbridge (Refer to Figure 3-3)	
 ***Downstream view of footbridge***	**Type**: Arch footbridge **Upstream grid ref:** NJ 95071 30520 **Material**: Concrete deck and abutments / steel parapet **Length (m):** 1 approx. **Condition**: Grade 2 (Good) **Part of FPS:** Yes **Comments**: Minor cracks at abutments. No deformation to arch. Superficial defects. Eroded banks upstream and downstream. Weir effect over invert. **Risk of Blockage:** Moderate **Maintenance:** Keep channel free of debris **Quick Win:** N/A

25- Footbridge (Refer to Figure 3-3)	
 ***Upstream view of footbridge***	**Type**: Single-span footbridge **Upstream grid ref:** NJ 95078 30453 **Length (m):** 2.8 **Material**: Concrete / steel parapet **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor cracks in deck. Severe corrosion of handrails. Deformation of rails. Pipe directly downstream of the bridge. Heavily vegetated banks upstream and downstream. **Risk of Blockage:** Moderate **Maintenance:** Remove any debris and control vegetation growth **Quick Win:** N/A

25- Footbridge (Refer to Figure 3-3)	
 ***Downstream view of watercourse***	 ***View of bridge***

26- Masonry Wall (Refer to Figure 3-3)	
 ***Downstream view***	**Type**: Masonry Wall **Upstream grid ref: NJ 95074 30452** **Material**: Masonry **Condition**: Grade 5 (Very Poor) **Part of FPS:** No **Comments**: Major masonry loss. Loss of backfill / ground behind the wall. **Risk of Blockage:** Low **Maintenance:** Maintain channel free of debris **Quick Win:** N/A

27- Gabion Baskets (Refer to Figure 3-3)	
 ***Upstream view***	**Type**: Gabions **Upstream grid ref: NJ 95074 30452** **Material**: Masonry **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Some distortion of alignment. Minor evidence of sliding. Packed below maximum capacity. Poor maintenance access. **Risk of Blockage:** Low **Maintenance:** Maintain channel free of debris **Quick Win:** N/A

28- Gordon Park footbridge (Refer to Figure 3-3)	
 ***View of footbridge***	**Type**: Single-span footbridge **Upstream grid ref:** NJ 95081 30356 **Length (m):** 1.8 **Material**: Concrete deck / masonry abutments / timber parapet / additional steel angles to parapet **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Timber fence showing signs of rot. Slight block displacement. Possible minor lateral movement at base of abutments. Pipe directly upstream of bridge. **Risk of Blockage:** High **Maintenance:** Keep channel free of debris **Quick Win:** N/A

28- Gordon Park footbridge (Refer to Figure 3-3)	
 ***View from upstream***	 ***View from downstream***

29- Footbridge (Refer to Figure 3-3)	
 ***View of footbridge***	**Type**: Single-span footbridge **Upstream grid ref:** NJ 95076 30330 **Material**: Steel / masonry abutments / timber decking **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments**: Signs of deformation. Minor corrosion. Decking worn. Open-jointed stonework. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

4 Broomies Burn

Assets are listed below from upstream to downstream, with numbering referenced in Table 4-1 and Figure 4-1, Figure 4-2, Figure 4-3 and Figure 4-4.

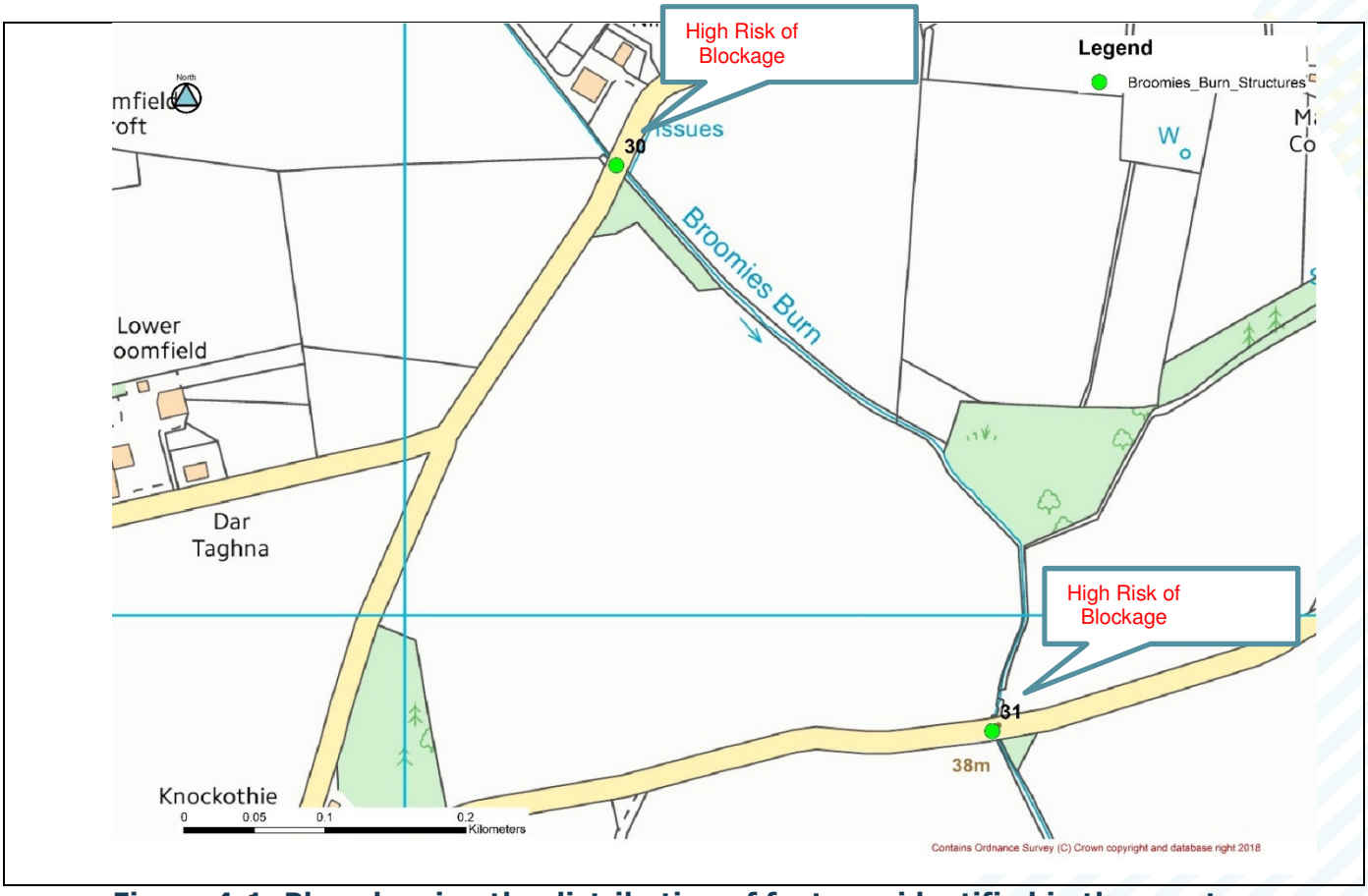

Figure 4-1: Plan showing the distribution of features identified in the asset condition assessment along the Broomies Burn

Table 4-1: List of structural assets shown in Figure 4-1		
Number	**Asset**	**Location**
30	Broomfield Bridge	Unnamed Road
31	Bridge	Unnamed Road

30- Broomfield bridge (Refer to Figure 4-1)	
 ***View of culvert from upstream***	**Type**: Masonry slab culvert **Upstream grid ref:** NJ 96150 32320 **Span (m):** 0.79 **Length (m):** 2.5 approx. **Material**: Masonry **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Root penetration through culvert. Loss of mortar at joints. Thickly vegetated banks. Poor access. Debris in watercourse downstream. Scour pool downstream. **Risk of Blockage:** High **Maintenance:** Keep vegetation growth under control, remove debris **Quick Win:** Cut trees around culvert, remove debris and collapsed fence.
 ***View of culvert from downstream***	 ***Downstream view of watercourse***

31- Bridge (Refer to Figure 4-1)	
 ***Downstream view of culvert***	**Type**: Circular culvert **Upstream grid ref:** NJ 96417 31918 **Span (m):** 1.2 **Length (m):** 2 approx. **Material**: Pre-cast concrete **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Small scour pool downstream. Severely eroded and heavily vegetated banks. Culvert invert buried deep into bed. Small opening size. **Risk of Blockage:** High **Maintenance:** Keep culvert clean and remove debris **Quick Win:** N/A
 ***Upstream view of watercourse***	 ***Downstream view of watercourse***

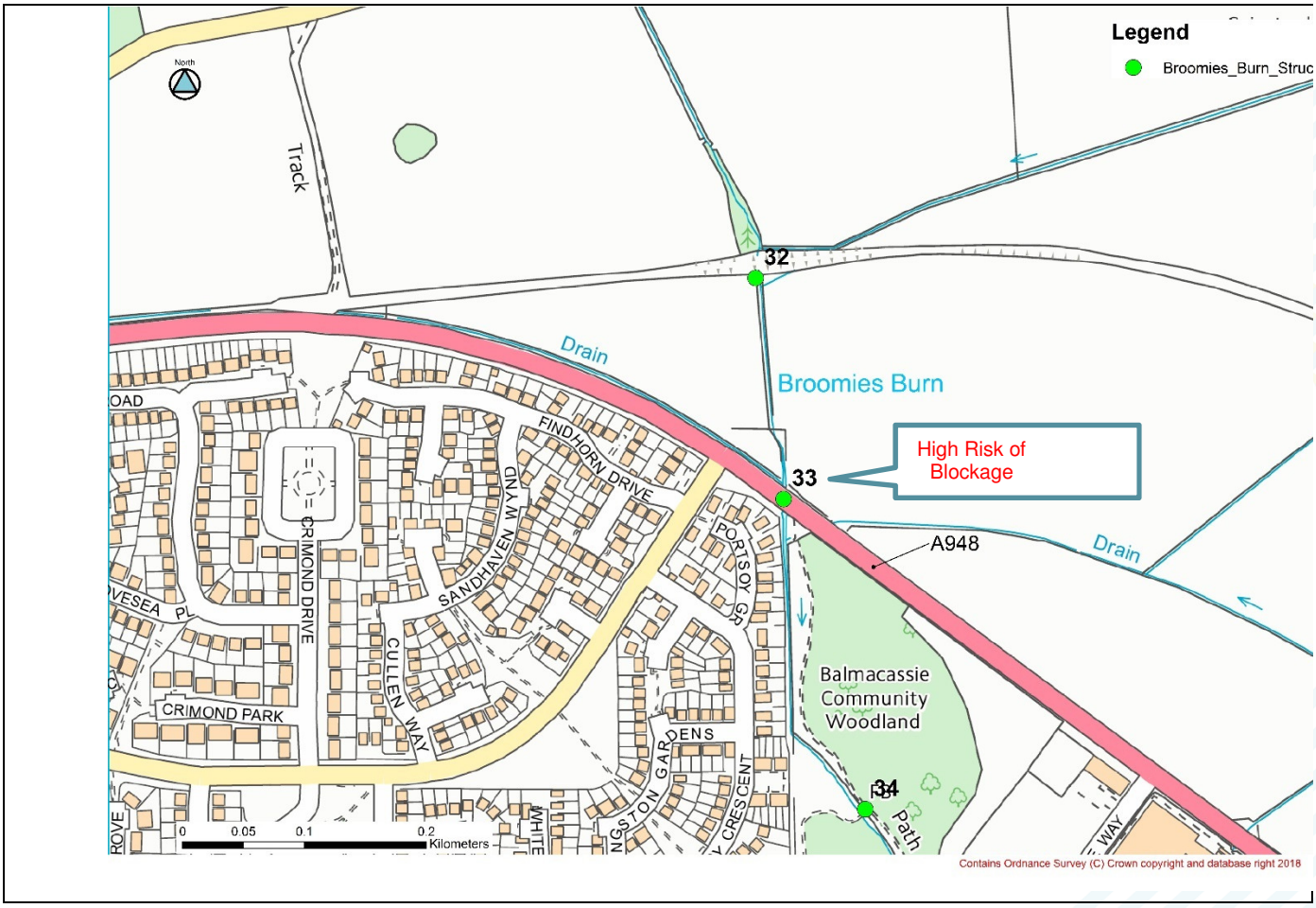

Figure 4-2: Plan showing the distribution of features identified in the asset condition assessment along the Broomies Burn

Table 4-2: List of structural assets shown in Figure 4-2		
Number	**Asset**	**Location**
32	Masonry Culvert	Unnamed Road
33	Broomies Bridge A948	A948 Road
34	Timber Bridge	Balmacassie Community Woodland

32- Masonry culvert (Refer to Figure 4-2)	
 ***Upstream view of culvert***	**Type**: Masonry culvert and headwall **Upstream grid ref:** NJ 96531 31663 **Span (m):** Unknown **Material**: Masonry **Length (m):** 12 **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor loss of mortar and spalling of arch and headwalls. High risk of scour (according to Aberdeenshire Council's notes). **Risk of Blockage:** Low **Maintenance:** Keep free of debris **Quick Win:** N/A

33- Broomies Bridge A948 (Refer to Figure 4-2)	
 ***Downstream view of culvert***	**Type**: Box culvert **Upstream grid ref:** NJ 96554 31481 **Span (m):** 2 **Rise (m):** 0.8 **Length (m):** 7.3 **Material**: Reinforced concrete **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor superficial defects. Heavily vegetated banks. **Risk of Blockage:** High **Maintenance:** Keep growth of vegetation under control, keep free of debris **Quick Win:** Remove vegetation around culvert's entrance/exit

34- Timber bridge (Refer to Figure 4-2)	
 ***Upstream view of bridge***	**Type**: Pedestrian bridge **Upstream grid ref:** NJ 96621 31227 **Span (m):** 3 **Width (m):** 2 **Material**: Timber **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Minor deformation of beam. Rotten and distorted handrails. Minor splits of timber decking. Fixings present. **Risk of Blockage:** Moderate **Maintenance:** Keep vegetation growth under control **Quick Win:** N/A
 ***View of bridge from upstream***	 ***Downstream view of watercourse***

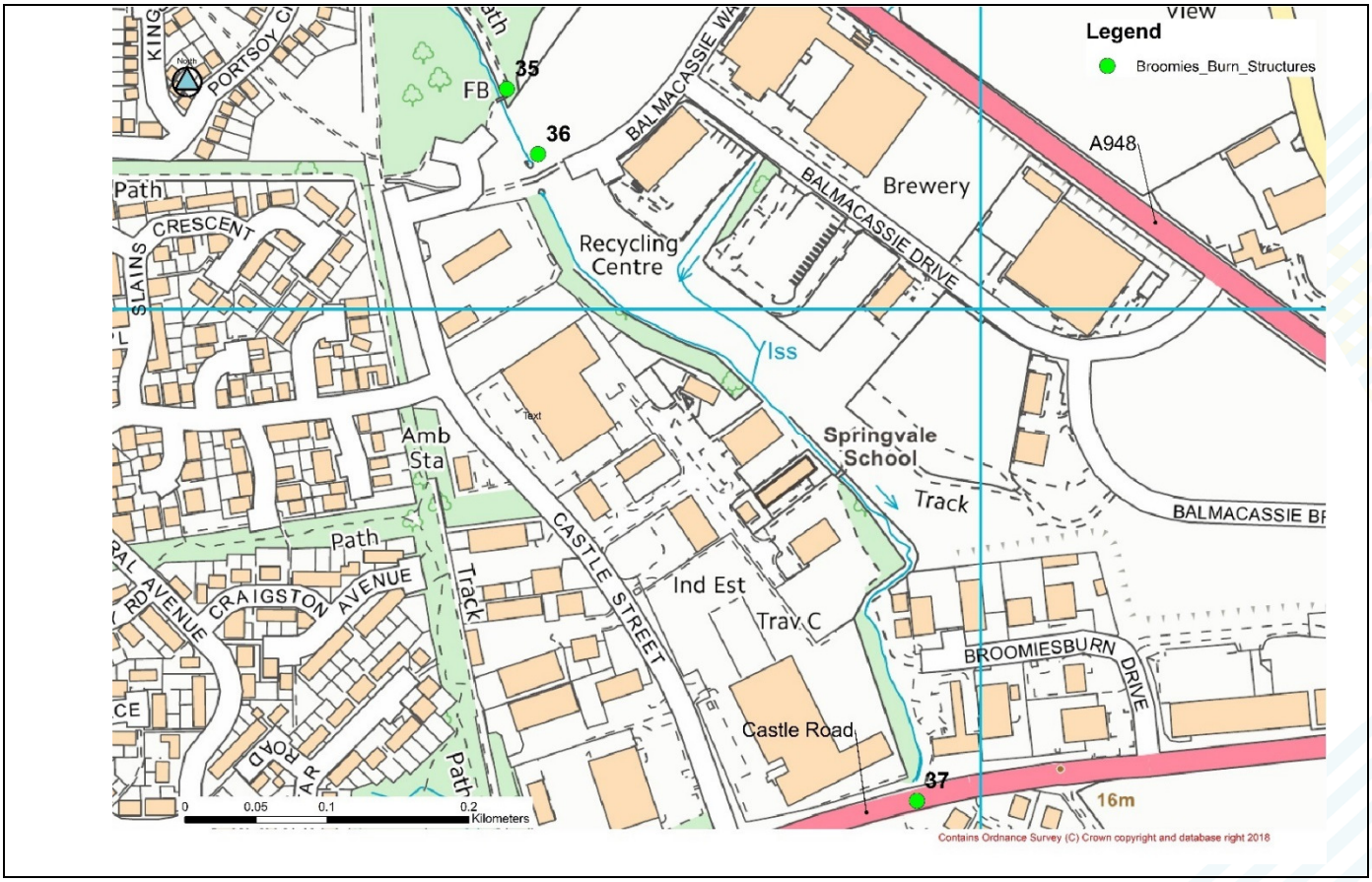

Figure 4-3: Plan showing the distribution of features identified in the asset condition assessment along the Broomies Burn

Table 4-3: List of structural assets shown in Figure 4-3		
Number	**Asset**	**Location**
35	Footbridge	Balmacassie Community Woodland
36	Culvert	Balmacassie Way
37	Culvert A920	A920 (Castle Road)

35- Footbridge (Refer to Figure 4-3)	
 ***View of bridge***	**Type**: Pedestrian bridge **Upstream grid ref:** NJ 96666 31155 **Span (m):** 4 **Width (m):** 1.9 **Height (m):** 1.5 (approximately) **Material**: Timber **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Erosion at abutments. Slightly distorted and rotten handrails. Minor splits of timber decking. Minor vegetation growth on deck. Exposed loose fixings, washers missing. **Risk of Blockage:** Moderate **Maintenance:** Keep vegetation growth under control **Quick Win:** N/A
 ***Upstream view of bridge***	 ***Downstream view of bridge, loose fixings***

36- Culvert (Refer to Figure 4-3)	
 ***Upstream view of culvert***	**Type**: Semi-circular culvert **Upstream grid ref:** NJ 96688 31109 **Width (m):** 3.6 **Length (m):** 17 approx. **Material**: Corrugated steel / concrete **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Vegetation growth on top of culvert. Heavily vegetated banks.

36- Culvert (Refer to Figure 4-3)	
	Concrete outlet structure present directly upstream. **Risk of Blockage:** Moderate **Maintenance:** Keep watercourse free of debris **Quick Win:** N/A
 ***Concrete outlet structure next to culvert***	 ***Upstream view of watercourse***

37- Culvert A920 (Refer to Figure 4-3)	
 ***Upstream view of culvert***	**Type**: Simple culvert, hollow concrete slab **Upstream grid ref:** NJ 96955 30653 **Inlet span (m):** 3.1 **Outlet span (m):** 2.8 **Rise (m):** 0.6 **Length (m):** 33 **Material**: Reinforced concrete slab and abutment **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Minor settlement of soffit. Minor vegetation growth on soffit. Concrete outlet structure directly upstream. **Risk of Blockage:** High **Maintenance:** Keep culvert and trash screen free of debris **Quick Win:** Remove excess vegetation, remove trash screen

37- Culvert A920 (Refer to Figure 4-3)	
	
Concrete outlet structure	***Downstream end of culvert***

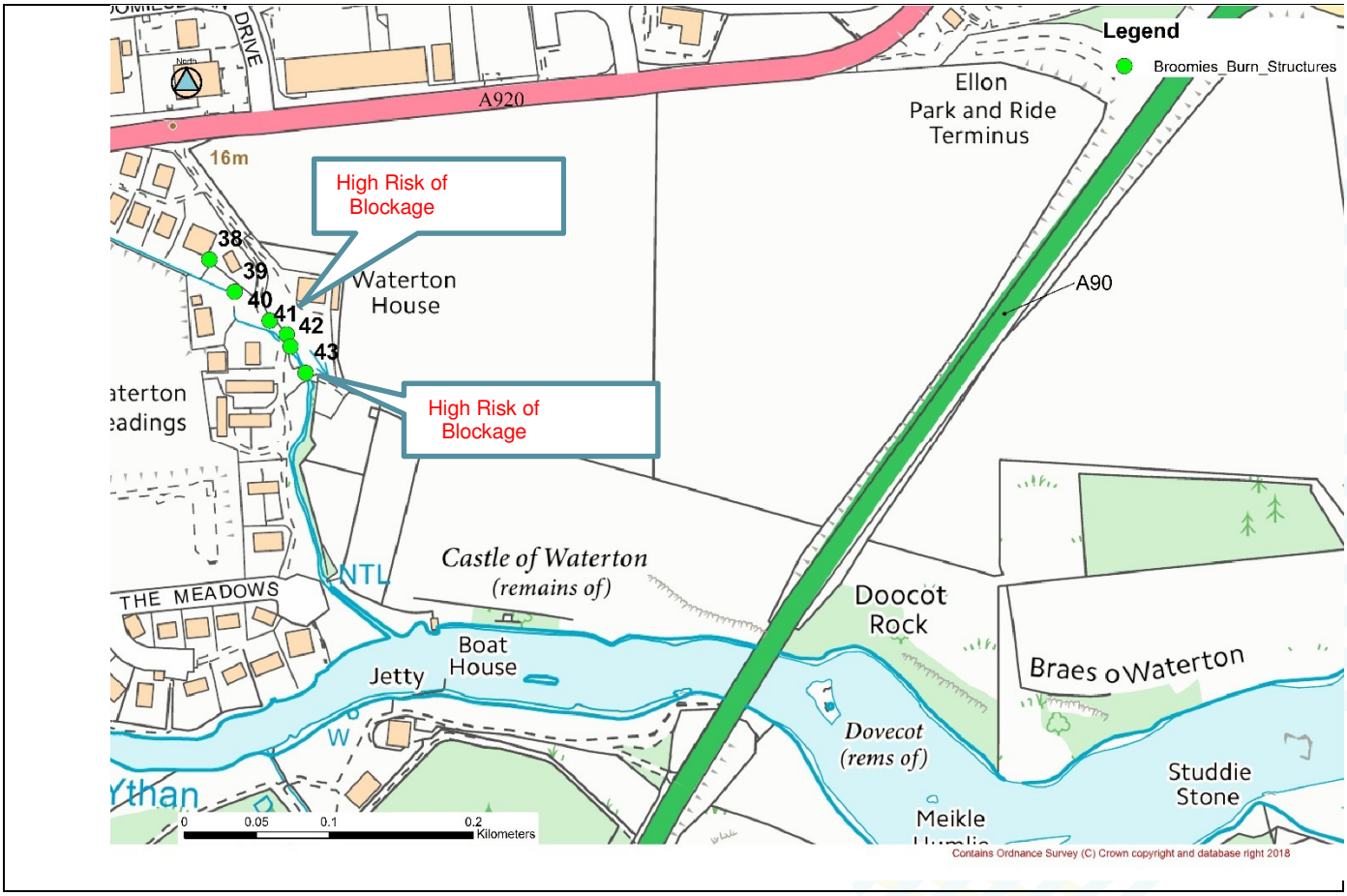

Figure 4-4: Plan showing the distribution of features identified in the asset condition assessment along the Broomies Burn

Table 4-4: List of structural assets shown in Figure 4-4		
Number	**Asset**	**Location**
38	Footbridge	The Meadows
39	Culvert	The Meadows
40	Footbridge	The Meadows
41	Culvert	The Meadows
42	Footbridge	The Meadows
43	Culvert	The Meadows

38- Footbridge (Refer to Figure 4-4)	
 ***View of bridge***	**Type**: Footbridge **Upstream grid ref:** NJ 97085 30578 **Width (m):** 3.6 **Material**: Timber / masonry **Condition**: Grade 2 (Good) **Part of FPS:** No **Comments**: Superficial defects on handrails. Steps in channel downstream. Watercourse channelized upstream and downstream. **Risk of Blockage:** Low **Maintenance:** None required **Quick Win:** N/A
 ***Watercourse downstream***	 ***Watercourse upstream***

39- Culvert (Refer to Figure 4-4)	
 ***Upstream view of culvert***	**Type**: Simple culvert **Upstream grid ref:** NJ 97099 30561 **Width (m):** 1 **Material**: Masonry **Condition**: Grade 1 (Very Good) **Part of FPS:** No **Comments**: No cracks. No distortion of shape. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

40- Footbridge (Refer to Figure 4-4)	
 ***Downstream view of bridge***	**Type**: Single-span footbridge **Upstream grid ref:** NJ 97127 30536 **Material**: Timber **Condition**: Grade 1 (Very Good) **Part of FPS:** No **Comments**: No visible defects. No signs of deterioration of timber or fixings. Bridge ties into wall. **Risk of Blockage:** Low **Maintenance:** None required **Quick Win:** N/A

41- Culvert (Refer to Figure 4-4)	
 ***Upstream view of culvert***	**Type**: Twin-bore stone culvert **Upstream grid ref:** NJ 97135 30527 **Material**: Timber **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Loose stonework over top of culvert. Minor vegetation growth. Displaced stonework. **Risk of Blockage:** High **Maintenance:** Keep free of debris **Quick Win:** N/A

42- Footbridge (Refer to Figure 4-4)	
 ***Upstream view of footbridge***	**Type**: Single-span footbridge **Upstream grid ref:** NJ 97134 30523 **Material**: Timber **Condition**: Grade 1 (Very Good) **Part of FPS:** No **Comments**: No visible defects. No signs of deterioration of timber or fixings. **Risk of Blockage:** Moderate **Maintenance:** Keep free of debris **Quick Win:** N/A

43- Culvert (Refer to Figure 4-4)	
 ***Upstream view of culvert***	**Type**: Twin-bore stone culvert **Upstream grid ref:** NJ 97148 30505 **Material**: Stone **Condition**: Grade 4 (Poor) **Part of FPS:** No **Comments**: Possible deformation of shape. Possible displacement of stonework at downstream end. **Risk of Blockage:** High **Maintenance:** Keep free of debris **Quick Win:** N/A
 ***Downstream end of culvert***	 ***Downstream view of watercourse***

5 Fortree Burn

Assets are listed below from upstream to downstream with numbering referenced in Table 5-1 and Figure 5-1.

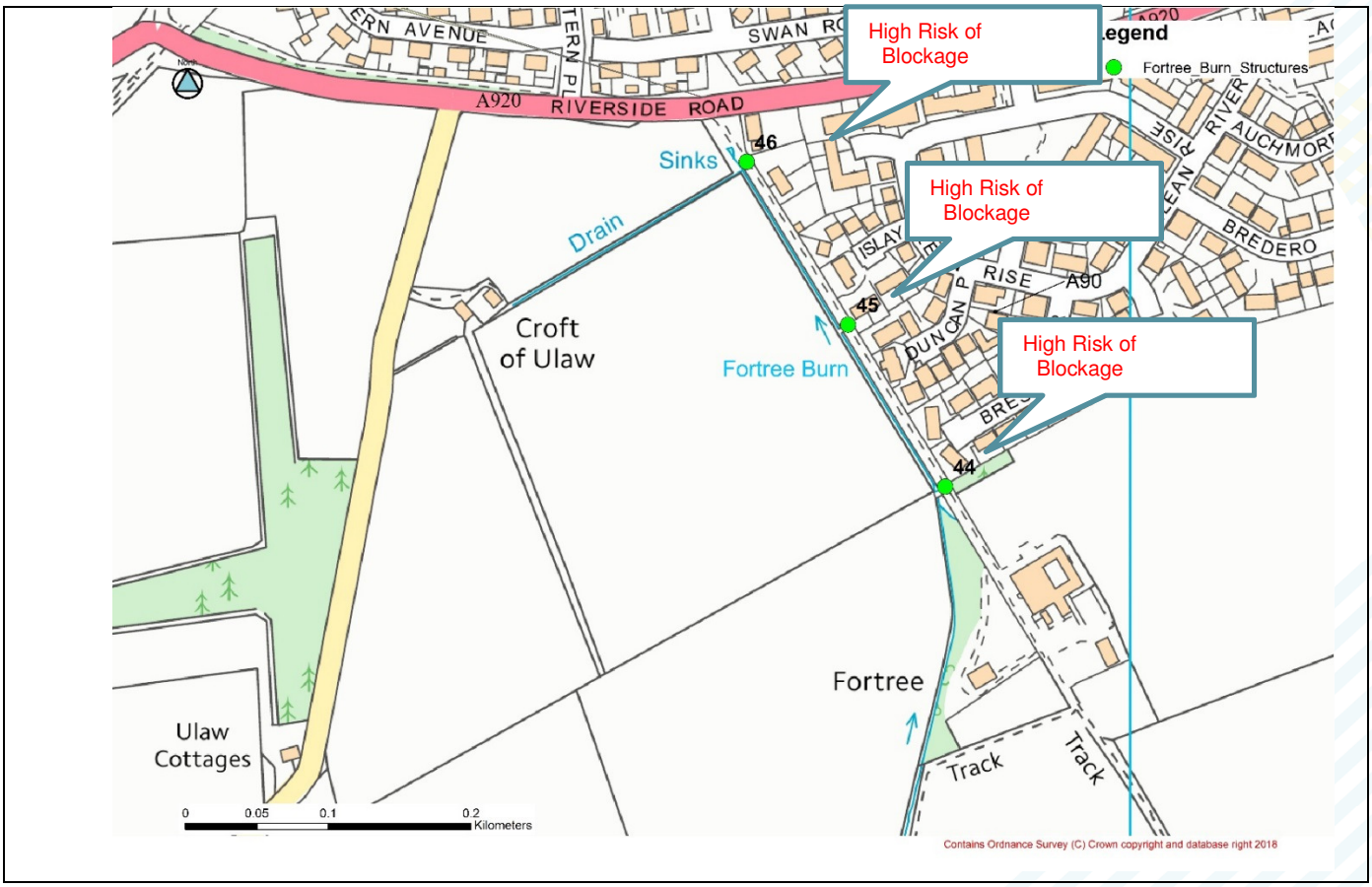

Figure 5-1: Plan showing the distribution of features identified in the asset condition assessment along the Fortree Burn

Table 5-1: List of structural assets shown in Figure 5-1

Number	Asset	Location
44	Culvert	Meiklemill
45	Stone Culvert	Meiklemill
46	Meiklemill Culvert	Golf Course

44- Stone culvert (Refer to Figure 5-1)	
 ***Culvert upstream***	**Type**: Twin-bore culvert **Upstream grid ref:** NJ 94870 29581 **Height (m):** 0.5 **Width of right bore (m):** 0.6 **Width of left bore (m):** 0.5 **Diameter (m):** 0.45 **Pipe Cover (m):** 0.6 **Material**: Stone extended with concrete pipe **Condition**: Grade 4 (Poor) **Part of FPS:** No **Comments**: Vegetation growth between stonework. Minor deformation of bores. Eroded banks upstream and downstream. No trash screen. Neighbour complaining that culvert causes flooding (possible collapse). **Risk of Blockage:** High **Maintenance:** Keep free of debris **Quick Win:** N/A
 ***Culvert downstream***	 ***Downstream view of watercourse***

45- Stone culvert (Refer to Figure 5-1)	
 ***View from downstream of culvert***	**Type**: Simple culvert **Upstream grid ref:** NJ 94802 29695 **Width (m):** Unknown **Material**: Stone **Condition**: Grade 3 (Fair) **Part of FPS:** No **Comments**: Vegetation blocking part of culvert. Distortion of cross section. **Risk of Blockage:** High **Maintenance:** Keep vegetation growth under control **Quick Win:** N/A
 ***Upstream view***	 ***Downstream view***

46- Meiklemill culvert (Refer to Figure 5-1)	
 ***Upstream view of culvert (inlet)***	**Type**: Semi-circular simple culvert **Upstream grid ref:** NJ 94731 29809 **Width (m):** 1.5 (approximately) **Diameter (m):** 0.75 (approximately) **Material**: Concrete **Condition**: Grade 4 (Poor) **Part of FPS:** No **Comments**: Minor cracks and spalling. Minor settlement. Rust staining. High and stiff vegetation at both sides of bank. Distortion of trash screen's bars.

46- Meiklemill culvert (Refer to Figure 5-1)	
	Timber protective fence partially collapsed. **Risk of Blockage:** High **Maintenance:** Keep vegetation growth under control **Quick Win:** Replace trash screen

6 Hillhead Burn

Assets are listed below from upstream to downstream with numbering referenced in Table 6-1 and Figure 6-1.

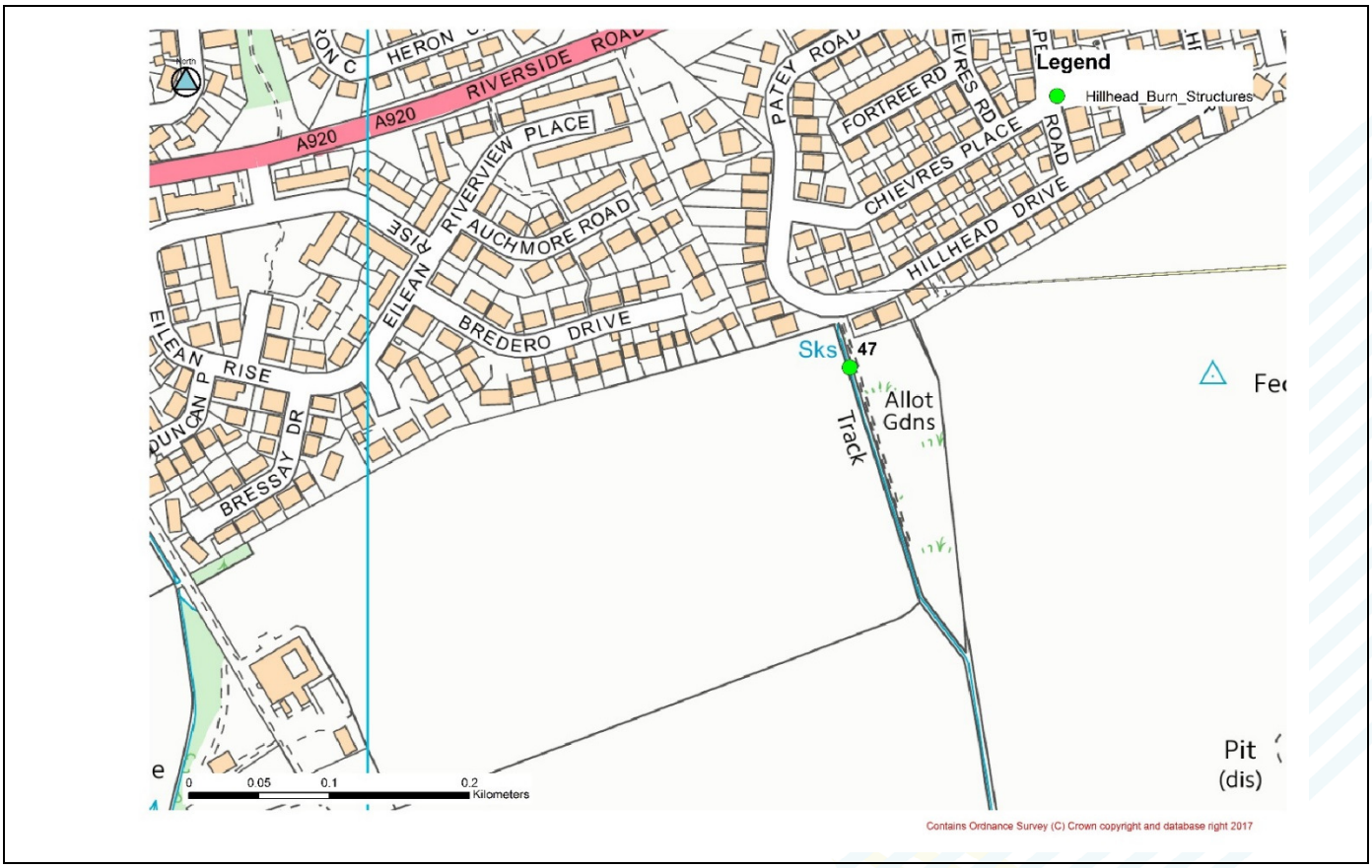

Figure 6-1: Plan showing the distribution of features identified in the asset condition assessment along the Hillhead Burn

Table 6-1: List of structural assets shown in Figure 6-1		
Number	**Asset**	**Location**
47	Hillhead Drive Culvert	Hillhead Drive

47- Hillhead Drive culvert (Refer to Figure 6-1)	
 ***Culvert upstream (inlet with trash screen)***	**Type**: Culvert headwall and screen **Upstream grid ref:** NJ 95343 29732 **Headwall Height (m): 2.1** **Headwall Width (m): 2.31** **Material**: Concrete / masonry **Condition**: Grade 3 (Fair) **Part of FPS:** Yes **Comments:** Vertical cracks at corners of old headwall. Minor vegetation growth on concrete headwalls. Loss of mortar at masonry headwall. Moderately steep and eroded banks. High flows bypass the culvert. Poor access to clean trash screen. Not tied in to surrounding ground. **Risk of Blockage:** Moderate **Maintenance:** Keep trash screens free of debris **Quick Win:** Tie in head wall to surrounding ground
 ***Trash screen upstream of culvert***	 ***Upstream view of watercourse***

7 Property Level Protection (PLP)

Property Level Protection was recorded in residential properties at the bottom of Broomies Burn in the Meadows. Figure 7-1 shows the properties with PLP. The survey only identifies externally visible measures. Internal measures such as watertight doors, non-return valves etc. have not been identified.

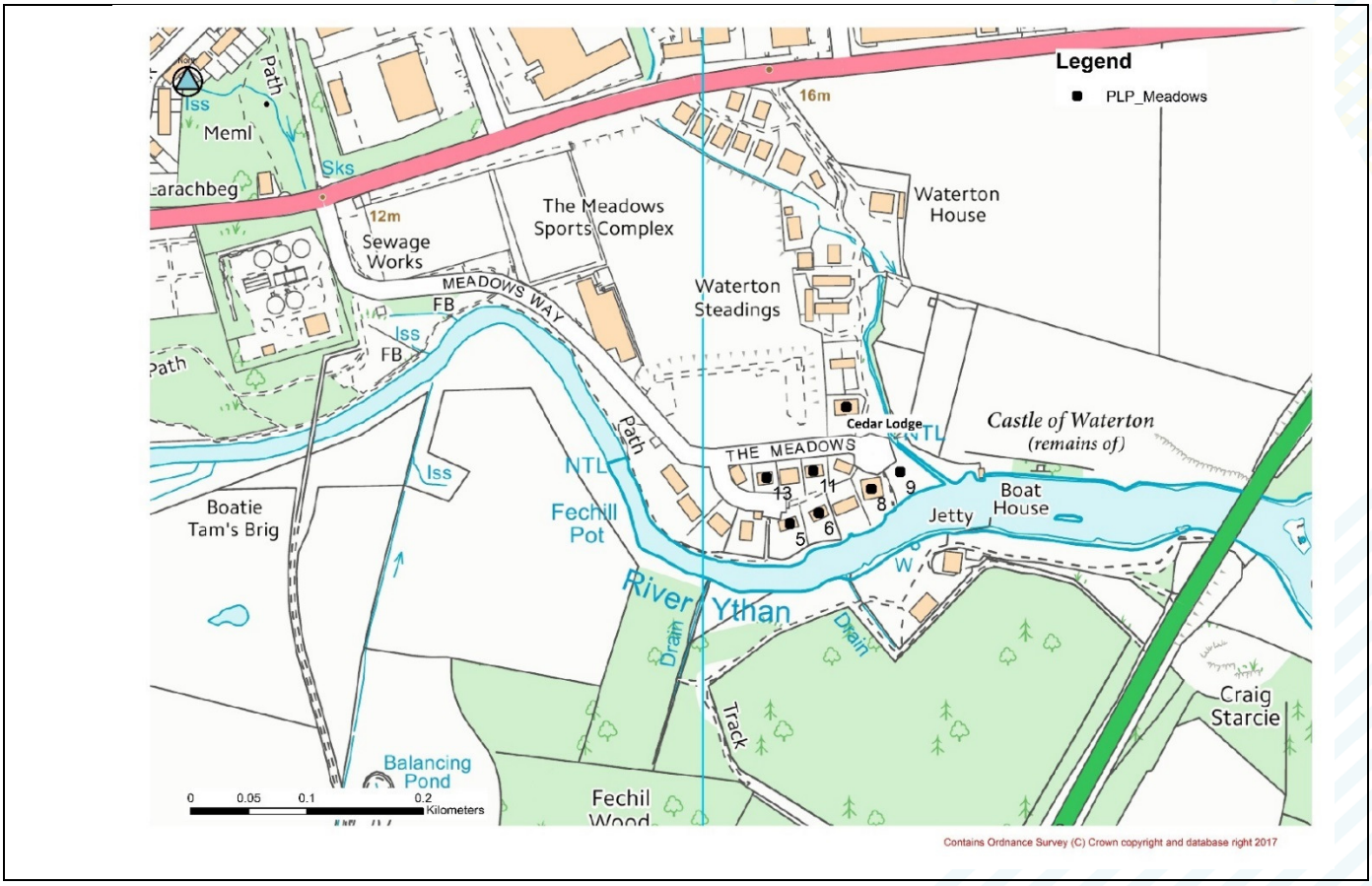

Figure 7-1: Plan showing the residential properties with PLP and their house numbers

All properties have used airbrick covers as a measure to mitigate flood risk. Figures 7-2, 7-3, 7-4, 7-5, 7-6, 7-7 and 7-8 show the PLP products used in the Meadows residential properties shown above.

Figure 7-2: Property Level Protection of Cedar Lodge at The Meadows

Figure 7-3: Property Level Protection of 5 The Meadows

Figure 7-4: Property Level Protection of 6 The Meadows

Figure 7-5: Property Level Protection of 8 The Meadows

Figure 7-6: Property Level Protection of 9 The Meadows

Figure 7-7: Property Level Protection of 11 The Meadows

Figure 7-8: Property Level Protection of 13 The Meadows

Appendices

A Complete list of structural assets

A.1 River Ythan

Table A-1 Structural assets along the River Ythan

Number	Asset	Location	Condition
1	Bridge of Ardlethen	B9005	Grade 2
2	Meiklemill Railway Bridge	Meiklemill	Grade 3
3	Meiklemill Culvert (Outfall)	Meiklemill	Grade 3
4	Meiklemill Footbridge	Meiklemill	Grade 2
5	Ellon Bridge A920	A920 (South Road)	Grade 2
6	Old Bridge of Ellon	Market Street	Grade 3
7	Boatie Tam's Brig	Meadows Way	Grade 2
8	River Ythan Bridge	A90	Grade 2
9	Memorial Bridge	Kirkton of Logie Buchan	Grade 2

A.2 Modley Burn

Table A-2 Structural assets along the Modley Burn

Number	Asset	Location	Condition
10	Culvert	Auchterellon Farm	Grade 2
11	Culvert	Golf Course	Grade 2
12	Culvert	Golf Course	Grade 2
13	Culvert	Golf Course	Grade 2
14	Culvert	Golf Course	Grade 2
15	Footbridge	Golf Course	Grade 2
16	Footbridge	Golf Course	Grade 3
17	Footbridge	Golf Course	Grade 5
18	Hospital Road Culvert (Inlet)	Golf Course	Grade 3 High Risk of Blockage
19	Hospital Road Culvert (Outlet)	Hospital Road	Grade 3
20	Culvert	Hospital Road	Grade 2

Table A-2 Structural assets along the Modley Burn			
21	Retaining Wall	Hospital Road	Grade 3
22	Station Road Culvert	Station Road B9005	Grade 2
23	Modley Burn bridge	Modley Place	Grade 3
24	Ellon Primary School Bridge	Modley Place	Grade 2
25	Footbridge	Modley Place	Grade 2
26	Masonry Wall	Modley Place	Grade 5
27	Gabion Baskets	Modley Place	Grade 2
28	Gordon Park Footbridge	Gordon Park	Grade 3 High Risk of Blockage
29	Footbridge	Gordon Park	Grade 3

A.3 Broomies Burn

Table A-3 Structural assets along the Broomies Burn			
Number	**Asset**	**Location**	**Condition**
30	Broomfield Bridge	Unnamed Road	Grade 3 High Risk of Blockage
31	Bridge	Unnamed Road	Grade 3 High Risk of Blockage
32	Masonry Culvert	Unnamed Road	Grade 2
33	Broomies Bridge A948	A948 Road	Grade 2 High Risk of Blockage
34	Timber Bridge	Balmacassie Community Woodland	Grade 3
35	Footbridge	Balmacassie Community Woodland	Grade 3
36	Culvert	Balmacassie Way	Grade 2
37	Broomies Bridge	A920	Grade2 High Risk of Blockage
38	Footbridge	The Meadows	Grade 2
39	Culvert	The Meadows	Grade 1
40	Footbridge	The Meadows	Grade 1
41	Culvert	The Meadows	Grade 3 High Risk of Blockage
42	Footbridge	The Meadows	Grade 1
43	Culvert	The Meadows	Grade 4 High Risk of Blockage

A.4 Fortree Burn

Table A-4 Structural assets along the Fortree Burn			
Number	**Asset**	**Location**	**Condition**
44	Culvert	Meiklemill	Grade 4 High Risk of Blockage
45	Stone Culvert	Meiklemill	Grade 3 High Risk of Blockage
46	Meiklemill Culvert	Golf Course	Grade 4 High Risk of Blockage

A.5 Hillhead Burn

Table A-5 Structural assets along the Hillhead Burn			
Number	**Asset**	**Location**	**Condition**
47	Hillhead Drive Culvert	Hillhead Drive	Grade 3

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

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