Front Field, Clattinger Farm, Wiltshire

Report on Eco-Hydrological Monitoring, 2015-2017

Ellie Jones

Floodplain Meadows Partnership Phase 1 Ambassador

October 2017

Executive Summary

Clattinger Farm is a 60.3ha nature reserve in north Wiltshire, owned and managed by Wiltshire Wildlife Trust. It is designated as a SSSI and SAC for its unimproved meadows. The study area, Front Field, is one of a number of seasonally flooded meadows within the reserve.

Between May 2015 and June 2017, a suite of botanical, hydrological and edaphic surveys were carried out as part of the Floodplain Meadows Partnership Ambassadors training course. The surveys sought to provide a robust method for ongoing botanical monitoring of grassland communities; increase understanding of the hydrological functioning of the meadow; and assess the eco-hydrology of the rush-dominated vegetation community on the north-western boundary of the field to inform future management.

National Vegetation Classification (NVC) assessment of the main vegetation community within the study area indicates that this is a good quality Burnet floodplain meadow MG4a *Alopecurus pratensis – Sanguisorba officinalis* grassland, *Dactylis glomerata* sub-community. Survey data also shows that the sward exhibits other characteristics associated with this sub-community, i.e. circumneutral soils, high species richness, very low soil fertility and infrequent flooding. A small network of paleochannels supports a second vegetation community, which is more characteristic of a sedge meadow, with water levels closer to the surface than within an MG4 grassland but similarly high cover of herbs.

Two other vegetation communities are present within the study area. The eastern field margin supports a tall, grassy sward. Ellenberg values for this community indicate that the ground here may be slightly drier and less fertile than the main community, whilst the dominance of grasses suggests that cutting of this area has not been frequent. The fourth community comprises an area of species-poor, rank vegetation on the north-western field margin. The dominance of hard rush (*Juncus inflexus*), but on well structured and drained soils, indicates mild compaction, whilst a floral assemblage indicative of high soil wetness and elevated fertility may have resulted from seasonal flooding of the adjacent ditch. Frequent scrub shows that cutting of this area is not undertaken on a regular basis.

Although the existing management regime of an annual hay cut and aftermath cattle grazing appears to be beneficial for the main vegetation community, a number of recommendations have been made for future management, including more regular cutting of field margins and dredging of the western boundary ditch. In addition, it is recommended that ongoing monitoring is implemented to provide a better understand of changes over time.

Contents

1. Introduction 4
2. Methods 6
   - 2.1. Study Area 6
   - 2.2. Vegetation 7
   - 2.3. Hydrology 8
   - 2.4. Soils 8
     - 2.4.1. Soil Profile 8
     - 2.4.2. Soil Nutrients 9
   - 2.5. Management Information 9
3. Results 9
   - 3.1. Vegetation 9
   - 3.2. Hydrology 14
   - 3.3. Soils 14
   - 3.4. Management 16
4. Discussion 16
5. Conclusions and Recommendations 17
6. References 17
7. Acknowledgements 18

Appendices

Appendix 1 – Botanical Survey Data 19

Appendix 2 – Dipwell Survey Results 33

Appendix 3 – Management Information 34

Figures

Fig. 1.1 Location Map for Clattinger Farm Meadows

Fig. 1.2 Aerial photographic map of Front Field

Fig. 2.1 The locations of survey points within the study area

Fig. 3.1 Vegetation community boundaries

Fig. 3.2 Depth to water table recorded at Dipwell 2, 01/11/2016 – 13/06/2017

Photographs

Photograph 1 **Spreading species-poor margin on western boundary, June 2017**

Tables

Table 3.1 **Best-fit NVC and Ellenberg value outputs and species composition data for Transect 1 (Q1-6) from survey in 2015 and 2016**

Table 3.2 **Ellenberg value outputs and species composition data for individual quadrats Q1-6 from survey in 2015 and 2016**

Table 3.3 **Best-fit NVC and Ellenberg value outputs and species composition data for NVC quadrats, 20th May 2016**

Table 3.4 **Best-fit NVC and Ellenberg value outputs and species composition data for Transect 2 (Q7-10) from survey in 2015**

Table 3.5 **Constancy table for Transect 2 (Community D), 29th June 2015**

Table 3.5 **Soil profile descriptions**

1. Introduction

Clattinger Farm Meadows is a nature reserve in north Wiltshire, owned and managed by Wiltshire Wildlife Trust since 1996 (see Fig. 1.1). The majority of the reserve, covering 60.3ha, is designated as a Site of Special Scientific Interest (SSSI) on account of its unimproved lowland grassland and outstanding meadow flora, and forms part of the North Meadow and Clattinger Farm Special Area of Conservation as an exceptional example of the Annex 1 habitat 'Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)'. The meadows are widely understood never to have received any significant applications of artificial fertilisers or pesticides in their history.

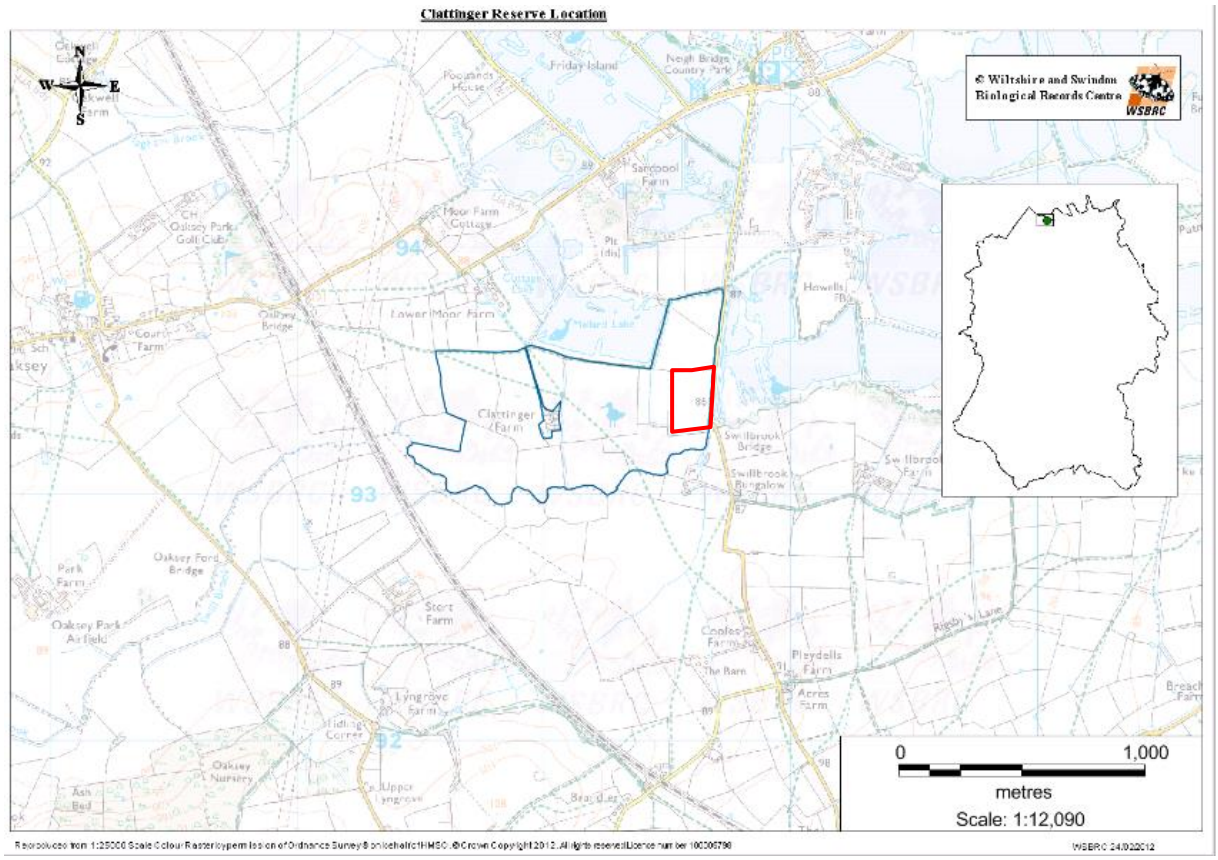

Fig. 1.1 Location Map for Clattinger Farm Meadows (in blue). The study site, Front Field, is outlined in red.

Front Field lies on the western boundary of Clattinger Farm Meadows and is 4.6ha in size. It is part of a series of seasonally flooded meadows which lie alongside the Swillbrook, a tributary of the River Thames, and support a characteristic vegetation community, MG4 *Alopecurus pratensis – Sanguisorba officinalis* floodplain meadow grassland. The soils here are derived from alluvium overlying Oxford Clay, with sand and gravel deposits below. These floodplain meadows have a long history of management by hay cutting, with aftermath grazing.

Similar to all of the meadows across Clattinger Farm, Front Field is low-lying, at approximately 85m AOD, and reasonably flat; however, a network of shallow paleo-channels is evident in aerial photography (see Fig. 1.2) and on the ground. The field is bordered on all four sides by established hedgerows and associated ditches.

Fig. 1.2 Aerial photographic map of Front Field (© 2017 Google; © 2017 Getmapping PLC)

The last SSSI Condition Assessment, carried out by Natural England in July 2010, concluded that Front Field was in favourable condition, with the main habitat in excellent condition and herb cover very high at 76%. Although there are no concerns over the condition of the majority of the sward, there has been no detailed botanical survey of the vegetation community since 2010 and little is known of the hydrological regime in this particular field. Photograph 1.1 below shows the development of a broad band of species-poor, rush-dominated vegetation on the north-western field margin. Possible causes for this variation in sward composition include silting up of the adjacent drainage ditch and compaction of the ground during hedge laying in winter 2011/2012, but no investigations into the eco-hydrological functioning of this zone had taken place prior to this study. It is for these reasons that Front Field was selected as the study area.

Photograph 1 Spreading species-poor margin on western boundary (right of picture), June 2017

This study, undertaken as part of the Floodplain Meadows Partnership Ambassadors programme, aims to:

- provide a robust method for ongoing botanical monitoring of the MG4 grassland community;
- increase understanding of the hydrological functioning of the meadow; and
- assess the eco-hydrology of the vegetation community on the north-western boundary of the field and inform future management of this area.

The following report presents the findings of a suite of botanical, hydrological and soil surveys, conducted at Front Field between May 2015 and June 2017.

2. Methods

2.1 Study Area

The study area comprises the area of grassland at Front Field, Clattinger. The boundary of the study area is marked with a red line in Figure 2.1 below.

Fig. 2.1 The locations of survey points within the study area. Yellow dots = fixed-point 1m x 1m quadrats. Green dots = ad hoc 1m x 1m quadrats (with references). Blue dots = dipwell and soil profile locations (with reference numbers). (© 2017 Google; © 2017 Getmapping PLC)

2.2 Vegetation

A walkover survey of the study area was carried out on 28th May 2015 to visually identify the boundaries between different vegetation communities.

On 29th June 2015 two transects were set out within the field, along which a total of ten fixed 1x1m quadrats were surveyed. Transect 1, comprising quadrats 1-6 (Q1-6) was established along the anticipated hydrological gradient from the southern boundary into field. Q1 was positioned 10m due north of the fifth fence post west of the bridge on the southern field margin, with subsequent quadrats at 20m intervals further north on the same bearing.

Transect 2, comprising quadrats Q7-10, was established at the northern end of the western boundary. Q7 was sited 2.5m into the field from the western fenceline, 10m south of the field gate slam post. Q8-10 were then set out at 10m regular spacings south of Q1, retaining a 2.5m distance from the boundary fenceline.

The locations of each quadrat are shown on Fig. 2.1 below. In addition to these measurements, longitude and latitude measurements were recorded for each quadrat using a mobile GPS app, GPS Status V1.2. Horizontal accuracy for each quadrat was fixed at 2m.

Q1-6 were re-surveyed on 6th June 2016.

On 20th May 2016 five ad hoc 1m x 1m quadrats were surveyed within the study area, three within the main community and one each within two other communities.

Quadrat data was input to MAVIS to identify 'best fit' National Vegetation Classification (NVC) communities. Ellenberg values were also calculated for individual plots and groups of plots to provide further information on soil moisture, pH and nutrient tolerances of the plant communities (Hill, M. O. *et al*, 1999). Quadrat data, constancy tables, MAVIS outputs and complete Ellenberg values are provided in Appendix 1.

2.3 Hydrology

Two dipwells were installed within the study area to provide information on sub-surface water levels.

Dipwell 1 was installed on 2nd November 2015 in the vicinity of Q1-6 in the south of the study area. The dipwell comprises a piece of PVC tubing, with an external diameter of 55mm, drilled with a series of small holes at 100mm spacing and covered with a taut geotextile socking to prevent ingress of soil but permit the free movement of water into the tube. The dipwell was installed by removing the overlying turf and augering a hole with a 1.2m-long, 50mm-wide hand auger within which to place the tubing. The length of the dipwell – 38.5cm - was determined by the depth at which impenetrable gravels were found. The dipwell sits 5cm below the level of the surrounding turf. The dipwell was secured with a screwcap and topped by an aluminium plate.

Dipwell 2 was installed on 18th October 2016 and is located in the north-western corner of the study area. The same method and materials were used for installation of this dipwell; however, Dipwell 2 comprises a 1m-long pipe with an external diameter of 40mm and was not secured with a screwcap.

The locations of the two dipwells are shown in Fig 2.1.

Measurements of water level depth were made using a buzzing stick approximately once a month, although readings were not evenly spaced. Readings from Dipwell 1 were abandoned on 12th May 2017, when it was clear that the tube was no longer receiving water inputs, probably as a result of silting up of the entry holes. From the readings obtained, it is likely that this dipwell stopped functioning satisfactorily during summer 2016. The results from Dipwell 1 are presented in Appendix 2, but not discussed further within the main body of this report.

2.4 Soils

2.4.1 Soil Profile

Soil profiles were investigated during dipwell installation in November 2015 and October 2016. A hand auger was used to remove a 5cm-diameter core of soil to a depth of 1.2m at both locations.

For each profile, soil characteristics were described following visual inspection and assessment of texture by hand. The depth of the darker, humic surface horizon, and depth to the sand and/or gravel layer were recorded, and any grey or brown mottling, indicative of the level at which the water table most frequently sits, was noted.

2.4.2 Soil Nutrients

A soil sample was collected from the study area on 2nd November 2015. Soil cores to a depth of 10cm below the turf were taken from six spots within the main community and immediately sent in a sealed plastic bag to the soil testing laboratory at The Open University for thorough drying and analysis on the advice of Dr Irina Tatarenko.

The sample was tested for soil pH and extractable phosphorus using the Olsen P test.

2.5 Management Information

Data on management activities was collected for 2015 and 2016, including date of the hay cut; yield; and the timing and nature of any grazing.

3. Results

3.1 Vegetation

The walkover survey carried out on 28th May 2015 identified four different vegetation communities within the study area. The boundaries delineating these communities – A, B, C and D – are marked on Fig 3.1 below.

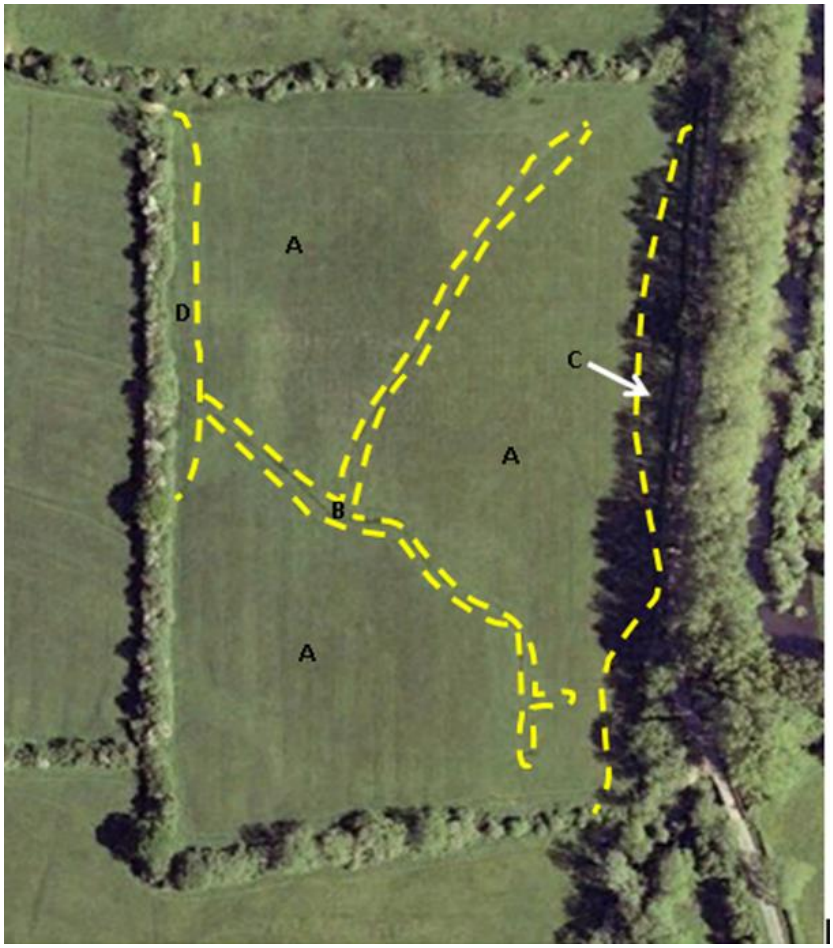

Fig. 3.1 Vegetation community boundaries (© 2017 Google; © 2017 Getmapping PLC).

MAVIS NVC and Ellenberg outputs for Quadrats 1-6, located within the main vegetation community, community A, are summarised for 2015 and 2016 in Table 3.1 below.

	2015	**2016**
Best-fit NVC community (MAVIS)	MG4a (64.96%)	MG4a (65.99%)
Ellenberg F – moisture	5.7	5.4
Ellenberg R – pH	5.9	6.1
Ellenberg N - nitrogen	4.2	4.2
Av. no. of species per 1m x 1m quadrat (2dp)	25.67	30.83
Av. % cover of grass (2dp)	56.33	67.17
Av. % cover of herbs(2dp)	76.50	100.50

Table 3.1 Best-fit NVC and Ellenberg value outputs and species composition data for Transect 1 (Q1-6) from survey in 2015 and 2016

In both years, the community shows a strong fit with Burnet floodplain meadow MG4a *Alopecurus pratensis – Sanguisorba officinalis* grassland, *Dactylis glomerata* sub-community. This sub-community

supports the highest species richness (25 species per m^2) and is generally found where conditions are driest, i.e. flooding is rare (Rothero, E. *et al*, 2016). Average species richness per quadrat exceeded 25 in both 2015 and 2016.

There was a large increase of over 5 species per m^2 between 2015 and 2016. Ellenberg values relating to moisture, pH and nitrogen remain similar between the two years, indicating that it is unlikely that the community has changed significantly in terms of sward composition. Although there was a increase in the cover of herbs from 2015 to 2016, there was a concurrent increase in the cover of grasses, suggesting that there was greater total vegetation growth at the time of survey in 2016 than in 2015.

	Q1		**Q2**		**Q3**		**Q4**		**Q5**		**Q6**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**
Ellenberg F	5.3	5.2	5.2	5.0	5.5	5.0	5.1	4.9	5.5	5.5	5.9	6.4
Ellenberg R	5.8	6.2	5.9	6.3	6.0	6.2	6.1	6.2	6.0	6.1	6.0	5.7
Ellenberg N	3.9	4.0	3.7	3.7	4.0	3.7	4.4	3.7	4.4	4.0	4.5	4.0
No. of species	25	33	30	32	28	27	25	32	21	34	25	27
% cover of grass	45	79	35	65	51	79	66	70	78	73	63	37
% cover of herbs	102	109	92	97	77	124	71	89	59	89	58	95

Table 3.2 Ellenberg value outputs and species composition data for individual quadrats Q1-6 from survey in 2015 and 2016

Table 3.2 above presents Ellenberg values and species composition data for individual quadrats Q1-6 from 2015 and 2016. The majority of quadrats achieved similar values for Ellenberg F (wetness), R (pH) and N (nitrogen) values within and between years; however, Q6 has noticeably higher scores for wetness than the other quadrats. This is most likely due to the location of this quadrat in close proximity to a low-lying paleo-channel (see Fig. 2.1).

Although there are some evident differences in species richness and percentage covers of grasses and herbs between individual quadrats in different years, there are no discernible trends over this period. For example, in 2015, the two quadrats further south have a much higher herb: grass ratio than the four quadrats further north; however, this trend is not perceptible in 2016.

'Best fit' NVC and Ellenberg values for the five ad hoc quadrats surveyed in three distinct communities in May 2016 are presented in Table 3.3.

Community	**A**			**B**	**C**
Quadrat	**A1**	**A2**	**A3**	**B**	**C**
Best-fit NVC community (MAVIS)	MG4b (58.6%)			MG8c (40.08%)	MG4a (47.91%)
Ellenberg F	5.4	5.5	5.7	7.2	4.8
Ellenberg R	6.1	6.0	6.2	5.9	6.2
Ellenberg N	3.7	4.1	4.1	4.4	3.5
No. of species	25	29	18	19	21
% cover of grass	56	76	57	26	103
% cover of herbs	96	111	64	145	34

Table 3.3 Best-fit NVC and Ellenberg value outputs and species composition data for NVC quadrats, 20th May 2016

Quadrats A1, A2 and A3 were located within the main vegetation community, A, similar to Transect 1. These three quadrats obtained Ellenberg scores for wetness, pH and fertility comparable to those obtained for Q1-6. In addition, percentage covers of grasses and herbs lie within the same range for both sets of quadrats. Quadrat A3 presented the lowest species richness of all of the quadrats surveyed within the main vegetation community. This quadrat contained high proportions – 30% - of glaucous sedge (*Carex flacca*) and creeping bent (*Agrostis stolonifera*), which may indicate a localised patch of more frequently wet soils.

Community B was surveyed with one quadrat sited along the lower-lying paleochannel which crosses the study area. Compared with quadrats from the main community type, quadrat B achieved a substantially higher Ellenberg value for wetness and was at the top of the range for Ellenberg N, relating to fertility. The quadrat had a very high herb:grass ratio.

Community C was surveyed with one quadrat within tall-sward vegetation on the eastern field margin. Compared with quadrats in the main vegetation community, quadrat C exhibited slightly lower Ellenberg values for wetness and fertility. This quadrat was dominated by grasses, particularly downy oat-grass (*Helictotrichon pubescens*), which achieved 60% cover.

Best-fit NVC communities were calculated for each set of quadrats, but as these are based on individual or small numbers of quadrats, they must be interpreted with caution. Community A quadrats were best matched with MG4b *Alopecurus pratensis – Sanguisorba officinalis* grassland, typical sub-community. Although this differs from the classification of Transect 1, also within the main vegetation community, there was only a small different in percentage fit between the two communities for Q1-6.

Best-fit NVC community for community B was MG8c *Cynosurus cristatus – Carex panicea – Caltha palustris* grassland, *Carex nigra – Ranunculus flammula* sub-community. This sub-community is characterised by a water table which is constantly close to the surface on soils which have very low soil fertility (Wallace and Prosser, 2016). However, goodness of fit was relatively low.

Community C matched best with NVC community MG4a, similar to community A, although goodness of fit was lower.

Table 3.4 presents the NVC and Ellenberg outputs and species composition data for Quadrats 7-10 within Transect 2, located within community D. A constancy table is shown in Table 3.5.

	Q7	**Q8**	**Q9**	**Q10**	**Average**
Best-fit NVC community (MAVIS)	-	-	-	-	MG1c (36.31)
Ellenberg F	7.1	7.0	7.0	6.4	-
Ellenberg R	6.8	6.4	6.6	6.4	-
Ellenberg N	5.4	5.1	5.6	5.1	-
No. of species	10	11	6	11	9.5

Table 3.4 Best-fit NVC and Ellenberg value outputs and species composition data for Transect 2 (Q7-10) from survey in 2015

		Constancy	Min. % cover		Max. % cover
Juncus inflexus	Hard rush	**IV**	**35**	**-**	**75**
Carex otrubae	False fox-sedge	**IV**	**5**	**-**	**15**
Rubus fruticosus	Bramble	**IV**	**5**	**-**	**5**
Holcus lanatus	Yorkshire fog	**III**	**25**	**-**	**35**
Epilobium hirsutum	Great willowherb	**III**	**15**	**-**	**25**
Salix spp.	Willow	**III**	**2**	**-**	**5**
Filipendula ulmaria	Meadowsweet	**I**	**0**	**-**	**40**
Cynosurus cristatus	Crested dog's-tail	**I**	**0**	**-**	**10**
Dactylis glomerata	Cock's-foot	**I**	**0**	**-**	**5**
Filipendula vulgaris	Dropwort	**I**	**0**	**-**	**5**
Carex flacca	Glaucous sedge	**I**	**0**	**-**	**3**
Centaurea nigra	Common knapweed	**I**	**0**	**-**	**3**
Ranunculus acris	Meadow buttercup	**I**	**0**	**-**	**3**
Ranunculus repens	Creeping buttercup	**I**	**0**	**-**	**3**
Agrostis capillaris	Common bent	**I**	**0**	**-**	**2**
Cirsium palustre	Marsh thistle	**I**	**0**	**-**	**2**
Luzula campestris	Field wood-rush	**I**	**0**	**-**	**2**
Trifolium repens	White Clover	**I**	**0**	**-**	**2**
Hypericum tetrapterum	Square-stalked St John's wort	**I**	**0**	**-**	**2**
Galium aparine	Cleavers	**I**	**0**	**-**	**2**
Primula veris	Cowslip	**I**	**0**	**-**	**1**
Cornus sanguinea	Dogwood	**I**	**0**	**-**	**1**
Plantago major	Greater plantain	**I**	**0**	**-**	**1**

Table 3.5 Constancy table for Transect 2 (Community D), 29th June 2015

Community D comprises a relatively species-poor community, dominated by hard rush, false fox-sedge and encroaching scrub. In comparison with quadrats in the main vegetation community, Ellenberg values for soil moisture and fertility are noticeably higher within Q7-10. The dominance of hard rush also indicates that compaction may have taken place in this area (Rothero, E. *et al*, 2016). Best-fit NVC community is MG1c *Arrhenatherum elatius* grassland, *Filipendula ulmaria* sub-community, characterised by rank, species-poor and unmanaged or infrequently managed swards; however, this assessment relies on a sample of only four quadrats and has a low goodness of fit.

3.2 Hydrology

A hydrograph for Dipwell 2 is shown in Fig. 3.2 below.

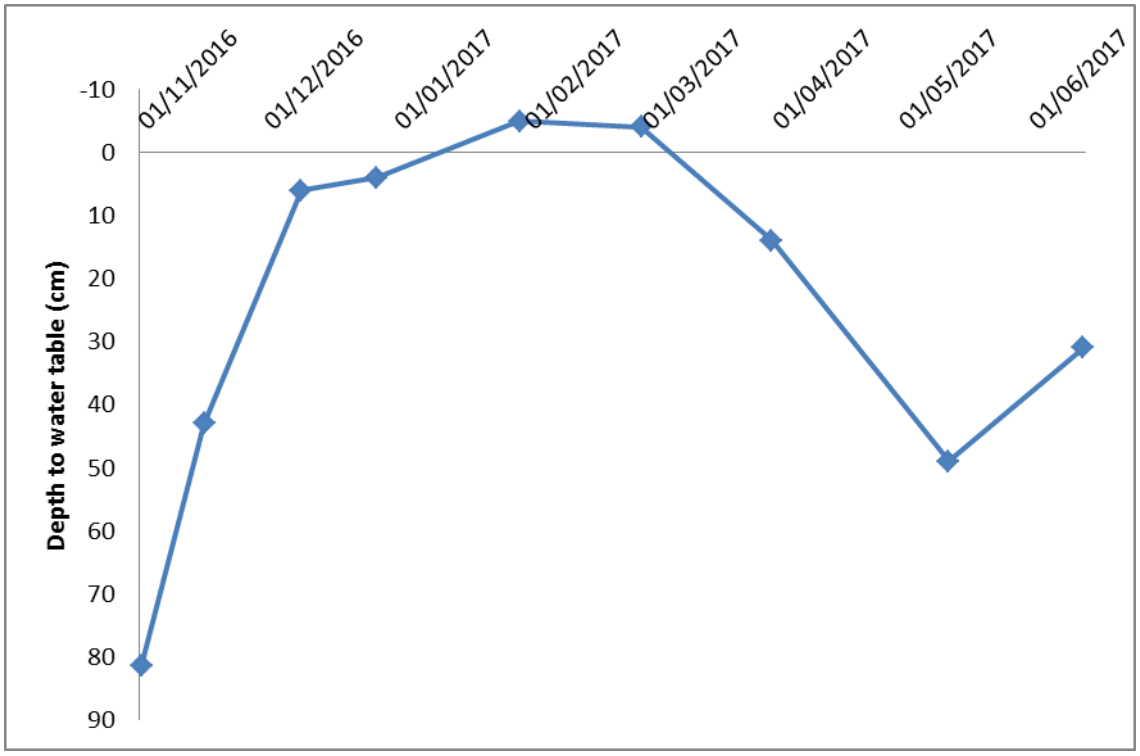

Fig. 3.2 Depth to water table recorded at Dipwell 2, 01/11/2016 – 13/06/2017

The graph shows that water levels between 1st November 2016 and 13th June 2017 fluctuated by nearly 90cm, with some shallow flooding for several weeks over the winter. This flooding was both preceded and followed by relatively large drops in the water table. The greatest depth to the water table was 81.5cm, recorded on 1st November 2016.

Although at least twelve months of data is required to more accurately analyse the hydrological regime at Dipwell 2, it is evident that the soils in the vicinity of this dipwell experience substantial fluctuations in water levels throughout the year and are able to drain reasonably well after a flood event.

3.3 Soils

The results of the soil profile investigations are shown in Table 3.5 below.

Soil profile 1, from the south of the study area within community A, had a dark brown, well-structured humic layer approximately 10cm deep, overlying a band of clay 15-20cm deep. Sands and fine gravels appear 25cm below the surface and continue downwards for the full depth of the profile, i.e. at least 120cm below ground level. There is no mottling.

Soil profile 2, on the north-western margin of the study area within community D, has a very shallow dark brown humic layer. Below that is a layer of clay to about 25cm below ground level. Sand and fine gravels containing some clay are found 25-50cm down, with clay disappearing from the profile at around 50cm depth.

1		0 – 10cm from surface: dark brown, with numerous small roots. Good soil structure and fairly friable, especially in the top 5cm. Clay content increasing towards the bottom 5cm. 10 – 20cm: Very clay-rich – sticky and dense. Getting lighter towards the bottom of the section. No mottling. 20 – 30cm: Clay present in the top 5cm. Sand and very fine gravel present in the bottom 5cm. 30-40cm: Very sandy with larger pieces of gravel, up to 1cm in diameter. 40-50cm: Very sandy and friable, with still containing some clay. 50-120cm: Very fine sands and gravels.
2		0 – 10cm from surface: shallow humic layer, approximately 2cm deep. Very dark brown, with high clay content. 10 – 20cm: Heavy clay. Getting lighter towards the bottom of the section. No mottling. 20 – 30cm: Clay present in the top 5cm. Sand and very fine gravel present in the bottom 5cm. 30-120cm: Very little clay content. Sands and gravels.

Table 3.5 Soil profile descriptions

Analysis of the soil sample taken in November 2015 recorded phosphate levels of 6.0mg/kg PO_4-P, using the Olsen-P method, and a pH of 6.45.

3.4 Management

In 2015, a hay cut was carried out on 21st July, with 30 bales of hay produced, 120cm x 90cm x 250cm in size. Aftermath grazing by Belted Galloway cattle took place between 10th September and 3rd November. A maximum of 16 cows, 11 calves and one bull had access to the field for grazing during this period; however, the field was grazed alongside several neighbouring ones so livestock were not confined to the study area.

In 2016, the hay cut also took place on 21st July, but only 22 bales of hay were produced. The cattle had access to the field from 13th August until 6th November, but were not restricted to the study area. A maximum of 24 cows, 23 calves and one bull grazed the field at any one time.

A full summary of management actions can be found in Appendix 3.

4. Discussion

As expected from surveys of the study area, including the most recent SSSI Condition Assessment (Natural England, July 2010), the main vegetation community within the study area comprises a good quality Burnet floodplain meadow MG4 *Alopecurus pratensis – Sanguisorba officinalis* grassland and shows a strong fit with the MG4a *Dactylis glomerata* sub-community. This sub-community is characterised by circumneutral soils, high species richness, very low soil fertility and infrequent flooding. Soil analysis has identified a pH of close to 7 and very low phosphate levels for this community within the study area, although it should be noted that these results were obtained from only one soil sample and may vary across the study area. Average species richness for the sward exceeded 25 per m^2 in both years of survey. Hydrological data was limited due to malfunctioning of the dipwell; however, the short duration of winter flooding and relatively rapid lowering of water levels after the flood event indicate that soils do not sit wet for long and drain well. The eco-hydrological conditions present within the meadow are therefore very similar to those expected within this MG4a sub-community.

Although some variance in species richness, grass:herb ratio and Ellenberg indicators was identified within and between quadrats, no significant trends are evident. There is no noticeable change is species composition along the anticipated north-south hydrological gradient, and this may relate to the fact that the field rarely floods, meaning that proximity to the river is of low importance. It is relevant to note that botanical survey data can be affected by variation in surveyor judgement; for example, individuals may vary in their estimations of percentage cover and have differing abilities to accurately identify species. During this study, the same surveyor undertook all quadrat survey, but it should be noted that expertise in plant species identification may have improved between the first and second survey seasons. Floodplain meadows are dynamic systems and can respond to seasonal variations. In light of the limitations identified above, it is inadvisable to draw conclusions on any temporal changes in botanical composition until a longer-term dataset has been collected.

Three other vegetation communities are present within the study area. The small network of paleochannels supports a community more characteristic of a sedge meadow, with water levels closer to the surface than within an MG4 grassland. The eastern field margin supports a tall, grassy sward. Ellenberg values for this community indicate that the ground here may be slightly drier and less fertile, whilst the dominance of grasses suggests that cutting of this area has not been frequent. NVC

assessments for these two communities were based on single quadrats and are therefore not considered reliable.

The fourth community comprises an area of species-poor, rank vegetation on the north-western field margin. The dominance of hard rush (*Juncus inflexus*) implies that compaction may have taken place, which would likely have occurred during hedge laying operations several years ago. However, results from the adjacent dipwell suggest that the soils in this area drain fairly well, whilst the soil profile doesn't exhibit strong evidence of compaction. Ellenberg values for this community show high soil wetness and an increase in soil fertility compared with the adjacent MG4a grassland. Scrub is also frequent. Increased water and nutrient inputs as a result of a flooding from unmanaged ditches, plus infrequent cutting, may be influencing the vegetation in this area. Changes to the current management of boundary features will be required to restore optimal eco-hydrological functioning, and proposed work is detailed in the following section.

5. Conclusions and Recommendations

The main vegetation community within the study area comprises a good quality MG4a *Alopecurus pratensis – Sanguisorba officinalis* grassland, *Dactylis glomerata* sub-community. Paleochannels within the field provide additional interest and support a slightly wetter, sedge meadow community. The existing management regime for the field, consisting of an annual hay cut and aftermath cattle grazing, follows traditional management practices and seems to provide favourable conditions for maintenance of the sward; it will therefore be continued.

Two further communities on the eastern and north-western field margins show signs of under-management. In addition, the north-western margin may have suffered mild compaction and waterlogging related to management of the adjacent hedgerow-ditch system. This study has highlighted that, although the majority of the field is in favourable condition, the soil and its associated vegetation communities are sensitive to compaction and changes in nutrient status and water inputs. The risks of inappropriate activities, such as vehicle movements causing compaction and a lack of ditch maintenance, are likely to be common to all floodplain meadow soils and vegetation communities; therefore, management regimes for these sites should take account of these findings.

The following recommendations for future monitoring and management are proposed:

- continue to undertake monitoring of the hydrological, botanical and edaphic condition of the study area to identify any changes over time.
- re-install Dipwell 1 and seek to install additional dipwells elsewhere within the site to investigate hydrology across the study area.
- continue to monitor Dipwell 2 and undertake further analysis of readings once a twelve-month dataset has been collected.
- undertake additional vegetation quadrat survey within communities B and C to better assess their species composition.
- ensure that management operations with the potential to cause compaction are only carried out when the ground is dry.
- cut field margins on a more frequent basis, leaving only one uncut, 3m-wide margin per year. Scrub removal may be required in advance.

- dredge the ditch along the western field boundary to facilitate drainage.

6. References

Hill, M.O., Mountford, J.O., Roy, D.B. & Bunce, R.G.H. (1999) *Ellenberg's Indicator Values for British Plants*. Institute of Terrestrial Ecology, Huntingdon, UK.

Natural England (July 2010) *Condition of SSSI Units for Site Clattinger Farm SSSI*. Accessed at https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1002547&ReportTitle=Clattinger%20Farm%20SSSI on 12th July 2017.

Rothero, E., Lake, S. and Gowing, D. (eds) (2016) *Floodplain Meadows – Beauty and Utility. A Technical Handbook*. Milton Keynes, Floodplain Meadows Partnership.

Wallace, H. and Prosser, M. (2016) *A review of the National Vegetation Classification for theCalthion group of plant communities in England and Wales*. Milton Keynes, Floodplain Meadows Partnership.

7. Acknowledgements

Many thanks to Emma Rothero, Hilary Wallace, David Gowing and Irina Tatarenko for sharing their expertise in the various aspects of floodplain meadow eco-hydrology and for their encouragement, help and support throughout the course. I'd also like to thank the other Phase 2 Ambassadors for sharing their experiences and for making this programme so enjoyable.

Appendix 1 – Botanical Survey Data

Transect 1 – 29th June 2015

		Q1	Q2	Q3	Q4	Q5	Q6	Const	Min		Max
Holcus lanatus	Yorkshire fog	5	2	2	3	30	20	VI	2	-	30
Sanguisorba officinalis	Great Burnet	15	15	20	5	3	2	VI	3	-	20
Anthoxanthum odoratum	Sweet vernal-grass	15	15	15	10	15	10	VI	10	-	15
Lotus corniculatus	Bird's-foot-trefoil	5	15	8	5	3	2	VI	3	-	15
Plantago lanceolata	Ribwort plantain	10	10	15	8	10	5	VI	8	-	15
Cynosurus cristatus	Crested dog's-tail	10	5	2	8	10	10	VI	5	-	10
Galium verum	Lady's bedstraw	1	3	1	2	1	1	VI	1	-	3
Silaum silaus	Pepper-saxifrage	1	1	2	3	3	3	VI	1	-	3
Ranunculus acris	Meadow buttercup	1	1	1	1	2	2	VI	1	-	2
Rhinanthus minor	Yellow rattle	25	5	5		3	5	V	5	-	25
Agrostis stolonifera	Creeping bent		2	15	20	15	15	V	15	-	20
Centaurea nigra	Common knapweed	2	5	3	15	20		V	3	-	20
Leontodon hispidus	Rough hawkbit	20	15	2	8		1	V	2	-	20
Carex flacca	Glaucous sedge	5	5	5	3	2		V	3	-	5
Leucanthemum vulgare	Oxeye daisy		2	2	5	4	2	V	2	-	5
Trifolium pratense	Red Clover		5	5	3	3	5	V	3	-	5
Filipendula ulmaria	Meadowsweet	5	2			1	10	IV	2	-	10
Festuca rubra	Red fescue	5	2		8	3		IV	3	-	8
Trisetum flavescens	Yellow oat-grass		1	5	3	5		IV	3	-	5
Ranunculus repens	Creeping buttercup	1		1	1		2	IV	1	-	2
Polygala vulgare	Common milkwort		1	1	2	1		IV	1	-	2
Linum catharticum	Fairy flax	1	1	1	1			IV	1	-	1
Agrostis capillaris	Common bent	10	5	5				III	5	-	10
Briza media	Quaking grass			5	8		3	III	5	-	8
Hypochaeris radicata	Common cat's ear		1	1	8			III	1	-	8
Trifolium repens	White Clover	3	1	1				III	1	-	3
Lathyrus pratensis	Meadow vetchling			1		1	2	III	1	-	2
Elytrigia repens	Couch grass		1		3			II	3	-	3
Poa trivialis	Rough-stalked meadow-grass			2	3			II	3	-	3
Carex nigra	Common sedge					2	3	II	3	-	3
Primula veris	Cowslip	1	1					II	1	-	1
Prunella vulgaris	Selfheal	1		1				II	1	-	1
Rumex acetosa	Common Sorrel	1					1	II	1	-	1
Thalictrum flavum	Common meadow-rue	1	1					II	1	-	1
Carex panicea	Carnation sedge						8	I	1	-	8
Deschampsia cespitosa	Tufted hair-grass						5	I	1	-	5
Poa pratensis	Smoothed-stalked meadow-grass		2					I	0	-	2
Carex hirta	Hairy sedge						2	I	1	-	2
Medicago lupulina	Black medick										
Cerastium fontanum	Common mouse-ear		1					I	0	-	1
Conopodium majus	Pignut						1	I	0	-	1
Luzula campestris	Field wood-rush				1			I	0	-	1
Dactylorhiza fuchsii	Common spotted orchid			1				I	0	-	1
Dactylorhiza maculata	Heath spotted orchid	1						I	0	-	1
Stachys officinalis	Betony		1					I	0	-	1
Juncus inflexus	Hard rush						1	I	0	-	1

Transect 2 – 29th June 2015

		Q7	Q8	Q9	Q10	Const	Min		Max
Juncus inflexus	Hard rush	75	20	35	40	IV	35	-	75
Carex otrubae	False fox-sedge	2	15	5	10	IV	5	-	15
Rubus fruticosus	Bramble	5	5	5	5	IV	5	-	5
Holcus lanatus	Yorkshire fog		5	25	35	III	25	-	35
Epilobium hirsutum	Great willowherb	15		25	2	III	15	-	25
Salix spp.	Willow	2		5	2	III	2	-	5
Filipendula ulmaria	Meadowsweet		40			I	0	-	40
Cynosurus cristatus	Crested dog's-tail				10	I	0	-	10
Dactylis glomerata	Cock's-foot		5			I	0	-	5
Filipendula vulgaris	Dropwort		5			I	0	-	5
Carex flacca	Glaucous sedge		3			I	0	-	3
Centaurea nigra	Common knapweed				3	I	0	-	3
Ranunculus acris	Meadow buttercup				3	I	0	-	3
Ranunculus repens	Creeping buttercup	3				I	0	-	3
Agrostis capillaris	Common bent		2			I	0	-	2
Cirsium palustre	Marsh thistle	2				I	0	-	2
Luzula campestris	Field wood-rush		2			I	0	-	2
Trifolium repens	White Clover				2	I	0	-	2
Hypericum tetrapterum	Square-stalked St Johı	2				I	0	-	2
Galium aparine	Cleavers		2			I	0	-	2
Primula veris	Cowslip	1				I	0	-	1
Cornus sanguinea	Dogwood	1				I	0	-	1
Plantago major	Greater plantain				1	I	0	-	1

Community A – 20th May 2016

		Q1	Q2	Q3	Const	Min		Max
Agrostis stolonifera	Creeping bent	5	20	30	III	20	-	30
Anthoxanthum odoratum	Sweet vernal-grass	15	20	7	III	15	-	20
Leontodon hispidus	Rough hawkbit	15	15	2	III	15	-	15
Plantago lanceolata	Ribwort plantain	10	10	8	III	10	-	10
Primula veris	Cowslip	3	10	1	III	3	-	10
Lotus corniculatus	Bird's-foot-trefoil	5	8	2	III	5	-	8
Rhinanthus minor	Yellow rattle	3	4	2	III	3	-	4
Festuca rubra	Red fescue	10	15		II	15	-	15
Carex nigra	Common sedge	15	15		II	15	-	15
Ranunculus repens	Creeping buttercup	2	10		II	10	-	10
Cynosurus cristatus	Crested dog's-tail	3		8	II	8	-	8
Filipendula ulmaria	Meadowsweet	8		5	II	8	-	8
Ranunculus acris	Meadow buttercup	8	5		II	8	-	8
Sanguisorba officinalis	Great Burnet	5	2		II	5	-	5
Trifolium repens	White Clover	5	3		II	5	-	5
Festuca arundinacea	Tall fescue		5	5	II	5	-	5
Orchis morio	Green-winged orchid	2	5		II	5	-	5
Centaurea nigra	Common knapweed		3	2	II	3	-	3
Leucanthemum vulgare	Oxeye daisy	3	2		II	3	-	3
Trifolium pratense	Red Clover		3	1	II	3	-	3
Galium verum	Lady's bedstraw	2	2		II	2	-	2
Succisa pratensis	Devil's-bit Scabious		2	2	II	2	-	2
Carex flacca	Glaucous sedge			30	I	0	-	30
Helictotrichon pubescens	Downy oat-grass	15			I	0	-	15
Poa trivialis	Rough-stalked meadow-grass		8		I	0	-	8
Holcus lanatus	Yorkshire fog			7	I	0	-	7
Bromus hordeaceus	Lop grass		5		I	0	-	5
Medicago lupulina	Black medick	5			I	0	-	5
Brompopsis erecta	Upright brome	5			I	0	-	5
Juncus inflexus	Hard rush			5	I	0	-	5
Briza media	Quaking grass		3		I	0	-	3
Dactylis glomerata	Cock's-foot	3			I	0	-	3
Carex disticha	Brown sedge			3	I	0	-	3
Luzula campestris	Field wood-rush		3		I	0	-	3
Taraxacum sect. vulgaria	Dandelion	3			I	0	-	3
Ajuga reptans	Bugle		3		I	0	-	3
Dactylorhiza fuchsii	Common spotted orchid		2		I	0	-	2
Polygala vulgare	Common milkwort		2		I	0	-	2
Dactylorhiza praetermissa	Southern marsh orchid	1			I	0	-	1
Ophioglossum vulgatum	Adder's-tongue		1		I	0	-	1
Potentilla reptans	Creeping cinquefoil			1	I	0	-	1
Silaum silaus	Pepper-saxifrage	1			I	0	-	1
Vicia cracca	Tufted vetch		1		I	0	-	1

Community B – 20th May 2016

		% cover
Filipendula ulmaria	Meadowsweet	65
Carex flacca	Glaucous sedge	15
Juncus articulatus	Jointed rush	10
Lysimachia nummularia	Creeping Jenny	10
Juncus inflexus	Hard rush	10
Valeriana dioica	Marsh valerian	10
Deschampsia cespitosa	Tufted hair-grass	8
Festuca arundinacea	Tall fescue	8
Agrostis stolonifera	Creeping bent	5
Lolium perenne	Perennial rye-grass	5
Cardamine pratensis	Cuckoo flower	5
Carex panicea	Carnation sedge	5
Galium palustre	Common marsh-bedstraw	5
Ranunculus repens	Creeping buttercup	3
Plantago lanceolata	Ribwort plantain	2
Trifolium repens	White Clover	2
Centaurea nigra	Common knapweed	1
Lotus corniculatus	Bird's-foot-trefoil	1
Vicia cracca	Tufted vetch	1

Community C – 20th May 2016

		% cover
Helictotrichon pubescens	Downy oat-grass	60
Anthoxanthum odoratum	Sweet vernal-grass	20
Festuca rubra	Red fescue	10
Dactylis glomerata	Cock's-foot	7
Briza media	Quaking grass	3
Holcus lanatus	Yorkshire fog	3
Carex flacca	Glaucous sedge	3
Lathyrus pratensis	Meadow vetchling	3
Leontodon hispidus	Rough hawkbit	3
Luzula campestris	Field wood-rush	3
Ranunculus acris	Meadow buttercup	3
Ranunculus repens	Creeping buttercup	3
Rhinanthus minor	Yellow rattle	3
Galium verum	Lady's bedstraw	2
Lotus corniculatus	Bird's-foot-trefoil	2
Trifolium pratense	Red Clover	2
Trifolium repens	White Clover	2
Dactylorhiza fuchsii	Common spotted orchid	2
Primula veris	Cowslip	1
Rumex acetosa	Common Sorrel	1
Sanguisorba officinalis	Great Burnet	1

Transect 1 – 6th June 2016

		Q1	Q2	Q3	Q4	Q5	Q6	Const	Min		Max
Sanguisorba officinalis	Great Burnet	8	8	20	3	12	25	VI	8	-	25
Lotus corniculatus	Bird's-foot-trefoil	15	12	20	10	6	3	VI	6	-	20
Plantago lanceolata	Ribwort plantain	5	15	20	10	10	5	VI	5	-	20
Anthoxanthum odoratum	Sweet vernal-grass	15	8	15	15	15	5	VI	8	-	15
Cynosurus cristatus	Crested dog's-tail	15	15	15	10	10	5	VI	10	-	15
Festuca rubra	Red fescue	15	3	10	10	8	5	VI	5	-	15
Carex flacca	Glaucous sedge	8	5	10	10	8	2	VI	5	-	10
Holcus lanatus	Yorkshire fog	8	3	7	5	6	5	VI	5	-	8
Trifolium pratense	Red Clover	3	4	8	3	5	2	VI	3	-	8
Centaurea nigra	Common knapweed	5	5	3	4	4	5	VI	4	-	5
Luzula campestris	Field wood-rush	2	1	1	1	3	1	VI	1	-	3
Agrostis stolonifera	Creeping bent	15	3		5	15	5	V	5	-	15
Briza media	Quaking grass		15	7	5	3	5	V	5	-	15
Trifolium repens	White Clover	8	2		3	1	1	V	1	-	8
Lathyrus pratensis	Meadow vetchling	2	2		5	2	1	V	2	-	5
Ranunculus acris	Meadow buttercup	5		5	5	5	5	V	5	-	5
Helictotrichon pubescens	Downy oat-grass	5	5	1	1	5		V	1	-	5
Silaum silaus	Pepper-saxifrage		2	3	3	4	4	V	3	-	4
Leucanthemum vulgare	Oxeye daisy		3	2	2	2	1	V	2	-	3
Primula veris	Cowslip	3	3	3	2	1		V	2	-	3
Rhinanthus minor	Yellow rattle	2	3	3	3	2		V	2	-	3
Rumex acetosa	Common Sorrel	1	1		1	1	1	V	1	-	1
Leontodon hispidus	Rough hawkbit	20	15	20	15			IV	15	-	20
Brompopsis erecta	Upright brome		10	15	10	8		IV	10	-	15
Filipendula ulmaria	Meadowsweet	4	7			5	10	IV	5	-	10
Galium verum	Lady's bedstraw	1	3		4	3		IV	3	-	4
Orchis morio	Green-winged orchid		1	2	1	1		IV	1	-	2
Taraxacum sect. vulgaria	Dandelion	1	1	1	1			IV	1	-	1
Poa pratensis	Smoothed-stalked meadow-grass	5	3		3			III	3	-	5
Succisa pratensis	Devil's-bit Scabious		1			5	2	III	2	-	5
Dactylorhiza fuchsii	Common spotted orchid	5	1				1	III	1	-	5
Dactylis glomerata	Cock's-foot			1	1	2		III	1	-	2
Polygala vulgare	Common milkwort	1	1		2			III	1	-	2
Cerastium fontanum	Common mouse-ear	1	1				1	III	1	-	1
Carex panicea	Carnation sedge					1	25	II	1	-	25
Agrostis capillaris	Common bent			8	5			II	8	-	8
Festuca arundinacea	Tall fescue	1					5	II	5	-	5
Vicia cracca	Tufted vetch				1	2		II	2	-	2
Hypochaeris radicata	Common cat's ear	1		1				II	1	-	1
Linum catharticum	Fairy flax	1		1				II	1	-	1
Medicago lupulina	Black medick	5						I	0	-	5
Potentilla reptans	Creeping cinquefoil					3		I	0	-	3
Ophioglossum vulgatum	Adder's-tongue					2		I	0	-	2
Deschampsia cespitosa	Tufted hair-grass					1		I	1	-	1
Lolium perenne	Perennial rye-grass						1	I	0	-	1
Carex hirta	Hairy sedge					1		I	1	-	1
Leontodon autumnalis	Autumn hawkbit			1				I	0	-	1
Ranunculus repens	Creeping buttercup	1						I	0	-	1
Tragopogon pratensis	Goat's-beard	1						I	0	-	1
Danthonia decumbens	Heath grass						1	I	0	-	1

Ellenberg values – Transect 1

Mean	7.1	5.4	6.1	4.2	0.3
Species name Please type your species names below	L Light	F Moisture	R Reaction	N Nitrogen	S Salt
Holcus lanatus	7	6	-	5	1
Sanguisorba officinalis	7	6	-	5	0
Anthoxanthum odoratum	-	-	5	-	1
Lotus corniculatus	7	4	7	3	0
Plantago lanceolata	6	-	-	-	0
Cynosurus cristatus	8	5	-	4	0
Galium verum	7	4	7	3	0
Silaum silaus	7	-	7	3	0
Ranunculus acris	7	6	-	-	0
Rhinanthus minor	_	_	_	_	_
Agrostis stolonifera	8	7	-	5	0
Centaurea nigra	8	5	3	4	0
Leontodon hispidus	8	5	7	6	0
Carex flacca	7	6	8	4	1
Leucanthemum vulgare	7	4	-	3	0
Trifolium pratense	7	5	-	-	0
Filipendula ulmaria	7	8	-	5	0
Festuca rubra	-	6	6	-	0
Vicia cracca	7	6	-	-	1
Ranunculus repens	6	7	-	7	1
Polygala vulgaris	7	4	3	2	0
Linum catharticum	7	-	7	2	1
Agrostis capillaris	7	-	4	4	0
Briza media	8	-	-	2	0
Hypochoeris radicata	8	5	4	3	1
Trifolium repens	8	5	6	6	1
Lathyrus pratensis	7	6	7	6	0
Festuca arundinacea	8	7	7	5	2
Ophioglossum vulgatum	7	7	7	2	1
Dactylis glomerata	7	5	-	6	0
Primula veris	7	4	8	3	0
Tragopogon pratensis	7	4	7	6	0
Rumex acetosa	8	-	-	6	0
Taraxacum sp	7	5	-	7	1
Carex panicea	8	8	-	4	1
Deschampsia cespitosa	6	7	-	3	0
Poa pratensis	6	5	-	6	0
Carex hirta	7	6	-	5	0
Medicago lupulina	7	4	8	-	0
Cerastium fontanum	6	5	-	5	1
Danthonia decumbens	8	-	3	2	0
Luzula campestris	7	4	3	3	0
Dactylorhiza fuchsii	_	_	_	_	_
Helictotrichon pubescens	5	3	-	4	0
Succisa pratensis	7	7	-	2	0
Leontodon autumnalis	7	5	5	5	0
Bromopsis erecta	8	3	8	3	0
Lolium perenne	8	5	7	7	0
Orchis morio	7	4	7	3	0
Potentilla reptans	6	6	7	5	0

MAVIS Outputs

Report dated Mon Jan 30 12:46:30 2017

Plot 0: NVC A1 20May2016

CVS: 2 species with no data: Dactylorhiza majalis praetermissa; Orchis morio

CVS: class 40

ELL: Light 7.2; Wetness 5.4; pH 6.1; Fertility 3.7

CSR: 3 species with no data: Sanguisorba officinalis; Silaum silaus; Orchis morio

CSR: C: 2.38 S: 3.17 R: 2.29

Plot 1: NVC A2 20May2016

CVS: 1 species with no data: Orchis morio

CVS: class 44

ELL: Light 7.2; Wetness 5.5; pH 6.0; Fertility 4.1

CSR: 3 species with no data: Ophioglossum vulgatum; Sanguisorba officinalis; Orchis morio

CSR: C: 2.37 S: 2.97 R: 2.48

Plot 2: NVC A3 20May2016

CVS: class 40

ELL: Light 7.0; Wetness 5.7; pH 6.2; Fertility 4.1

CSR: 1 species with no data: Carex disticha

CSR: C: 2.34 S: 3.03 R: 2.23

Plot 3: NVC B 20May2016

CVS: class 51

ELL: Light 7.0; Wetness 7.2; pH 5.9; Fertility 4.4

CSR: 1 species with no data: Valeriana dioica

CSR: C: 3.12 S: 2.65 R: 1.79

Plot 4: NVC C 20May2016

CVS: class 47

ELL: Light 7.1; Wetness 4.8; pH 6.2; Fertility 3.5

CSR: 1 species with no data: Sanguisorba officinalis

CSR: C: 2.23 S: 3.50 R: 2.32

Plot 5: Transect 1 Q1 06Jun2016

CVS: class 38

ELL: Light 7.2; Wetness 5.2; pH 6.2; Fertility 4.0

CSR: 1 species with no data: Sanguisorba officinalis

CSR: C: 2.35 S: 3.19 R: 2.51

Plot 6: Transect 1 Q2 06Jun2016

CVS: 1 species with no data: Orchis morio

CVS: class 44

ELL: Light 7.2; Wetness 5.0; pH 6.3; Fertility 3.7

CSR: 3 species with no data: Sanguisorba officinalis; Silaum silaus; Orchis morio

CSR: C: 2.32 S: 3.48 R: 2.20

Plot 7: Transect 1 Q3 06Jun2016

CVS: 1 species with no data: Orchis morio

CVS: class 52

ELL: Light 7.2; Wetness 5.0; pH 6.2; Fertility 3.7

CSR: 3 species with no data: Orchis morio; Sanguisorba officinalis; Silaum silaus

CSR: C: 2.35 S: 3.51 R: 2.35

Plot 8: Transect 1 Q4 06Jun2016

CVS: 1 species with no data: Orchis morio

CVS: class 47

ELL: Light 7.2; Wetness 4.9; pH 6.2; Fertility 3.7

CSR: 3 species with no data: Orchis morio; Sanguisorba officinalis; Silaum silaus

CSR: C: 2.35 S: 3.41 R: 2.37

Plot 9: Transect 1 Q5 06Jun2016

CVS: 1 species with no data: Orchis morio

CVS: class 47

ELL: Light 7.1; Wetness 5.5; pH 6.1; Fertility 4.0

CSR: 4 species with no data: Orchis morio; Ophioglossum vulgatum; Sanguisorba officinalis; Silaum silaus

CSR: C: 2.61 S: 3.01 R: 2.47

Plot 10: Transect 1 Q6 06Jun2016

CVS: class 40

ELL: Light 7.3; Wetness 6.4; pH 5.7; Fertility 4.0

CSR: 2 species with no data: Sanguisorba officinalis; Silaum silaus

CSR: C: 2.31 S: 3.51 R: 2.07

Plot 11: Transect 1 Q1 29Jun2015

CVS: class 52

ELL: Light 7.1; Wetness 5.3; pH 5.8; Fertility 3.9

CSR: 4 species with no data: Sanguisorba officinalis; Silaum silaus; Thalictrum flavum; Dactylorhiza maculata

CSR: C: 2.06 S: 3.15 R: 2.69

Plot 12: Transect 1 Q2 29Jun2015

CVS: class 52

ELL: Light 7.1; Wetness 5.2; pH 5.9; Fertility 3.7

CSR: 3 species with no data: Sanguisorba officinalis; Silaum silaus; Thalictrum flavum

CSR: C: 2.25 S: 3.39 R: 2.42

Plot 13: Transect 1 Q3 29Jun2015

CVS: class 52

ELL: Light 7.1; Wetness 5.5; pH 6.0; Fertility 4.0

CSR: 4 species with no data: Rhinanthus angustifolius; Sanguisorba officinalis; Silaum silaus; Dactylorhiza [spp]

CSR: C: 2.51 S: 2.97 R: 2.63

Plot 14: Transect 1 Q4 29Jun2015

CVS: 1 species with no data: Briza minor

CVS: class 44

ELL: Light 7.2; Wetness 5.1; pH 6.1; Fertility 4.4

CSR: 3 species with no data: Briza minor; Sanguisorba officinalis; Silaum silaus

CSR: C: 2.70 S: 2.80 R: 2.65

Plot 15: Transect 1 Q5 29Jun2015

CVS: class 47

ELL: Light 7.1; Wetness 5.5; pH 6.0; Fertility 4.4

CSR: 2 species with no data: Sanguisorba officinalis; Silaum silaus

Plot 16: Transect 1 Q6 29Jun2015

CVS: class 51

ELL: Light 7.0; Wetness 5.9; pH 6.0; Fertility 4.5

CSR: 2 species with no data: Sanguisorba officinalis; Silaum silaus

CSR: C: 2.83 S: 2.67 R: 2.58

Plot 17: Transect 2 Q7 29Jun2015

CVS: class 32

ELL: Light 6.9; Wetness 7.1; pH 6.8; Fertility 5.4

CSR: 3 species with no data: Cornus sanguinea; Epilobium tetragonum; Salix seedling/sp

CSR: C: 3.29 S: 2.59 R: 1.16

Plot 18: Transect 2 Q8 29Jun2015

CVS: class 28

ELL: Light 6.8; Wetness 7.0; pH 6.4; Fertility 5.1

CSR: 1 species with no data: Filipendula vulgaris

CSR: C: 3.37 S: 2.43 R: 1.56

Plot 19: Transect 2 Q9 29Jun2015

CVS: class 19

ELL: Light 6.8; Wetness 7.0; pH 6.6; Fertility 5.6

CSR: 1 species with no data: Salix seedling/sp

CSR: C: 3.53 S: 2.42 R: 1.63

Plot 20: Transect 2 Q10 29Jun2015

CVS: class 28

ELL: Light 6.9; Wetness 6.4; pH 6.4; Fertility 5.1

CSR: 1 species with no data: Salix seedling/sp

CSR: C: 2.99 S: 2.86 R: 2.16

Group 0: NVC A 20May2016

NVC: MG4b 56.86

NVC: MG4v2 55.58

NVC: MG8v2 55.53

NVC: MG8a 55.35

NVC: MG4a 54.64

NVC: MG4 53.10

NVC: MG5a 52.06

NVC: MG8b 51.91

NVC: MG5 51.32

NVC: MG5b 50.47

Group 1: NVC B 20May2016

NVC: MG8c 40.08

NVC: MG8v2 38.65

NVC: M22b 37.69

NVC: MG8b 37.19

NVC: MG8a 37.04

NVC: MG4c 36.32

NVC: MG4d 35.93

NVC: MG14 35.86

NVC: MG14b 34.57

NVC: MG6d 34.53

Group 2: NVC C 20May2016

NVC: MG4a 47.91

NVC: MG5b 47.86

NVC: MG4b 47.58

NVC: MG3 47.17

NVC: MG4 47.00

NVC: MG5c 46.98

NVC: MG5a 46.69

NVC: MG5 46.59

NVC: MG3b 46.12

NVC: MG8d 45.63

Group 3: Transect 1 06Jun2016

NVC: MG4a 65.99

NVC: MG4b 64.97

NVC: MG4 64.48

NVC: MG4v2 61.03

NVC: MG5a 60.59

NVC: MG8a 60.51

NVC: MG5 59.39

NVC: MG5b 58.99

NVC: MG5c 56.34

NVC: MG3b 55.92

Group 4: Transect 1 29Jun2015

NVC: MG4a 64.96

NVC: MG4b 62.78

NVC: MG4v2 62.29

NVC: MG8a 60.76

NVC: MG4 59.88

NVC: MG5a 59.48

NVC: MG5 58.84

NVC: MG8v2 57.89

NVC: MG5b 57.69

NVC: MG8d 54.35

Group 5: Transect 2 29Jun2015

NVC: MG1c 36.31

NVC: MG9 34.84

NVC: W24a 33.60

NVC: M27b 31.92

NVC: OV26 31.78

NVC: MG9a 31.39

NVC: OV26a 31.16

NVC: MG9b 31.10

NVC: W24 30.91

NVC: S18 30.59

Appendix 2 – Dipwell Survey Results

Dipwell number	OS Grid Ref	Eastings	Northings	Date of installation	Height at time of installation
1		51.639829	-1.97959	02/11/2015	38.5cm
2		51.63812	-1.97839	18/10/2016	100cm

Dipwell number 1	Date	Depth to water table / cm		Dipwell number 2	Date	Depth to water table / cm	
1	04/12/2015	36		2	01/11/2016	81.5	
1	05/01/2016	6		2	16/11/2016	43	
1	31/03/2016	13.5		2	09/12/2016	6	
1	06/06/2016	>38.5		2	27/12/2016	4	
1	01/11/2016	>38.5		2	30/01/2017	-5	
1	16/11/2016	>38.5		2	28/02/2017	-4	
1	09/12/2016	>38.5		2	31/03/2017	14	
1	27/12/2016	>38.5		2	12/05/2017	49	
1	30/01/2017	>38.5		2	13/06/2017	31	
1	28/02/2017	>38.5					
1	31/03/2017	>38.5					
1	12/05/2017	>38.5					

Appendix 3 – Management Information

Year	Date of hay cut	Dry yield (no. bales)	Type of bales	Size of bales	Observations on impact of vehicles on site	Date animals on site	Date aminals removed	Number of animals	Type of animals	Sward height when animals removed	
2015	21-Jul	30	Hay	120cm x 90cm x 250cm	None - cut and removed when dry	10/09/2015	24/09/2015	11	Cows		Grazed alongside Bridge Field, Ditch Field and Eleven Acres
								11	Calves		
								1	Bull		
						30/09/2015	13/10/2015	11	Cows		Grazed alongside Ditch Field and Mrs Ody's
								11	Calves		
								1	Bull		
						13/10/2015	03/11/2015	16	Cows		Grazed alongside Ditch Field and Mrs Ody's
								11	Calves		
								1	Bull		
2016	21-Jul	22	Hay	120cm x 90cm x 250cm	Compaction around gateways where wet	13/08/2016	19/08/2016	24	Cows		Grazed alongside Long Meadow, Swillbrook, Side Ham, Ham Ground, Eleven Acres, Bridge Field and Ditch Field
								23	Calves		
						19/08/2016	20/08/2016	24	Cows		Grazed alongside Washpool Ground, Bridge Field, Ditch Field andThe Drive East
								23	Calves		
								1	Bull		
						20/09/2016	27/09/2016	10	Steers		Grazed alongside Ditch Field
						27/09/2016	06/11/2016	25	Steers and heifers	5.4cm	Grazed alongside Ditch Field