

Manhood Wildlife and Heritage Group



Fixing and Linking Our Wetlands (FLOW) Project
Selsey Parish
Ditch condition assessment results and habitat
improvement plan 1.0

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Manhood Wildlife and Heritage Group
March 2021



Broad Rife, Selsey, May 2020 © Jane Reeve

Acknowledgements

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Thanks, also go to the volunteers who attended ditch assessment training and then spent many hot and humid, as well as cold, wet, and windy days walking the fields of Selsey Parish looking at the ditches and hedges. Specific thanks should go to David Wyatt for his time in creating most of the maps in this report, as well as walking many kilometres of ditches surveying for us.

Thanks to CDC, WSCC and the EA for all their help and support and all the information that they provided.

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Acronyms and abbreviations

Name	Acronym
Area of Outstanding Natural Beauty	AONB
Cabinet Office Briefing Room	COBR
Chichester District Council	CDC
Chichester Harbour Conservancy	CHC
Department for Environment, Food & Rural Affairs	DEFRA
Environment Agency	EA
Fixing and Linking our Wetlands	FLOW
Geographical Information System	GIS
Local Wildlife Site	LWS
Manhood Peninsula	MP
Manhood Peninsula Partnership	MPP
Manhood Peninsula Surface Water Management Plan	MPSWMP
Manhood Wildlife and Heritage Group	MWHG
National Lottery Heritage Fund	NLHF
Natural England	NE
Operation Watershed	OW
Sussex Biodiversity Records Centre	SxBRC
Southern Water	SW
Trust for Conservation Volunteers	TCV
West Sussex County Council	WSCC

Executive Summary

The National Lottery Heritage Fund (NLHF) Fixing and Linking Our Wetlands (FLOW) study of the Selsey Parish ditch system took nine months to complete and used a scoring system to analyse the main attributes of the ditches. This included drainage, environmental and biodiversity aspects. In this time 65 ditches and waterways were surveyed which totalled approximately 35 kilometres and this is illustrated in Figure 4.

This map also shows that there were some areas where access was a challenge, and the project was not able easily to survey the ditches and hedges. This is on intensely farmed agricultural land and while the landowner did permit access, the conditions were difficult to meet and in reality, it was not practically possible.

Where they were associated with a ditch, 13 kilometres of hedgerows were also surveyed, and ash tree locations noted.

The majority of the ditches were found to be in good or moderate condition, and it was clear that the main landowners do manage the ditches on their land. Most have a system of rotational management and these ditches tended to have the better vegetation structure and diversity.

Opportunities were found for improvements in the water storage capacity of the ditch system during high rainfall events that would also provide better wetland habitat. Other locations were found for pond enhancements that could provide better water storage. Putting small interventions like this into the system could make a difference during high rainfall events by just holding back a low percentage of the water.

10 opportunities for drainage and environmental improvements can be seen in Figure 20 which range from improving vegetation diversity to cutting back shading trees and digging out old relic ponds.

Feedback will be offered to all the landowners about the survey findings on their land with advice and ideas for improvements.

The Selsey Parish has a ditch system that is extensive and in the main has been well looked after by its landowners. The parish drainage has been affected by the relatively new Medmerry realignment scheme, and the broad rife plays a key role in carry water away from the ditch system to the sea.

The Town Flood Group have been active in identifying and addressing areas of flooding, but the FLOW team did find some small opportunities to make drainage and environmental improvements. In the long term these could become attractive assets to the parish and be monitored and maintained by landowners and the community.

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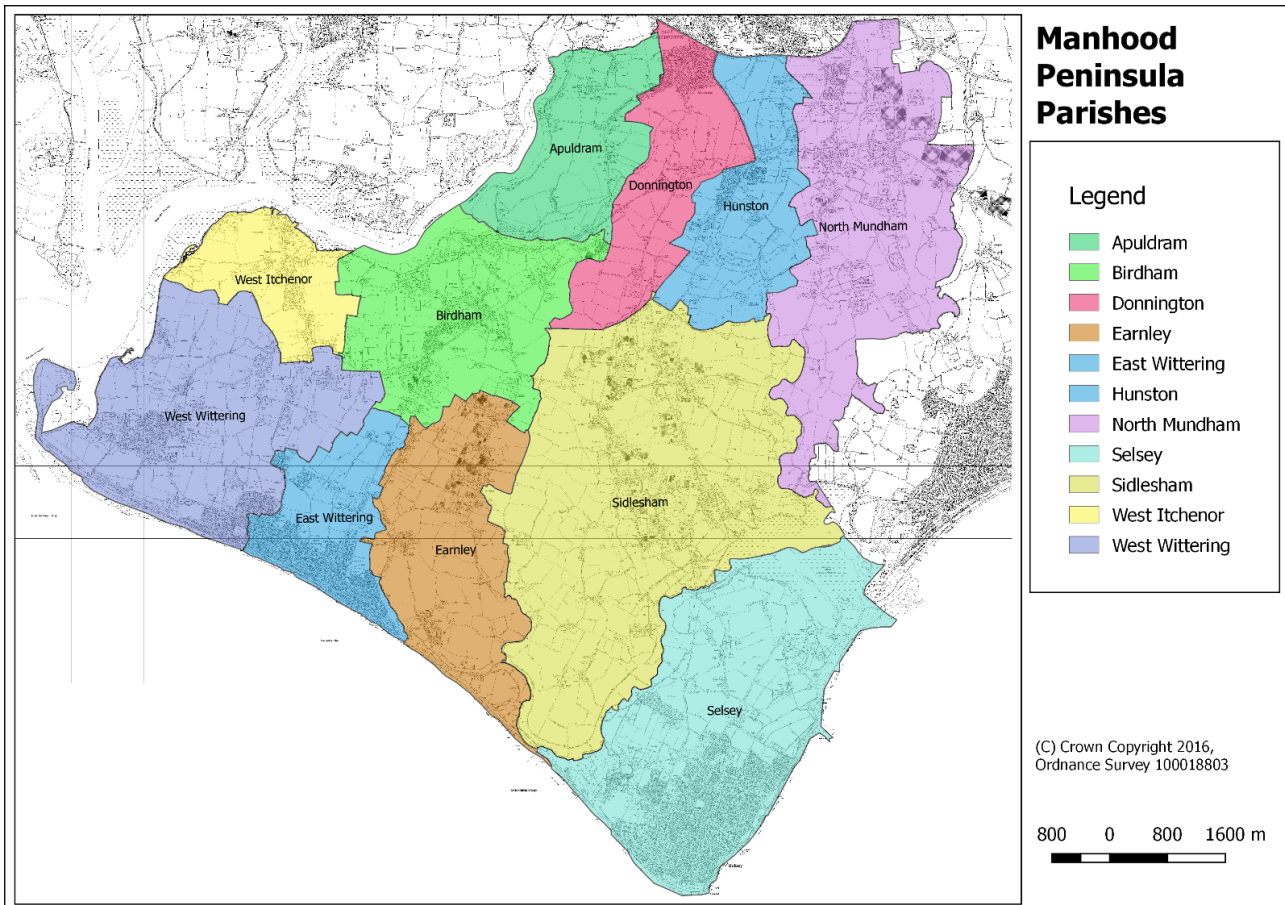
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1. Introduction to the FLOW Project

Fixing and Linking Our Wetlands, FLOW, is a NLHF Project to carry out a complete condition assessment of all the wetlands on the Manhood Peninsula (MP), conduct hedgerow surveys, where they are associated with ditches, of the Parishes, and develop costed management plans to help identify and prioritise improvement.

Figure 1: FLOW Project area



Ditches and waterways form a large, linked habitat on the MP, that connect the internationally important sites of Pagham Harbour, Medmerry and Chichester Harbour, and their care and upkeep is not just of benefit to wildlife but increasingly to local communities, as more frequent flooding events take place. Well maintained ditches, ponds and rifes allow water to be stored or flow away to the sea, reducing the risk of flooding and providing a stable and important home to many species, including the fast-declining water vole (Strachan 2011).






Repeated flooding events in 2012, 2013 and 2014 highlighted the need to address the condition of the wetland system. Responsibility now rests with riparian owners who may require encouragement, information, and support to identify and tackle what needs doing. The dissolution of the local Internal Drainage Boards (IDBs) and Districts (IDDs) by DEFRA in this area means that they have stepped back from much of the management of ditches and waterways that they traditionally carried out and, again, riparian owners have had to take over.

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WSCC published the Manhood Peninsula Surface Water Management Plan (MPSWMP) in July 2015, written by CHM2Hill consultants. They have stated that *'Given the scale and length of the drainage network in the Manhood Peninsula, it is not possible or practicable for a single body to ensure that every part of the drainage system is fully functioning. There is simply insufficient resource and funding available for this to happen'*. The role of the FLOW team is to have an overview of the parishes and to work with and advise different riparian owners, small and large about wetland management while also working with the diverse range of agencies that also have an interest in this area.

The MPSWMP recommendations support the work that FLOW intend to carry out by engaging the local community, advising riparian owners, identifying areas for improvement, and managing that work. The recommendations were as follows:

'In the longer-term ongoing management and maintenance will be critical to manage flooding. The MPSWMP identified five principles which are considered the fundamental elements to ensuring continued long-term maintenance and management of the drainage system across the Manhood Peninsula:

-  *ditch clearance remains the responsibility of riparian owners and landowners;*
-  *local communities have a key role to play;*
-  *runoff into the ditch network needs to be controlled;*
-  *the continuity of the ditch network is critical, and;*
-  *a consequence-based approach should be adopted (i.e. focusses on the critical parts of the drainage network).*

The ongoing management and investment should be based around four key themes:

-  *the importance of land drainage consents to prevent culverting or infilling of watercourses where it will increase flood risk;*
-  *the need to control runoff from new developments;*
-  *the requirement to continue maintaining watercourses, culverts and highway drainage on a cyclical basis, and;*
-  *the need to control runoff from glass houses on the Manhood Peninsula.*

The objective is to ensure that the drainage system is managed and maintained on a proactive, cyclical basis to ensure it is functioning as intended. This can be achieved through an annual walkover survey of the critical drainage routes to identify their condition, maintenance requirements and any land drainage consent issues. This should take place in late autumn to allow vegetation die back following the summer, but also to identify any remedial measures before the wet winter months when the Manhood Peninsula is primarily affected by flooding'

Hedges are another important habitat as they are abundant but frequently over-managed and overlooked on the MP, often originally relic pieces of woodland, they act as important green infrastructure. The hedges in this area are often associated with a drainage ditch and these form the boundaries to fields. The two combined offer good wildlife corridors and connect the designated areas of Pagham and Chichester Harbours, and Medmerry. Hedgerows, whether related to ditches

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or not, can be targeted for improvement to combat soil erosion and reduce surface water movement across agricultural land which is an important factor in overall water management.

MWHG received funding from the NLHF to carry out the FLOW Project. The project aims to gain a working understanding of the ditch network across the peninsula by assessing the condition of the ditches which form it. An action plan of suggested improvement work will be produced, focusing on reducing the impact of flooding and enhancing biodiversity. Some of the work outlined may be carried out as part of the FLOW project. In addition to the main focus on the wetland network, the project will look at other important habitats across the peninsula including hedgerows and rough grassland. These will inform Chichester District Council (CDC) Green Infrastructure maps which investigate habitat provision and connectivity specifically for water voles, bats and barn owls.

Many of the ditches and hedges outside of the protected areas have been neglected and this will continue unless the issues arising in the wider environment are addressed. The area offers a discrete opportunity for demonstrating the importance of the Lawton Report (2010) suggestions and thus would contribute to enhancing not only the habitats and their associated species but would increase resilience in the face of climate change and provide an example for others to follow.

2. The National Lottery Heritage Fund Grant

The National Lottery Heritage Grant for the Fixing and Linking Our Wetlands Project (FLOW) (HG-14-06996) was awarded in June 2015 to the Manhood Wildlife and Heritage Group to carry out the Development Phase from September 2015. This lasted until 31st May 2016 and the time was spent on a Pilot study area, West Wittering, developing, and refining the projects aims, objectives and activities, reviewing the budget and understanding which outputs would be useful and achievable.

In October 2016, the MWHG were awarded a grant from the NLHF to continue the project until March 2021 and therefore the ditches and hedges in the remaining parishes were to be surveyed and mapped with a view to improvement. This covers the parishes of Apuldram, Donnington, Earnley, Hunston, North Mundham, Selsey and Sidlesham*, and allows a comprehensive picture of the condition of the waterways, and potential improvements, to be seen. This end date was extended to the end of June 2021 due to delays caused by the pandemic in 2020.

While the parishes of West Itchenor and Birdham are not being surveyed, they are being included in wetland improvement works and projects being supported by volunteers and consultancy input by FLOW staff.

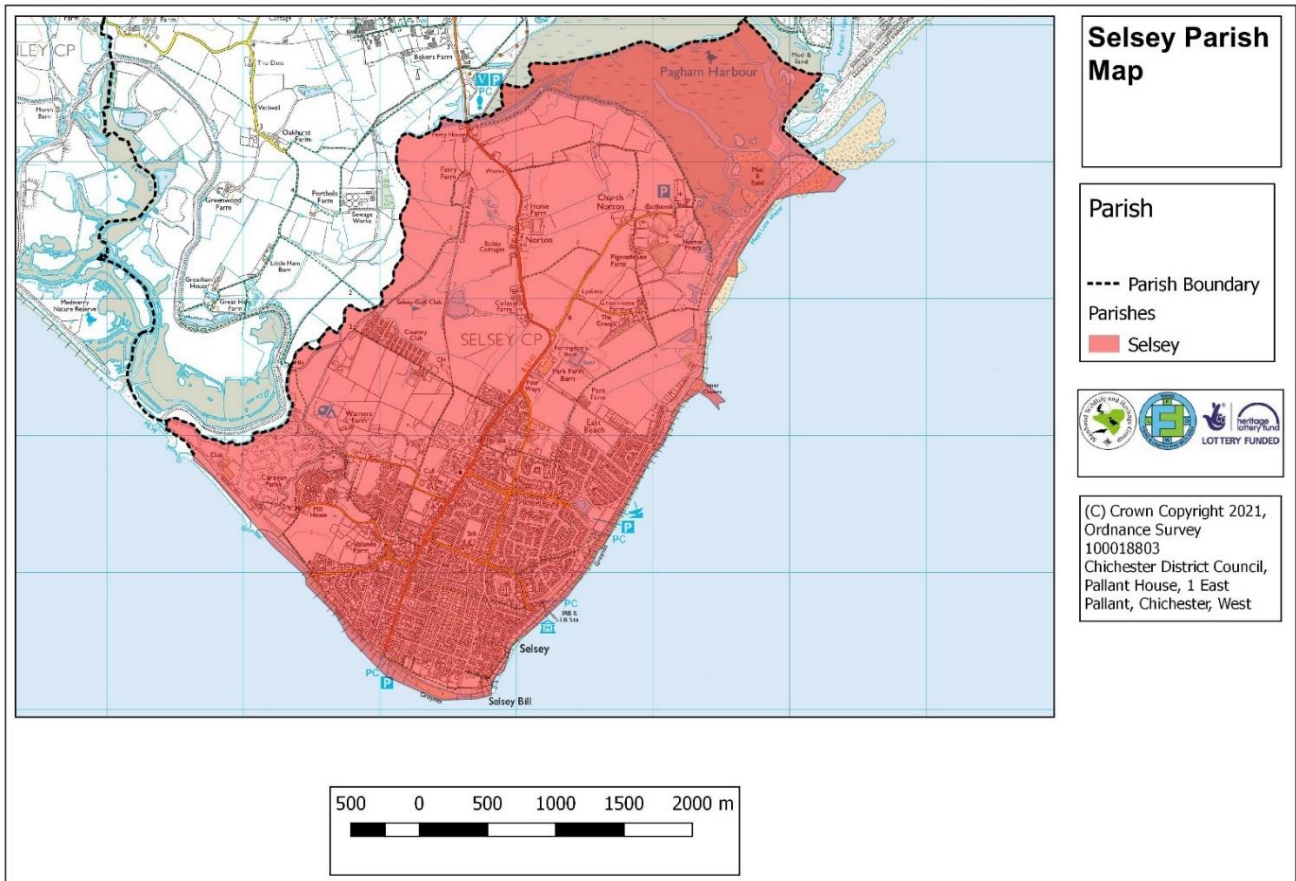
* Birdham and West Itchenor parishes were previously surveyed in 2013 and 2014 as part of an independently funded wetlands project.

3. Selsey Parish

i General information about the parish

Selsey is the sixth parish to be surveyed as part of the FLOW survey schedule and the seventh to be surveyed since 2014 when grants from CHC, CDC and MPP funded ditch assessment projects in the parishes of Birdham and West Itchenor, following significant flooding in previous years.

Figure 2: Selsey Parish boundary



Selsey Parish is made up of one main urban residential area, Selsey Town, at the southern tip of the MP, with boundaries on the north and west bordering Sidlesham and Earnley. The land is flat and predominately supports large scale intensive arable farming with a large salad packing plant and business headquarters.

To the north the parish is bordered by Pagham Harbour Nature Reserve, managed by the RSPB, and made up of habitat with internationally recognised protective designations. This site attracts many local visitors as well those from further afield, especially ornithologists during periods of bird migration or when a rare species is seen.

Selsey is a large parish, approximately 12.28km², with one main river (rife), bordering the western edge, carrying water from farm drainage ditches that create a web across the land, to the sea at Pagham Harbour and Medmerry.

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A number of rifes from the MP terminate at the Medmerry coastal realignment scheme, created in 2011, with water passing under the new sea wall via flaps and valves into the new intertidal area. As part of the development of the scheme, large water storage and holding areas were created on the land side of the sea wall to tank the water from the rifes during high tide when the water could not escape. These large wetland areas tank water during high rainfall events allowing the rifes to continue to drain water away from the parish roads and properties.

ii Recent flooding events and parish action

In 2012, 2013, 2018 and 2019 the MP suffered from severe flooding events and many local parish flood groups have been extremely active in investigating and remedying the causes of this flooding. Through the Parish Councils and WSCC (through Operation Watershed and Highways) funding was made available for drainage improvement projects and this has benefited Selsey.

In 2016, levels work funded by WSCC OW, was carried out in Golf Links Lane to understand which way the ditches ran, how deep they were and how to improve flow as surface water flooding was an issue in this area.

A summary of flood issues and their status identified in the MPSWMP (2015) commissioned by WSCC and updated in December 2017 is seen below.

Investment strategy: Maintain					
Ref (in priority)	Type of measure	Description	Status	Action owner	Status Dec 2017
SELS_001	Maintenance	Ensure the highway drainage route along High Street is clear to reduce flood risk to the highway and properties.	Proposed	WSCC	WSCC still to progress. Jetting / investigation work needed.
SELS_002	Investigation	Investigate drainage route on Elm Tree Close and take remedial action where defective.	Proposed	WSCC	WSCC still to progress. Jetting / investigation work needed.
SELS_003	Maintenance	Monitor the highway drainage and ditches on the B2145 because it is the only road out of Selsey and therefore is critical infrastructure for the town.	Ongoing	WSCC	On-going.
SELS_004	Investigation	SW is undertaking a Drainage Area Plan for Selsey which will identify sewerage flooding issues and identify remedial measures.	Complete	SW	Drainage Area Plan for the catchment is complete and summary report circulated. Schemes to resolve sewer related issues are identified. The prioritisation and delivery of improvement schemes will be based on risk relative to other issues across the region and funding priorities determined by customer engagement.

4. Methodology

i. Access and initial information

Following contact with the Chair of the Selsey Flood Action Group, a meeting was held to confirm land ownership and access of land in Selsey. In addition, information was sought about the parish drainage and any associated issues. The Chair of the Selsey Flood Action Group was able to provide comprehensive information, the result of all the flood group work, about the landowners, the rifles, flooding issues, current flood reduction schemes and contact details.

Access was granted by all the landowners approached and in theory good coverage was to be allowed to most of the parish. Unfortunately, with time pressures, the availability of volunteers, the conditions imposed for access by one landowner, meant that some areas were not surveyed, and this can be seen in Figure 5.

ii. Ditch and pond surveys

A Ditch Condition Assessment sheet (Appendix i) was developed to capture a wide range of information on the ditches and ponds surveyed. These surveys have been designed to give a rapid assessment of a wide range of information including the physical attributes of each ditch (bank profile, water availability, storage capacity, conveyance potential etc), the emergent and bankside vegetation structure, historical and current management observations, and surrounding land use. In addition, information on flow regimes and direction were recorded along with any additional information relevant to each survey site and a detailed sketch was completed. No survey was undertaken without landowner permission, which was granted by all those approached as part of this parish evaluation. All surveys were undertaken between March and September 2018.

The information gathered was 'scored' to enable comparisons between ditches. In order to produce maps of the results a traffic light system was developed with red as "poor", amber as "moderate" and green as "good". However, it should be noted that this scoring system is relative and as such does not imply an overall status but rather the specific ditch's condition relative to others surveyed.

Whilst the long-term intention of the FLOW project was to train volunteers from each Parish to undertake much of the survey work, and long-term management of improved areas, only a couple of local residents were successfully engaged to get involved at this stage of the project.

All data was compiled into Microsoft Excel Spreadsheets before being used to create maps of the parish using Geographical Information System (GIS), specifically, QGIS (Wein QGIS 2:18.3 2020).

iii Hedge surveys

The FLOW project used a shorter hedgerow survey form provided by the Sussex Biodiversity Records Centre, adapted to identify potential dormice habitat (SxBRC), to create a summary that documents the tree species within the hedge along with its overall structure and shape and the surrounding land use. This hedge survey form was completed when carrying out ditch surveys with

the priority to do a hedge survey where they were associated with ditches. Other hedges were captured where it was easy to do so.

The information collected has been shared with the SxBRC to be added to the regional database. In addition, locations of hedge surveys have been mapped using QGIS and opportunities to in-fill gaps, create new hedgerows or implement more sensitive hedgerow management have been identified.

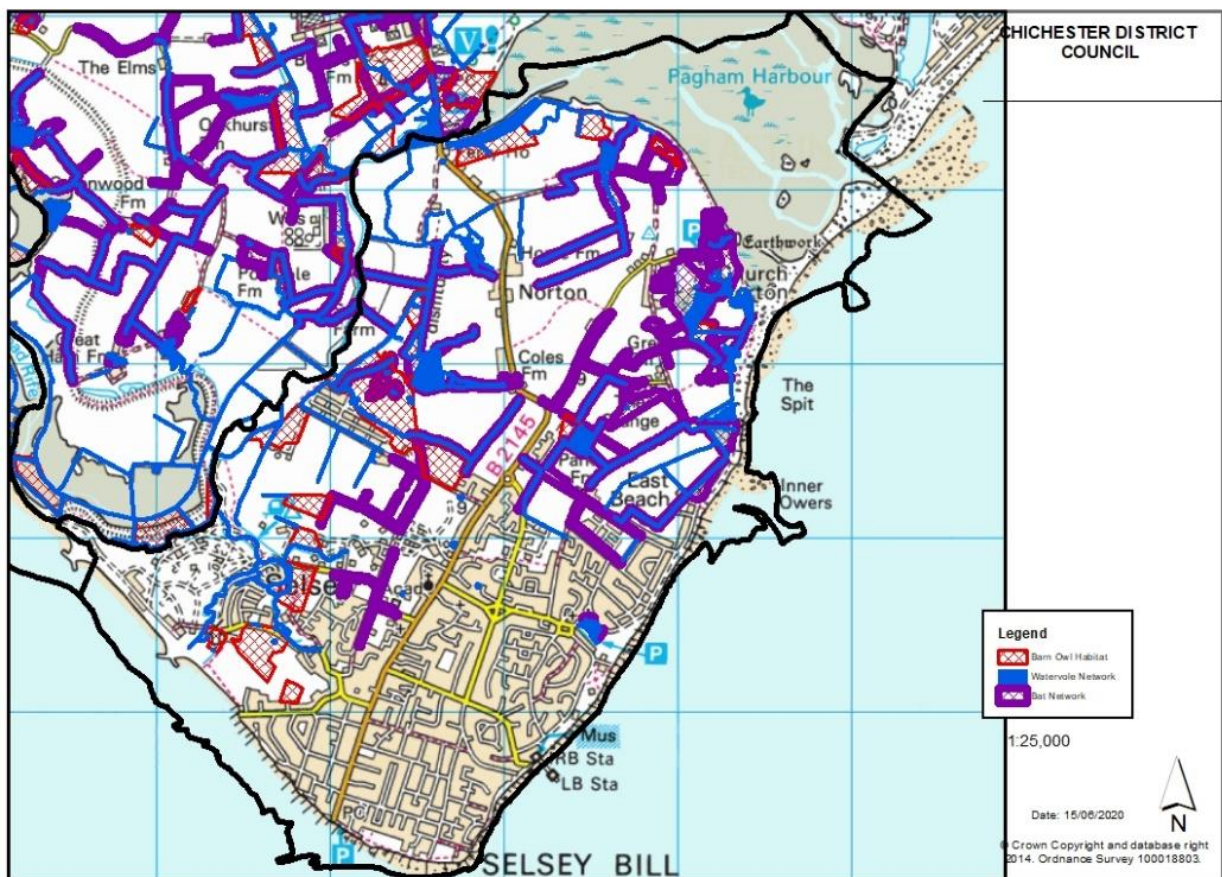
iv CDC Green Infrastructure maps

In 2013 CDC carried out a desk-based study mapping three key habitats on the MP: waterways, rough grassland, and hedgerows and connected woodlands. Data was used from the SxBRC, ecological surveys submitted through Planning applications and enquiries, local Biodiversity Action Plans and any other information that could be used. The data focussed on the waterways network with water voles (*Arvicola amphibius*) in mind, the hedges/tree network for bats and rough grassland habitat for barn owls (*Tyto alba*).

As part of this Parish Survey, the FLOW project volunteers have ground-truthed these maps to give an indication of their accuracy for habitat associated with the target species.

Figure 3. shows the ecological habitats marked up across the MP and this were examined during the fieldwork to see if they were still in existence. The results can be seen in section 9.iv Other Environmental Issues Found: CDC Green Infrastructure maps.

Figure 3: CDC Green Networks map – provided by CDC



v. Ash tree (*Fraxinus excelsior*) census

At the request of the Tree Council, who were asked by the Cabinet Office Briefing Room (COBR), the presence of Ash trees on the MP have been recorded as this is currently the only area of the UK not to have a confirmed report of Ash Tree dieback. Ash tree locations were recorded on a hand-held Global Positioning System (GPS) and this information will be passed in an MS Excel spreadsheet.

5. Sources of information

Information on drainage, the environment and flooding within the parish of Selsey has been gained locally from the Town Council, landowners, Chichester District and West Sussex County Councils and the Environment Agency. Another source of important local information was the Selsey Flood Action Group who helped with landowner details where they were not known.

Chichester District Council provided an Ordnance Survey License to enable mapping of results along with a number of local, relevant GIS layers. West Sussex Highways Authority granted access to GIS information regarding the local area (utility locations, agricultural land grading information, hedgerow information and other historical information) and allowed these to be printed. Further GIS based information has been obtained from the Open Access, Environment Agency website. NE data sets were also used to look at designated area boundaries, key species locations, habitat mapping and which farms are in stewardship.

Parish Tithe Maps were purchased from WSCC Records Office to inform on the historical location of features which could be reinstated or improved and the WSCC Manhood Peninsula Surface Water Management Plan (MPSWMP 2015), provided information about the flooding and drainage problems of Selsey. This has informed us of specific issues within the parish and enabled us to look more closely at and in those areas.

The individual landowners that we approached about access to their land were asked about detailed information on their ditches, the flow direction, historic and recent management, capacity, etc. Where possible we asked them to give us field maps with ditches marked on and to have a tour with them of their land.

6. Results

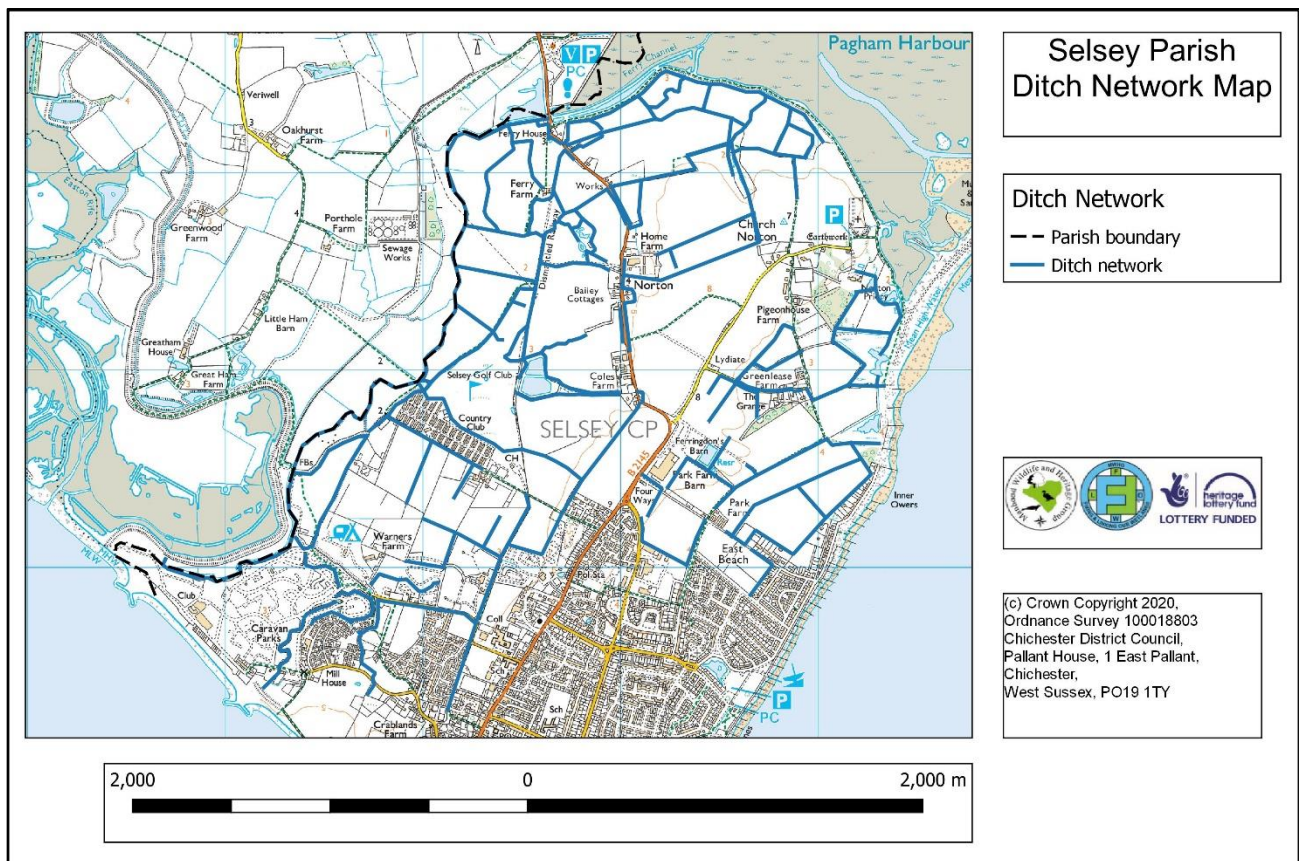
With the help of the Chair of the Flood Group and the landowners, we managed to survey many of the sites that we sought permission for, getting good coverage of Selsey Parish.

Where a landowner gave us permission to access their land and to carry out surveys, we tried to get complete coverage of that area, without concern for the parish boundary. We did this so that the full picture of the ditch system could be gained where possible and to ensure that we only had to ask permission for access once.

All landowners have been offered feedback about the findings and this took the form of conversations and written reports where they were requested.

The total length of ditches surveyed was approximately 35km, and un-surveyed was 15 km.

Figure 4: Selsey ditch network



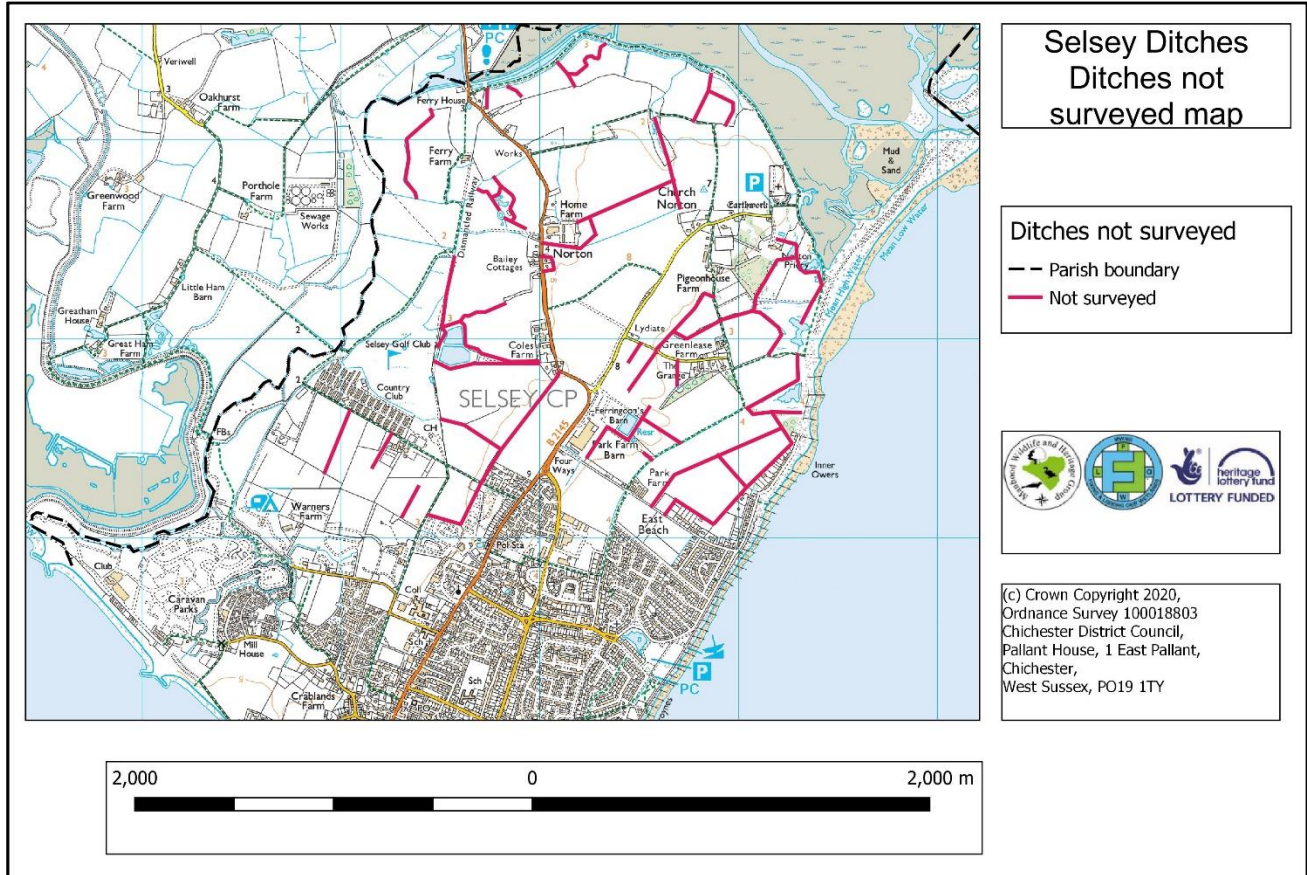
The main ditches have been mapped and can be seen generally to the north of the parish on the agricultural land.

There were also ditches that the project was unable to survey and they can be seen in Figure 5.

This map shows that there were significant areas where access was a challenge, and the project was not able to easily survey the ditches and hedges. This was on the intensely farmed agricultural land and, while the landowner did permit access, the conditions imposed were so difficult to meet that in

reality it was not possible. There were also a few ditches were not surveyed in detail due to practical and visibility difficulties (e.g., overgrown vegetation and behind high fences).

Figure 5: Selsey ditches not surveyed



i Overall results of ditches surveyed

The table below summarises the survey statistics from the ditch condition assessments (see Appendix 1 for ditch condition assessment form used).

Attributes surveyed			%	Notes
Average Ditch Score		24	10	131 ditches surveyed
Length of ditches surveyed		35km		
Total good ditches (score >40)		4	3	
Total moderate ditches (score >21-40)		89	75	
Total poor ditches (score <21)		26	22	
Ditches which remain wet throughout the year		33	28	
Ditches which are seasonally dry		47	39	
Unknown water availability		40	34	
Relative ditch capacity	very high	4	3	
	high	4	3	
	moderate	18	15	
	low	2	2	
	very low	91	76	
Ditches with concrete or boarded sides		0	0	
Buffer width	Very wide (>4m)	6	5	

Attributes surveyed			%	Notes
	Wide (2.1-4m)	12	10	
	Moderate (1.1-2m)	50	42	
	Narrow (0.1-1m)	51	43	
	Not present	0	0	
Average buffer size 1.8 = moderate (1.1-2m)				
Ditches observed with moderate to high bank erosion on one or both sides		0	0	
Litter	none recorded	72	60	
	litter present	36	30	
	litter abundant	11	10	
Vegetation diversity	high (>5 types)	8	7	Average number of types per ditch 2
	moderate (3-4 types)	35	29	
	Low (<3 types)	76	64	
Riparian vegetation	Absent	2	1.5	
	Present	129	98.5	
	2 or less	69	53	
	3 or more types	49	37	
Channel vegetation	present	51	39	
	absent	80	61	
Ditches not managed on rotation				
Heavily shaded ditches (>80% shaded)		10	8	
Moderately shaded ditches (40—80% shaded)		46	39	
Ditches with little/no shading (<40%)		63	53	
Thick layer of sediment		22	18	
Ditches with hedge on one or both sides		43	36	

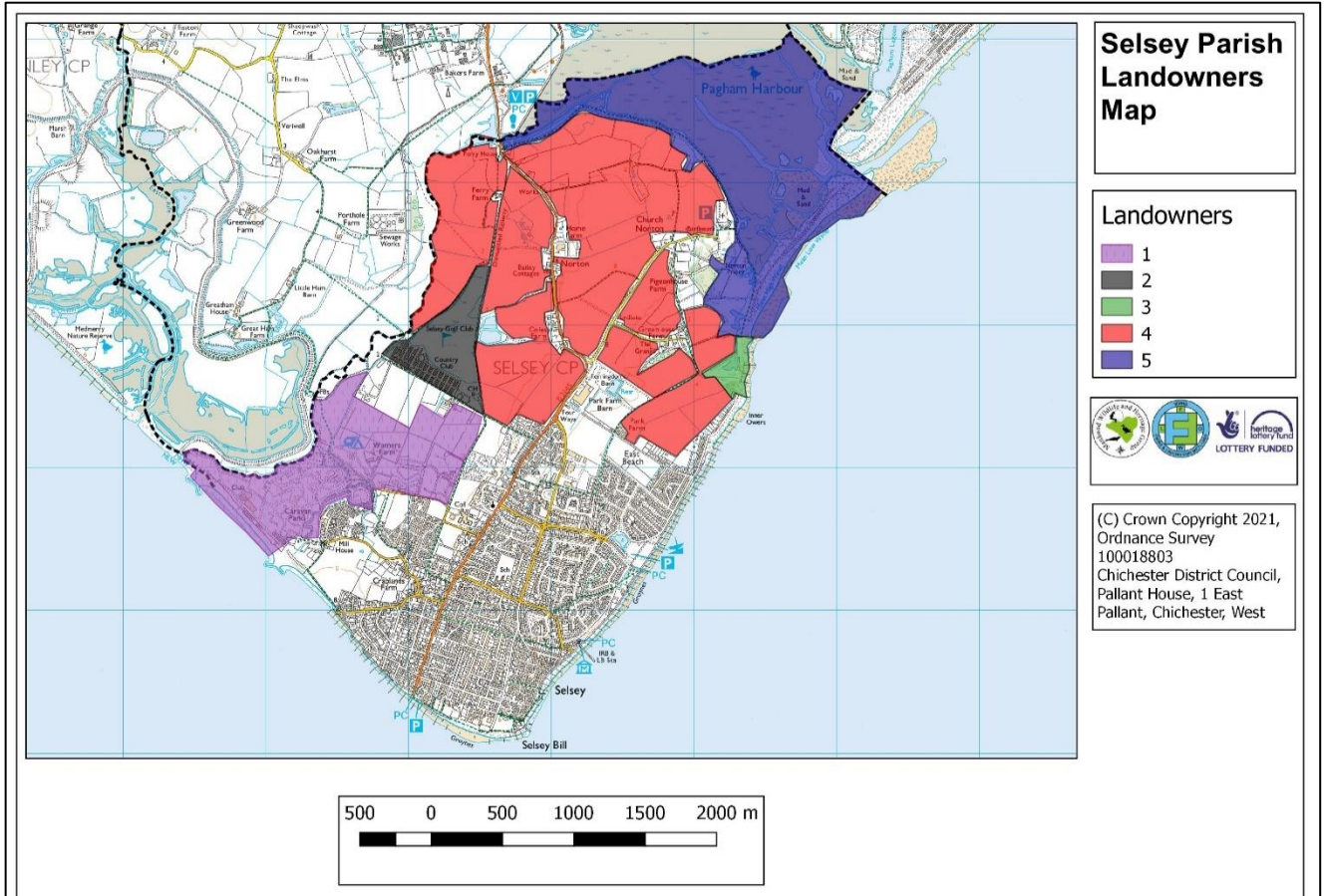
These survey results have been used to create maps in the rest of this section and in **7. Discussion** and **8. Opportunities for improvement works**.

ii Landowners

Selsey Parish is made up of 1 significant commercial landowner that owns and farm the arable land left in the parish. It was the larger land areas that we targeted as we wanted to study the network of waterways for drainage attributes and biodiversity value. Figure 6 shows the landowner plots surveyed.

There are field areas on the map that have not been covered (in white) because the fields did not have ditches, and therefore we did not seek access to the land, or the fields were small and individual owners could not be identified. This totalled a small amount of land.

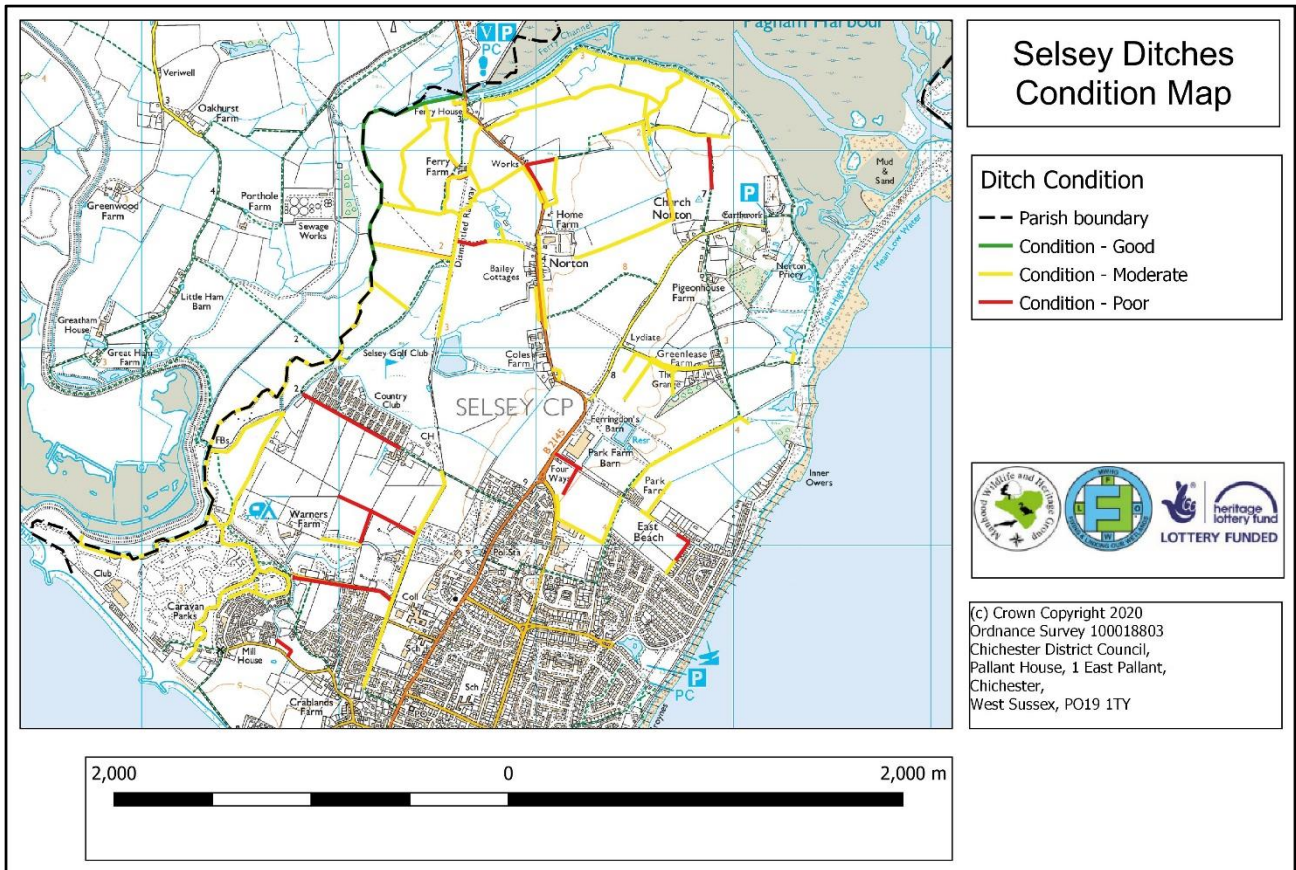
Figure 6: Landowners involved in the FLOW project in Selsey Parish



iii Condition of the ditches across the Parish

Using the scoring system, we were able to see which areas had ditches with high scores and were considered in good condition, and those with low scores and possible problems. Most of the ditches fell into the ‘moderate’ category – some of which had potential for improvement but others, which due to their location, original role, physical attributes, or neighbouring land management could not be improved.

Figure 7: Condition Assessment of ditches in Selsey



A high scoring ditch would be one that was large, had water all year round, good vegetation cover on the banks, had a range of vegetation in the water and on the banks, and which also had a hedge associated with it.

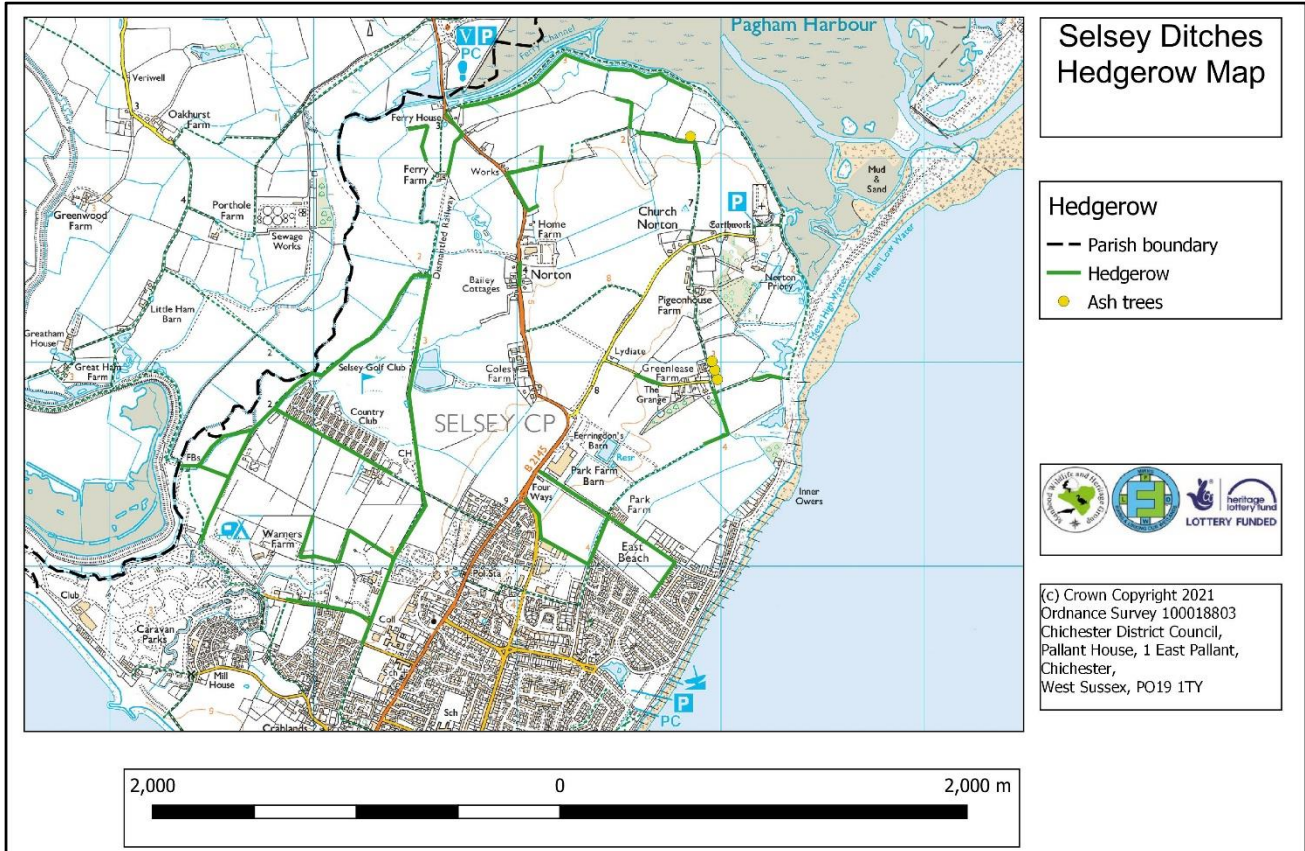
Poor ditches varied from being completely overgrown with bramble so that they could not be seen, to being very shallow, bare earthed and dry most of the year. Most ditches were seen with vegetation on either one or both sides and none had been over managed with complete vegetation removal.

iv Hedges surveyed across the Parish

The hedges surveyed were primarily those associated with ditches and 44 hedges were assessed and recorded, which totalled over 13 kilometres in length.

The hedges ranged in age, structure, and management, with 55% containing bramble (*Rubus sp.*), 73% with Hawthorn (*Crataegus monogyna*), 18% with Blackthorn (*Prunus spinose*), and 27% with English Oak (*Quercus robur*) as is typical for the area.

Figure 8: Surveyed Hedgerows in Selsey



There were other tree species recorded, as seen below, and the percentage of hedges with them is also shown (where it was over 5%):

- Willow (*Salix sp.*) (20%)
- English Elm (*Ulmus minor var. vulgaris*) (9%)
- Ash (*Fraxinus excelsior*)
- Field Maple (*Acer platanoides*)
- Sycamore (*Acer pseudoplatanus*)
- Sweet Chestnut (*Castanea sativa*)
- Gorse (*Ulex europaeus*) (13%)
- Poplar (*Populus sp*) (9%)
- Elder (*Sambucus nigra*)
- Crab Apple (*Malus Sylvestris*)
- Cypress sp
- Cedar sp.

Other plants species of significance seen within the hedge were fern sp.

Species of tree absent that have been found in hedges in other MP parishes:

- Hazel (*Corylus avellana*)
- Whitebeam (*Sorbus aria*)
- Silver Birch (*Betula pendula*)
- Holly (*Ilex aquifolium*)
- Spindle (*Euonymus europaea*)
- Wild Cherry (*Prunus avium*)
- Alder (*Alnus glutinosa*)
- Rowan (*Sorbus aucuparia*)
- Dogwood (*Cornus sanguinea*)
- Whitebeam (*Sorbus aria*)

v Ash tree census

When walking the ditches and looking at hedges and the tree species within them, the location of Ash trees was noted. There were not many Ash trees seen in this parish as much of the land is open with few wooded areas. Where ash trees were seen they tended not to be standalone trees but, in a hedge, or adjacent to one. There were no signs of Ash dieback detected.

7. Discussion

The Manhood Peninsula Surface Water Management Plan (MPSWMP) 2015, commissioned by WSCC, focusses on flooding events that took place in 2012/2013 on a parish-by-parish basis. It looked at actions that needed to take place to reduce future flood risk and identified individual issues and problems. In Selsey there was an opportunity for the Town Council to meet with the authors of the report to talk through issues in the parish and many problems were reported and detailed actions taken for solutions. There were 4 actions detailed and 3 were taken by WSCC to investigate and progress and the remaining one was for Southern Water to examine as it involved sewerage flooding issues.

The FLOW project focussed its work on identifying opportunities to improve drainage and biodiversity opportunities on the farmland and more rural areas of the parish where ditch and ponds could be examined, and not land built up with culverts being used for drainage. The focus was on finding opportunities to hold water back that had both flood risk reduction and biodiversity benefits.

i Selsey's key waterways

As noted in the MPSWMP, primary conveyancing routes have been identified in the parish and their condition was focused on. These are *'the critical routes of the drainage network which will cause the most significant flooding to property and infrastructure if they are blocked or poorly maintained (NB: these routes include all of the Rifes, and builds upon the 'key transport routes' initially proposed by Royal Haskoning in 2006)'*

There is one main route for water to travel through to get out to sea and that is Broad Rife.

This rife is a large channel that picks-up water from farm drainage and roadside highways ditches and is key to the water storage and movement capacity of the drainage system of the parish. It is also key for environmental connectivity as it contains water for longer and has the potential to be a hotspot for wetland biodiversity with good management. This rife does not just drain water from Selsey Parish but also take water from Sidlesham into Pagham Harbour and Medmerry and acts as a wildlife corridor allowing movement of wetland species.

Broad rife flows into Pagham Harbour and extends into the saltmarsh and mudflats as main river. The main Harbour entrance between the Norton and Pagham spits is extremely dynamic shingle and changes with significant storms. The Harbour is slowly silting up with the material brought in from the rifes across the area and in the future, this may impede the drainage of the surrounding land and the ability of the water to get away.

These waterways need to be prioritised for any clearance and maintenance work as they are key to the conveyance of water. If they become blocked or are overwhelmed, they will have the largest impact on people, properties, and roads. Investigation of sites adjacent or connected to these that could be used as temporary water storage areas were explored.

Figure 9: Key Waterways map of Selsey

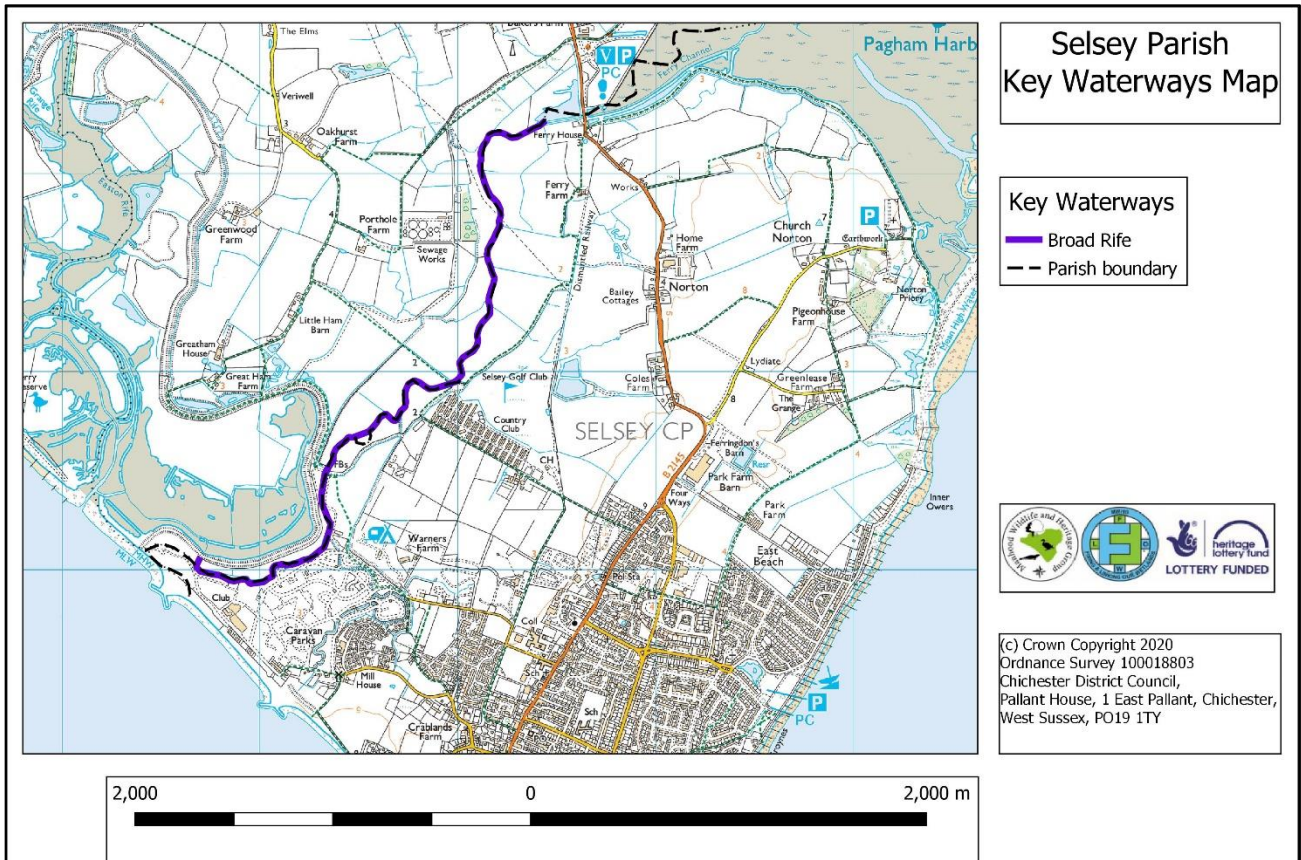
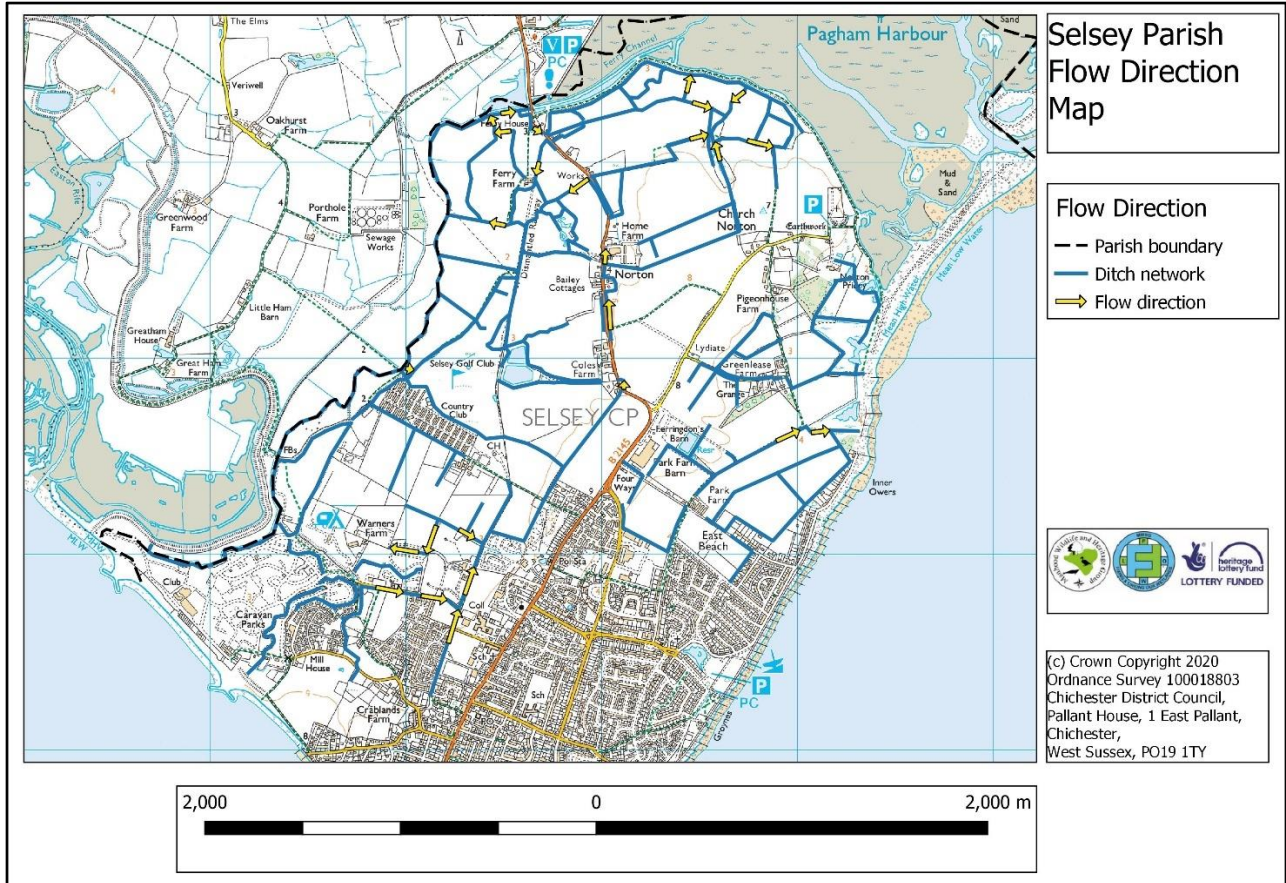


Figure 10 displays the flow direction, where it could be discerned. This was not always an easy piece of information to gather as the land on the MP and in the parish is so flat that often the ditch just holds the water, and it does not flow unless there is significant volume in the channel. Even then the surface of the water can look quite static while there is some flow underneath.

With the land having very little fall and therefore the water not necessarily moving with a significant force of gravity, the flow direction can change when the levels in the ditch change. This means that water in a ditch may run in one direction until it gets particularly high and then it changes direction and runs the opposite way.

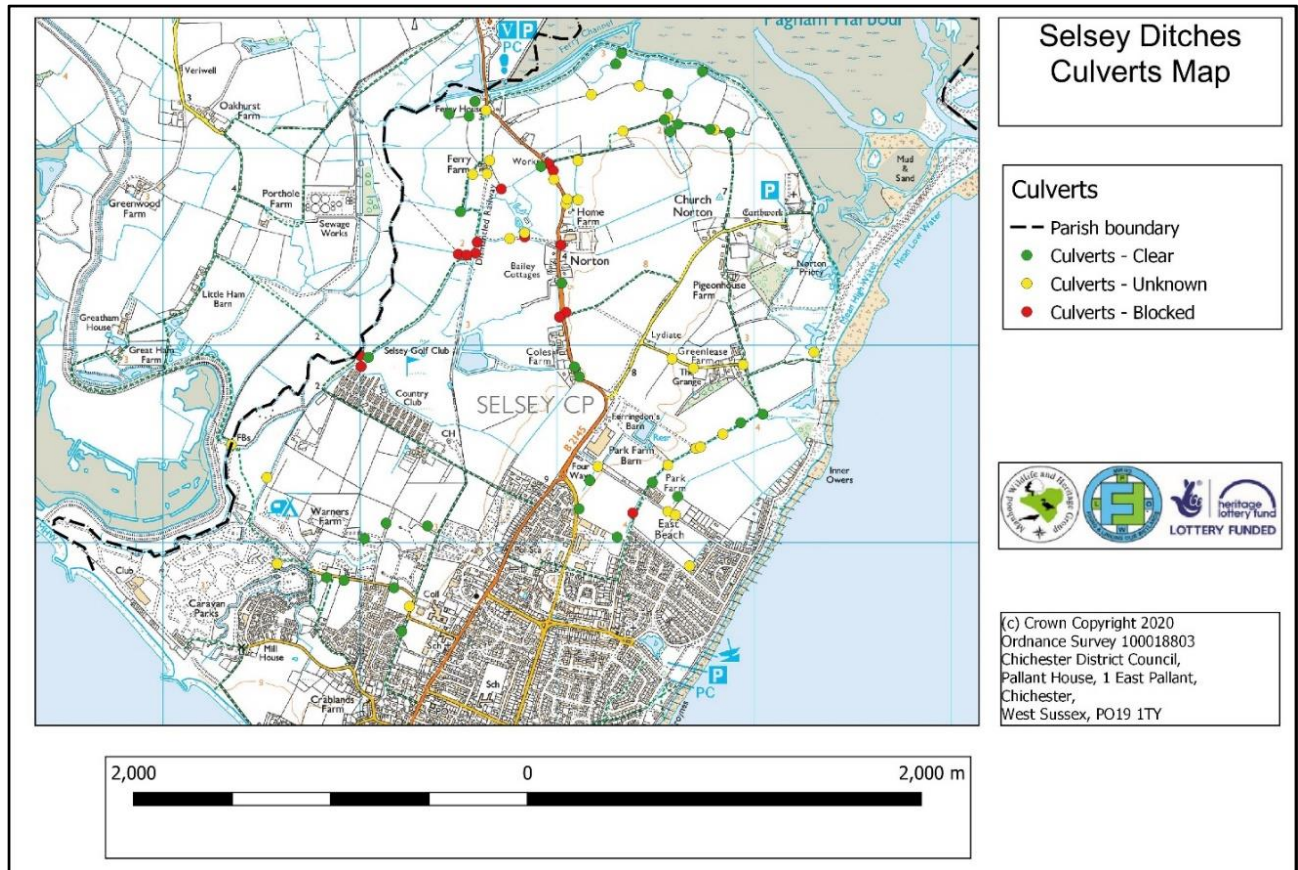
Figure 10: The flow direction in Selsey ditches

Selsey Parish ditch condition assessment results and habitat improvement plan



While the ditch surveys were being carried out, any culverts that could be easily accessed were checked to assess their condition, whether they appeared to be functioning or were blocked. In many cases this was not always obvious and so were marked as unknown.

Figure 11: Selsey Ditches Culverts map



ii Overall condition of the ditches

Figure 7, a map of the condition assessment results in Selsey, shows that the majority, 75% of the ditches in the parish are in 'moderate' condition and that 22% were 'poor'. However, as previously stated this scoring is relative and boundaries between categories must be made. As such some moderate ditches will be marginally inside the required scoring band and should be considered, where appropriate, as a priority for improvement or further monitoring. The fact that 3 % of the ditches are shown to be in good condition may be skewed by the low number of rifes with larger margins and all year-round water availability that are present in the parish. However, 3% is low compared to other parishes and this may well reflect the management of the ditches resulting in poor vegetation diversity, bank erosion and debris build up.

The physical and biological condition of the ditches is primarily influenced by their management regime and therefore different landowners tended to have ditches that were characteristic to them with similar adjacent land uses, managed hedges and banks looking homogenous. This was also influenced by their position within the parish, their proximity to the sea, and the influence of the wind.

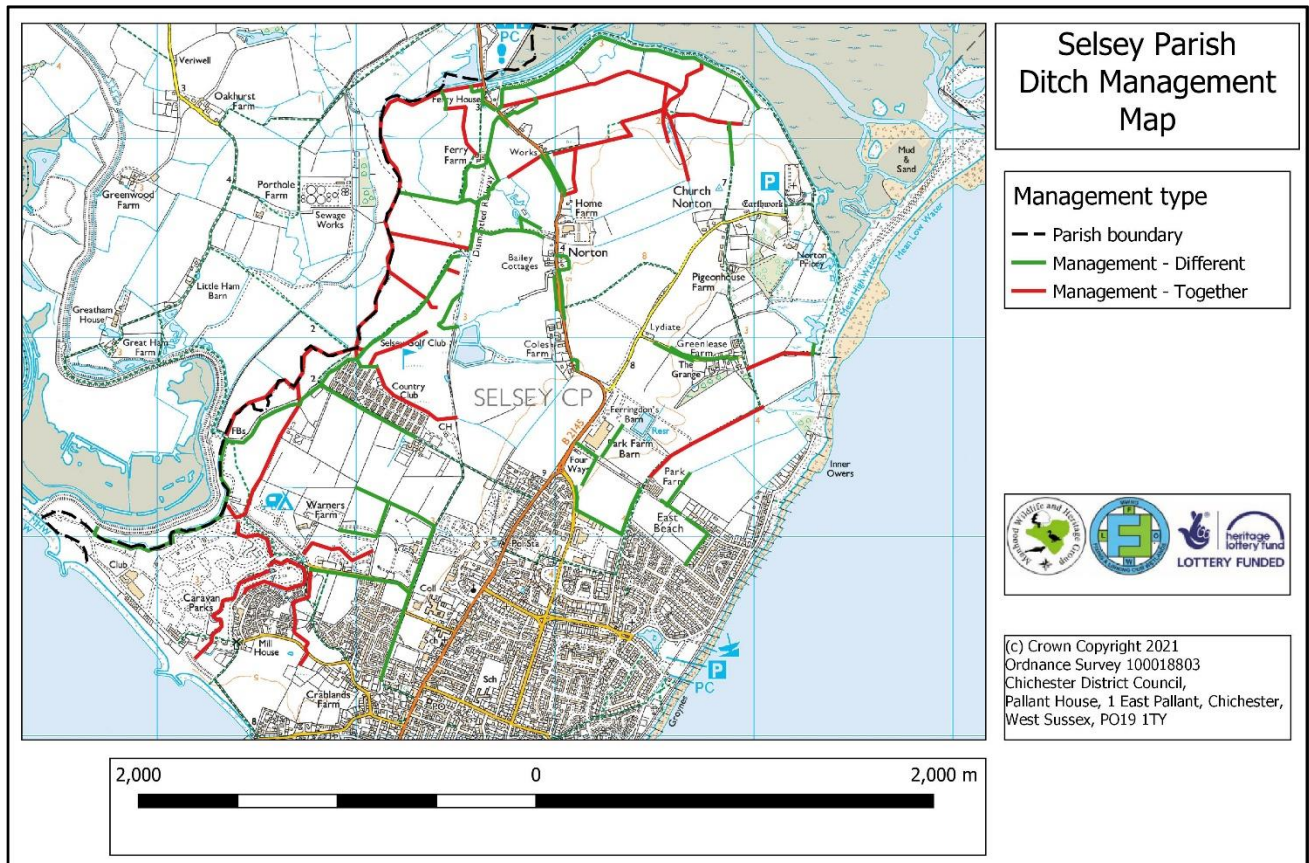
It was found that 75 % of the ditches in the Parish are managed on a rotational basis with only one bank being cut at a time. This may be because some of the ditches have hedges associated with them and therefore it is only practical to do one bank or because vegetation was only cut on one bank per year as is best practice.

Selsey Parish ditch condition assessment results and habitat improvement plan

It was seen that 25 % of ditches had both sides managed every year and while this appears to open up the channel for water movement, it can actually contribute to bank erosion, depending on the height and type of vegetation cut. It also tends to lessen the biodiversity value of the ditch.

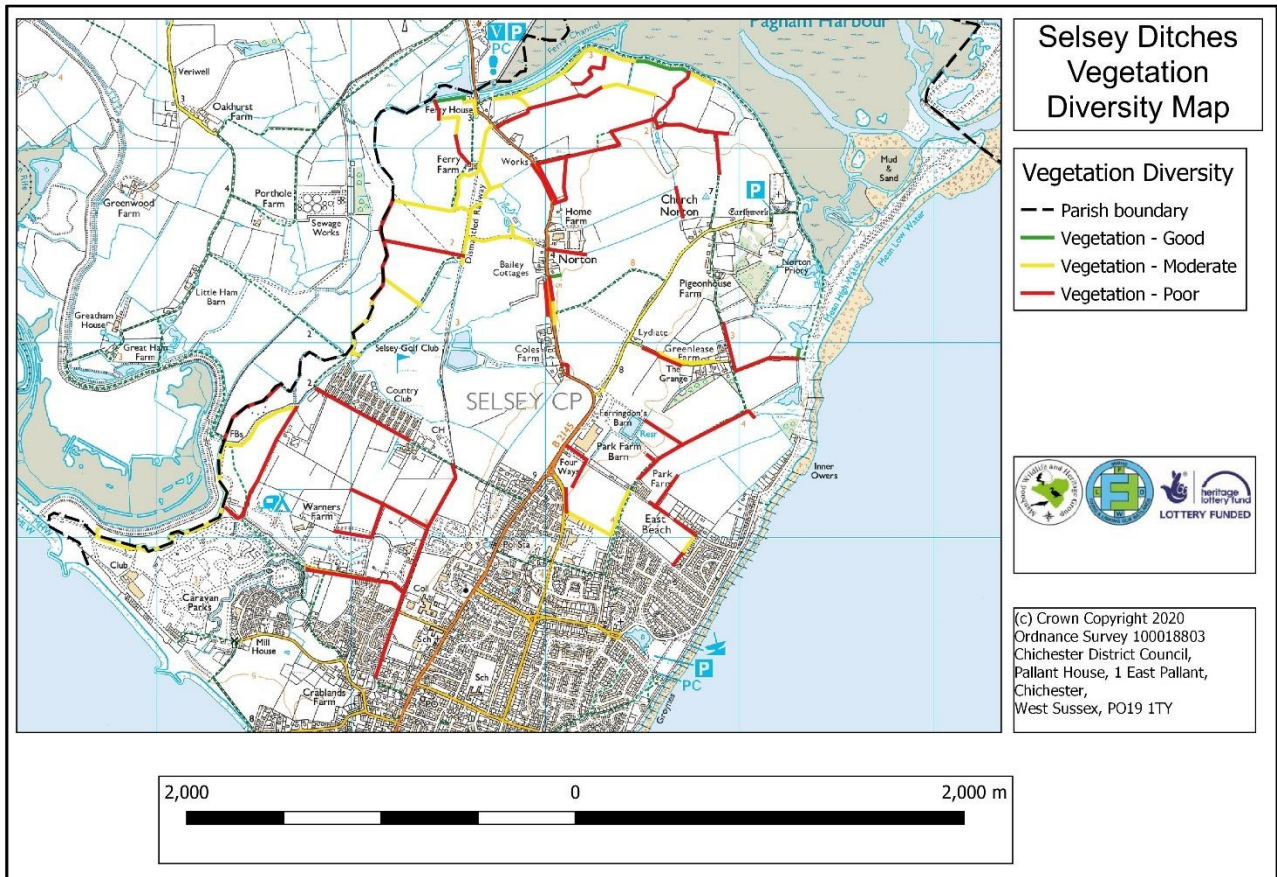
During the examination of the ditches, culverts were also inspected, where it was possible to do so, and it was noted where some culverts were silted up or looked in poor condition.

Figure 12: Rotational Management of ditch banks in Selsey



The management regimes that the ditches experience is reflected in their appearance and their biodiversity. There will also be factors relating to their wider environment such as water quality, availability of year-round water and wind. In order to gauge the biodiversity of the ditches the range of vegetation types present on ditch banks was recorded. The 7 different vegetation types recorded were: trees, shrubs, riparian forbs, sedges, rushes, reeds, and long grass.

Figure 13: Selsey Ditches Vegetation Diversity Map



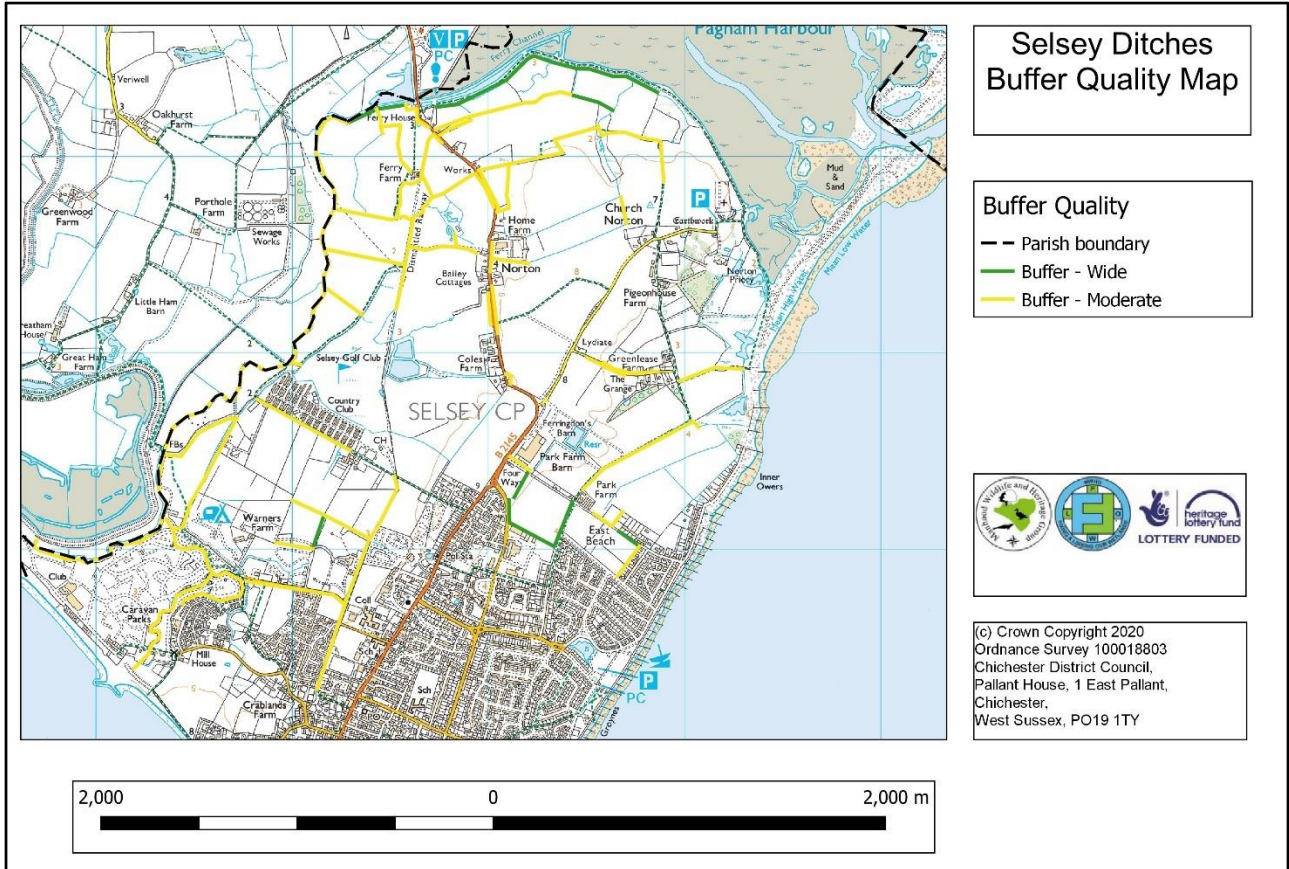
There were some areas with very little plant diversity at all while some ditches were noticeably better.

Often where there was just one species or two recorded, it was either a grass species or a bank of nettles. The timing of the surveys will have had an effect, those ditches surveyed in October would be more likely to score low having just been cut.

The general pattern was that where ditch bankside vegetation was cut on both sides every year, then these had less plant species present. Where the map shows a rotational management scheme and a ditch with low vegetation diversity, this could be explained on examination by a land use or other environmental issue.

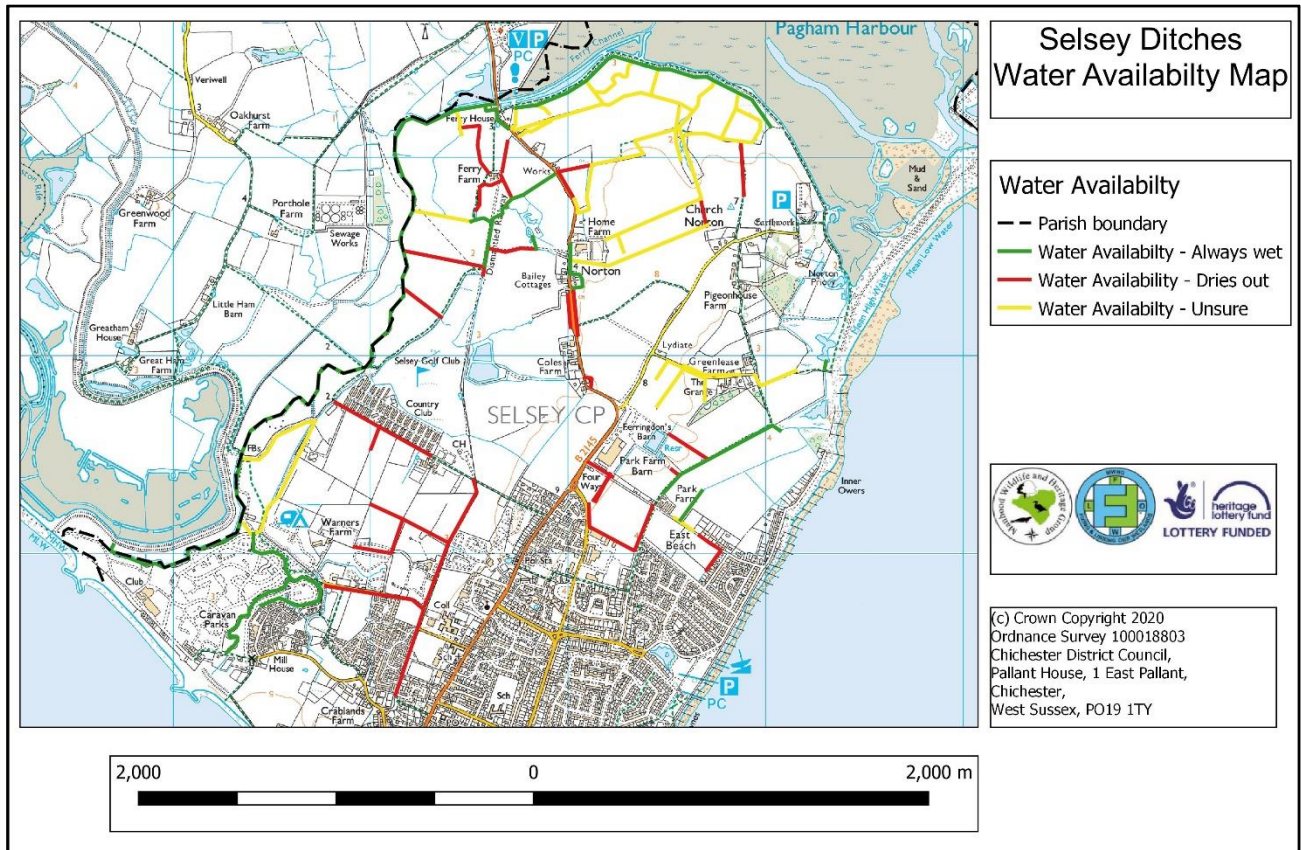
The width of the buffer either side of the waterway is also a factor that can be taken into account when looking at the quality of habitat. Where there is little buffer with arable land right up to the edge of the ditch, there is a greater chance of low water quality with chemical spray entering the water, compaction of the banks by heavy machinery resulting in potential bank erosion, and poor bankside and in channel vegetation as there is so little space for them to take hold.

Figure 14: Buffer width of the ditches in the Selsey parish



Another environmental issue to consider is water availability as it is common for the ditches on the MP to dry up during the summer, as there are often long periods without significant rain. Some of the larger ditches and rifes will hold water for longer and these are particularly important for wildlife such as water voles, amphibians, dragonflies, aquatic invertebrates, and birds. Selsey had a relatively high number of ditches that stayed wet all year round, 28% and this is influenced by Broad Rife running through the parish.

Figure 15: Water availability in ditches surveyed in Selsey



iii Management for water voles

One of the key species in the area is the water vole (*Arvicola amphibius*), the fastest declining mammal in England, (Strachan et al. 2011), and it lives in the linked-up waterways of the MP and is considered a regionally important population. Water voles have specific habitat requirements that include all year-round availability of water and good vegetation coverage on soft earthy banks with a wide range of plant species. These needs do not sound onerous, but water voles do not hibernate, spending much of the winter in their burrows with cached food, but they prefer undisturbed vegetation on the banks all year round for cover and quite steady levels of water. On the MP, it has been noted that water voles do use ditches that dry out as part of their habitat and seem to use the linked network of ditches to move to wetter areas and ponds as condition change.

Looking at Figures 13 and 15, water voles are most likely be found in the areas where there is most water year-round and a wide range of plant species. It can quickly be seen that this reduces the amount of habitat and number of suitable water vole ditches in the parish.

A management regime that cuts just one side of the bank every year, puts the debris away from the channel, and even leaves some areas untouched on a 4-year rotational basis will benefit water voles the most. Placing small bunds in the ditch, at a low level, to hold water back in the spring will keep the ditches wetter for longer and encourage water voles to stay.

The EA document '*delivering consistent standards for sustainable asset management*' Version 3 March 2012 lays out various cutting regimes available, with timings and frequencies, the range of

bankside cuts, in-channel vegetation removal, silt removal etc, with wildlife and other factors in mind. Management can take place of ditches, but it needs to be sympathetic. Where water voles have been identified as being present then advice should be sought from the EA about the habitat management as under the Wildlife and Countryside Act 1981, updates 2006, it is an offense to interfere with water vole habitat and a license from NE would be required for work.

Water voles leave clear indications of their presence and can be easily and quickly surveyed for. The SxBRC will have historic records of their locations but it is presumed by WSCC that they are present in all ditches on the MP and therefore this must be checked before work goes ahead.

iv Limitations of the study

The ditch condition assessment form was created using an Assessment Form that had originally been developed to assess water vole habitat, was then adapted for use during the Birdham and West Itchenor ditch studies and was further evolved to take in more environmental and physical characteristics. The form has a scoring system so that ditches could be rated as 'Good', 'Moderate, and 'Poor' and a traffic light - Green, Amber and Red system used so that on maps it could be instantly seen which ditches would form the focus of management recommendations.

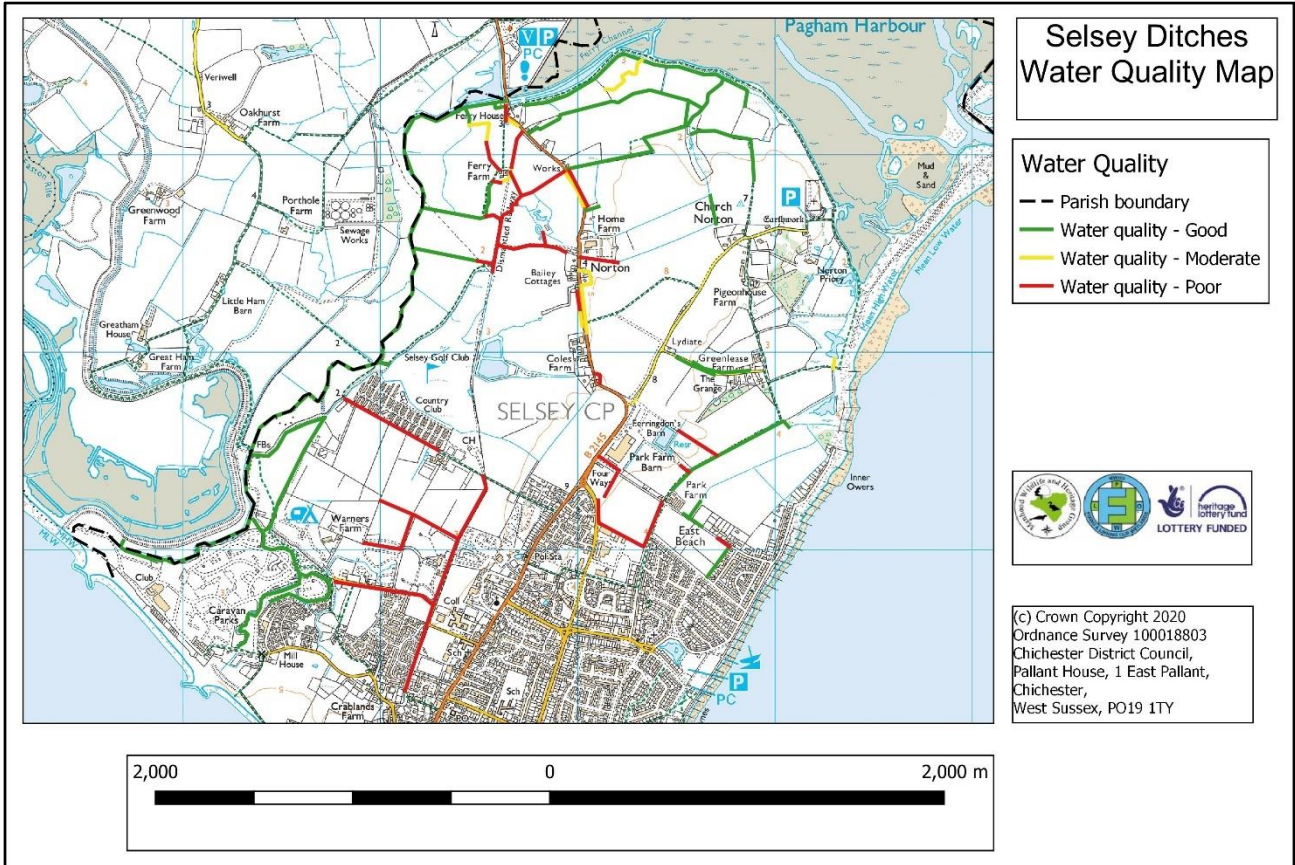
Although this form was used, and a score given to all the ditches, it soon became evident that most of the ditches were amber, meaning in 'moderate' condition. We realized that the scoring system had severe limitations as the ditches have so many characteristics that it is impossible to accurately represent this with a number. It might be best to break this down into a physical attribute score, a biological score, an environmental score (for the surrounding habitat), and a management score. A well but sympathetically managed ditch can be good for water flow and storage and for wildlife but capturing that as a single number is not realistic. Therefore, maps have been created that look at the specific attributes.

The water quality was not analysed during this project, but it would be useful in future to get a picture of specific issues in particular locations. We have been able to infer some runoff and pollution incidents from the vegetation and the state of the water itself but there would be value in gaining information on the specifics and subtleties across the area. This information can then be used to find the sources of the problems and address them.

The likely contaminants of the water courses will be nitrates and phosphates from the fertilizers used as part of the intensive arable farming, as well as chemical pesticides and slug pellets. All of this gets into the water and significantly impacts biodiversity. Ditches where the water was milky / oily or covered in algae were scored low and whereas water that was clear, running and had vegetation growing in it was scored more highly.

Figure 16: Selsey Ditches Water Quality Map

Selsey Parish ditch condition assessment results and habitat improvement plan

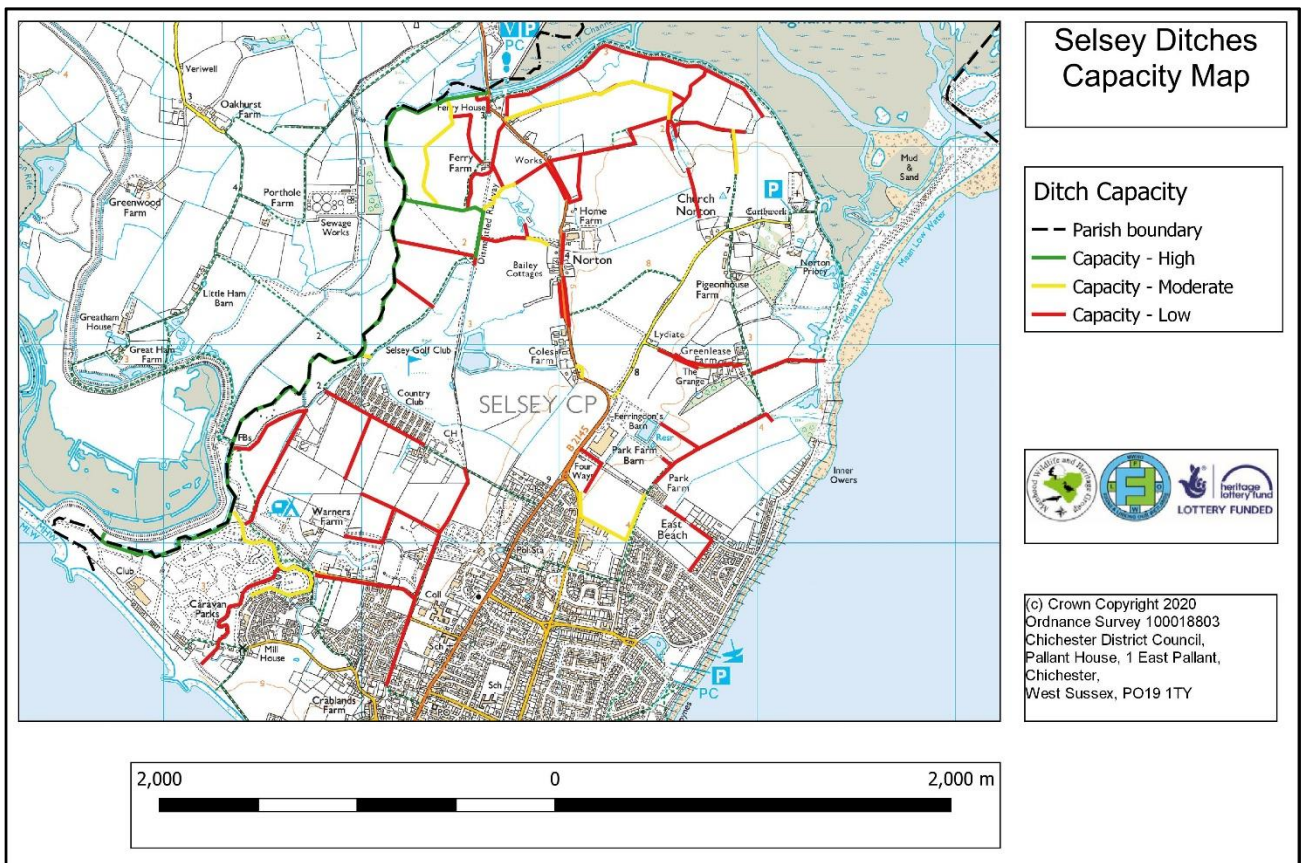


8. Opportunities for improvement works

Through the detailed fieldwork and data gathering that we have carried out, combined with the desk-based study of the information provided by WSCC, CDC, EA and other organisations, we have looked for opportunities to improve the water carrying capacity of the ditches and ponds, and to also find benefits for wildlife.

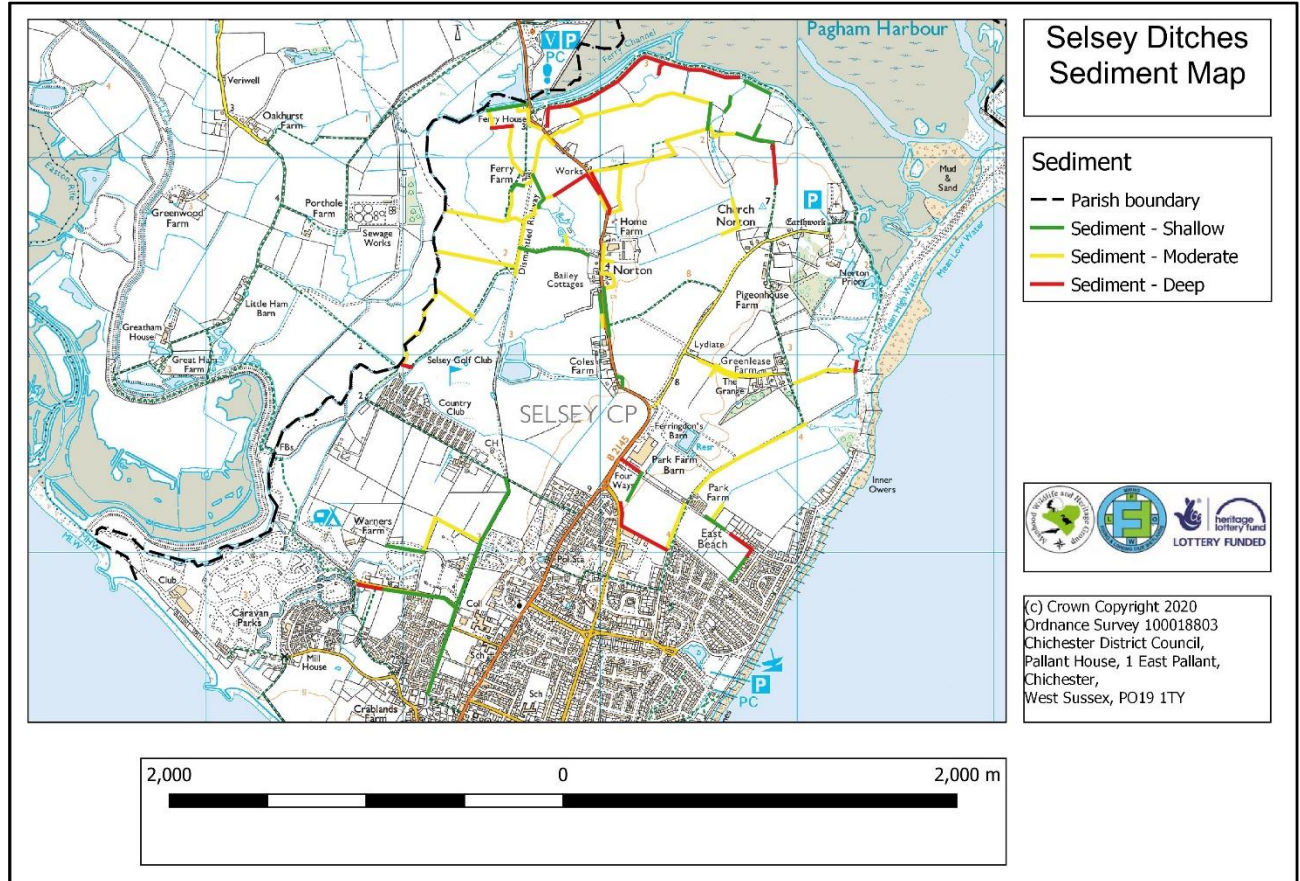
To look at opportunities for improvement the approximate capacity of the ditches and waterways was calculated from the ditch widths, depth and lengths that we had gathered and the mapped, see Figure 18. This illustrates which ditches have the potential to hold more water and confirms the positions of the primary conveyancing routes.

Figure 17: Selsey Ditches Capacity Map



Related to this was the sediment amount recorded in ditches and this information was gathered and mapped. The primary conveyancing routes and most of the ditches on farmland do not appear to have much silt, and it was approximately 18% ditches that had silt deeper than 250mm.

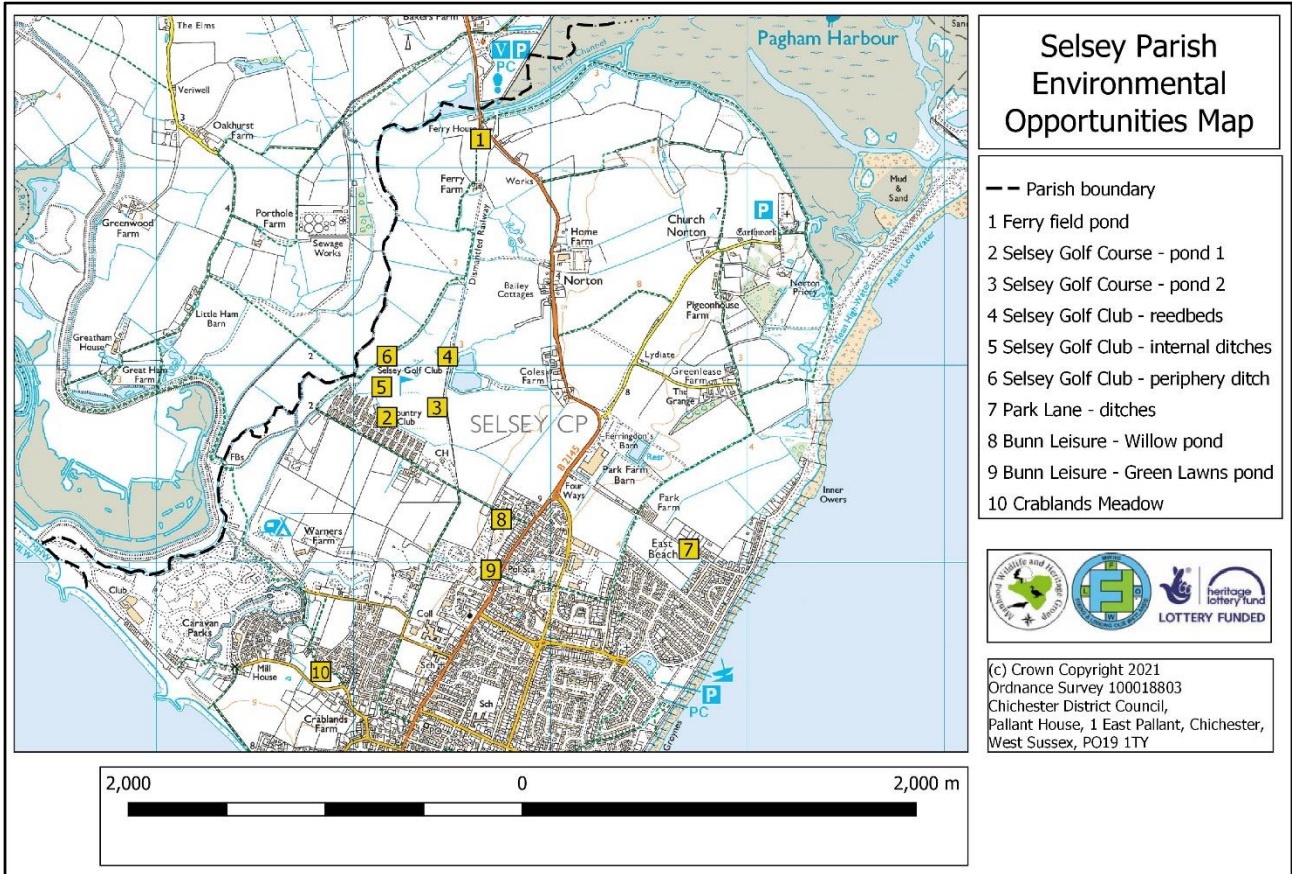
Figure 18: Sediment depth in ditches surveyed in Selsey



i The opportunities

The opportunities found to improve sites have both drainage and environmental benefits as opening up a neglected or undermanaged ditch or pond to improve water tanking capacity or aid flow, will also benefit wildlife by preventing periodic flooding and getting light onto the water and banks.

Figure 19: Selsey Parish Environmental Opportunities Map



The improvements identified have a range of benefits but any actions to enhance drainage will have a positive effect on wildlife.

The table below shows the opportunity found to improve the environment and wetland habitat.

id	Site	Issues and proposed action	Responsibility
1.	Ferry corner pond	This relic pond, seen on the 1846 tithe map, has historic records of water voles. over time it has become isolated from the ditch system and is shallowing out with no open water seen. It would benefit from some rotation reed cutting, a small section dug out and ensuring that the ditch along the roadside is in good condition as a link to the rest of the wetland system.	Landowner
2.	Selsey Golf Course pond 1	This pond is large and borders the Country Club. On the Golf Course side, the earth banks are steep (90) and have an exposed face that could be good habitat for kingfishers. The banks are mowed right up to the edge and they would benefit from having a 5-metre margin of longer vegetation to buffer this. This will help to 'mop' up any chemical spraying before it reaches the water and prevent golf balls rolling into the pond when putting.	Landowner
3.	Selsey Golf Course pond 2	This pond also suffers from mowing right up to the edge and the biodiversity would improve if a wide margin could be left down the banks and against the water.	Landowner
4.	Selsey Golf Course reedbeds	The reedbeds are full of life but no open water could be seen. A light rotational cut, at the correct time of year,	Landowner

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id	Site	Issues and proposed action	Responsibility
		would benefit many species and a margin of unmown vegetation along the bank edge.	
5.	Selsey Golf Course ditches	These ditch have the potential to be a rich source of biodiversity but have quite exposed banks due to the over mowing – a margin should be left to allow some protection.	Landowner
6.	Selsey Golf Course periphery ditch	This larger ditch on the periphery of the site, on the western side, is dark and overgrown but the main issue here is the amount of rubbish build up. This is a pollution threat.	Landowner
7.	Park Lane ditches	Along this unmade private road these ditches, over time, have become disconnected from the wider water network, and shallowed out in places, and therefore there are significant flooding issues. There needs to be a comprehensive and detailed study of the network and culverts here before any remedies can be found. This may have been exacerbated by recent adjacent housing development. Any actions may have to include the CDC drainage team but as the land is private it may be the residents that would be required to pay for the improvements.	Landowners
8.	Bunn Leisure pond 1 (The Willows pond)	This pond is very dark with little light reaching the water or the banks. Careful management of the trees to lift them away from the water and the introduction of riparian plants into the water would improve the biodiversity value of this pond.	Landowner
9.	Bunn Leisure pond 2 (Green Lawns pond)	This pond has poor wildlife value and is shaded and has little riparian vegetation. By carefully cutting back the willow, introducing a range of riparian plants and not mowing and strimming the banks the biodiversity value of the pond can be increased.	Landowner
10.	Crablands meadow	This field is an LWS and therefore has been identified as having significant wildlife value. Onsite there is a ditch that has previously had water voles in it and a connecting low-lying wet area that can be seen on the 1846 tithe map (see below) as a significant pond. It would be good to manage this area again so that the pond could be reinstated to hold water year-round as a resource for wildlife and to take water off the nearby road which is prone to surface water flooding.	Landowner

A section of the 1846 Tithe map (© West Sussex County Council)

The tithe map illustrates Ferry corner pond that is currently drying out and is at risk of being lost.



Ferry corner pond

The tithe map indicates the relic pond at Crablands meadow that is now a wet willow carr in the field.



Pond at Crablands meadow

ii Improvement works

When considering improvement work on a large scale, there are issues that must be taken into consideration and these have been identified in the MPSWMP:

- Landscape issues
- Historic environment
- Water
- Geology, soil and geomorphology

- Biodiversity, flora and fauna - the relevant species surveys should be carried out to ensure that any work does not disturb, denude or remove habitat from protected species. This should include water voles, Great Crested Newts, Dormice, and bats. Data can be gained from the Sussex Biodiversity Records Centre on species records for the local area which can inform any plans for improvement.

iii High level physical works

This will be used on sites where ditch and pond banks require reprofiling, junction ponds are created, and silt is removed. Contractors maybe needed for this work, but the preference would be for the landowners to carry this out as they know their land intimately and can fit the work in with cropping regimes or other work on the land.

A significant issue when carrying out ditch or pond work and spoil or silt is removed, is what to do with it. Taking it to landfill can be a significant cost to a project so where possible, spreading it on adjacent land or using it to create higher banks would be preferable. It may be that a D1 exemption certificate maybe needed from the EA to do this (to prevent the spreading of contaminated spoil on land for food production): www.gov.uk/guidance/waste-exemptions-disposing-of-waste

See Appendix iii for a costed plan of the suggested work.

iv Low level physical and maintenance work

As part of the landowner reports and follow up dialogue opportunities are identified for wetland, hedge, and habitat improvement and this could take the form of physical works that involve landowner machinery or contractors. Lower-level work could be carried out by volunteers.

Volunteers can carry out a range of tasks:

- Hedgerow improvement – planting new hedges, filling in gaps in hedges, and laying hedges.
- Sympathetic ditch and pond maintenance removing vegetation – small willow branches, bramble and bankside vegetation.
- Biological survey work– water voles, amphibians, botanical, invertebrate, bat and bird.

9. Other environmental Issues found

During the FLOW survey work, a range of land management issues were identified, and these have been discussed with individual landowners via face-to-face meetings. However, it is worth noting them here as they can have an overall cumulative effect on the environment of the parish.

i Water Quality

The EU Water Framework Directive was adopted by the UK in Dec 2000 and it covers water quality in river catchments, in groundwater and aquifers, the abstraction of water, and runoff from all sources and pollution types.

While we did not analyse the water quality in Sidlesham we were aware of the symptoms of runoff, particularly of nitrates and phosphates, and where possible we noted their source. Most arable farms use nitrates based fertilisers intensely and there is no organic farming in the Parish. The ditches, where they have a good margin and a range of riparian vegetation on the banks, even small relic reedbeds can utilise this nitrate runoff and 'mop it up' before it gets passed on through the water course. If the nitrates stay in the water this can lead to eutrophication and significant algal growth which uses up all the oxygen in the water. This effectively kills all other species so that no invertebrates or other aquatic plants can survive and so the water way loses its biodiversity. Even ditches with vegetated margins can become covered in algae and blanket weed as field drains bypass this vegetated fringe and deliver water directly into the ditch.

Blanket weed, and algae were seen in many ditches and, as it was noted as a water quality indicator.

Nitrate and Phosphate analysis

Over the course of the FLOW project University students carry out individual pieces of research and a Masters' student, Claire Lipop, from the University of Oxford spent the 2017 summer assessing water vole habitat across the MP, (C. Lipop 2017). She looked at ponds and waterways, their vegetation structure, water levels and some water quality issues. During her analysis she checked the phosphate and nitrate levels of these areas and 1 site was in the Parish of Selsey.

Nitrate levels: the nitrate levels in the waterway tested in Selsey had no significant levels of nitrates in it.

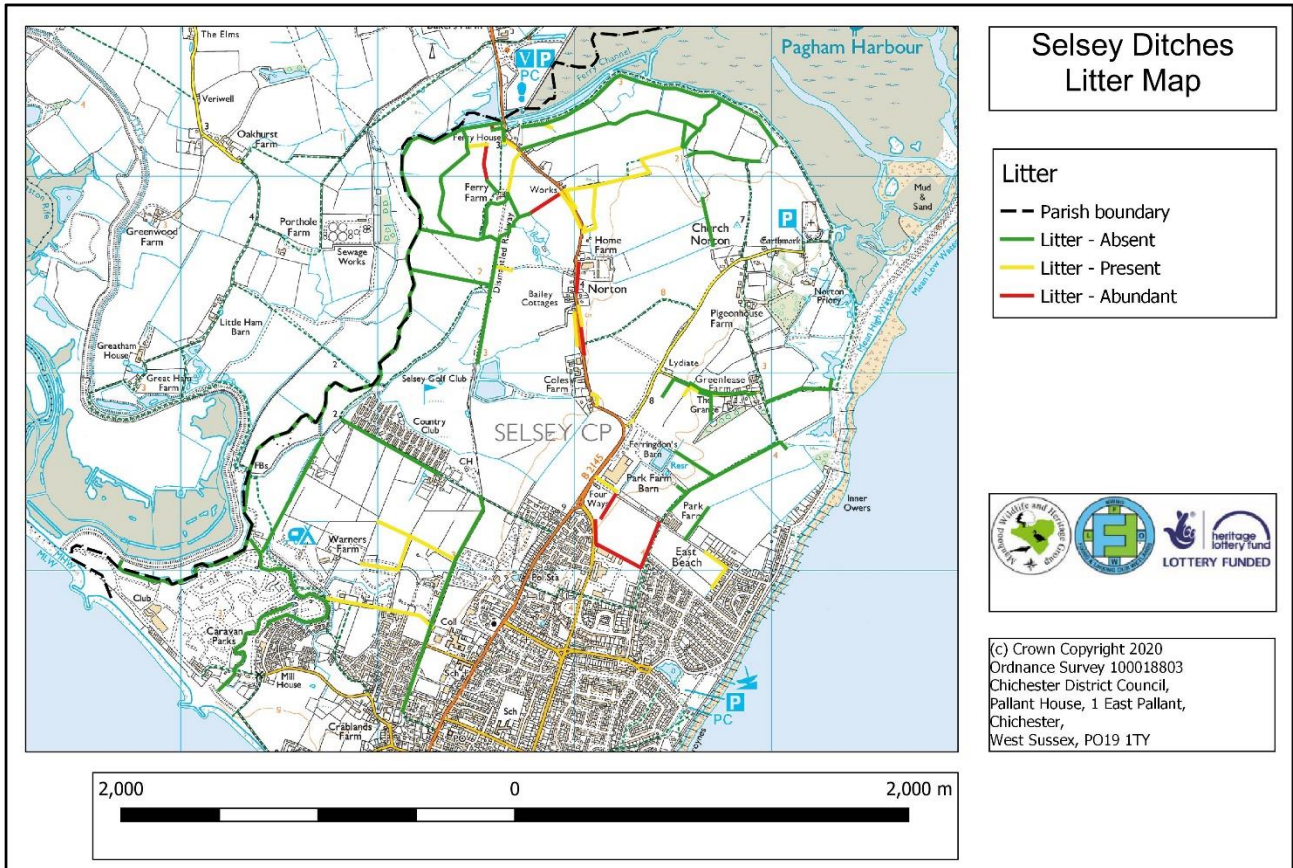
Phosphate levels: the site tested showed significant phosphate levels and may be the size of the waterway and the larger the channel, had higher phosphate levels. This may be due to the fact that the larger waterways receive water from other sites and, so they gain runoff from many farmers' fields and it has had a cumulative effect.

ii Litter

We came across litter in many of the ditches that we surveyed and this partly because it is such an open and flat parish that litter blows across fields and gets caught in the hedges and then falls into

the adjacent ditches. Some of the ditches were worse than others, but this litter is a threat to wildlife, water quality and may end up in the sea where it also becomes a hazard.

Figure 20: Selsey Ditches Litter Map



iii Hedges

During the extensive hedgerow surveys, we carried out we found that Selsey has moderate coverage and any gaps or the potential to plant new hedges should be discussed with the landowners in the future and supported by the Town Council. Managing hedges by laying them was also explored as this is a traditional technique for encouraging new growth in older hedges, thickening the base and providing better habitat for birds and invertebrates.

Future hedge improvement work could include:

- Sites for new hedges
- Hedges needing gaps filled
- Sites for hedge management – cutting back bramble on overhanging ditches and getting light on the ditch banks to get better vegetation diversity.
- Hedge management issues – alternatives to heavy flailing and time of year for this work. Hedges were found that had been cut in August and September breaking the Wildlife and Countryside Act 1981, amended 2006, removing food sources from birds, invertebrates, and small mammals.
- Hedge laying

Hedges are important for many species as a route along which to disperse and forage in safety. They also act as good windbreaks for farmers, protecting crop plants, help to prevent soil erosion and can act as barriers for crop diseases such as potato blight (pers comm. Monnington 2016). They are an important landscape feature on the MP where there are few woodlands, and they are often overlooked and poorly managed.

Comprehensive hedgerow advice and information can be sought from Hedgeline:

<http://www.hedgeline.org.uk/>

They provide information on planting hedges, hedge cutting, the hedge management cycle and hedges and their importance for a range of species.

New hedges may not be beneficial for all species and this needs to be considered where appropriate – Lapwings (*Vanellus vanellus*) need large open areas with no hedges that potential predators could use as cover.

iv CDC Green network maps

The CDC Green network maps were created to look at three habitat types; wetland, hedgerow and rough grassland for barn owls. These were desk-based studies and had not been reviewed or previously checked.

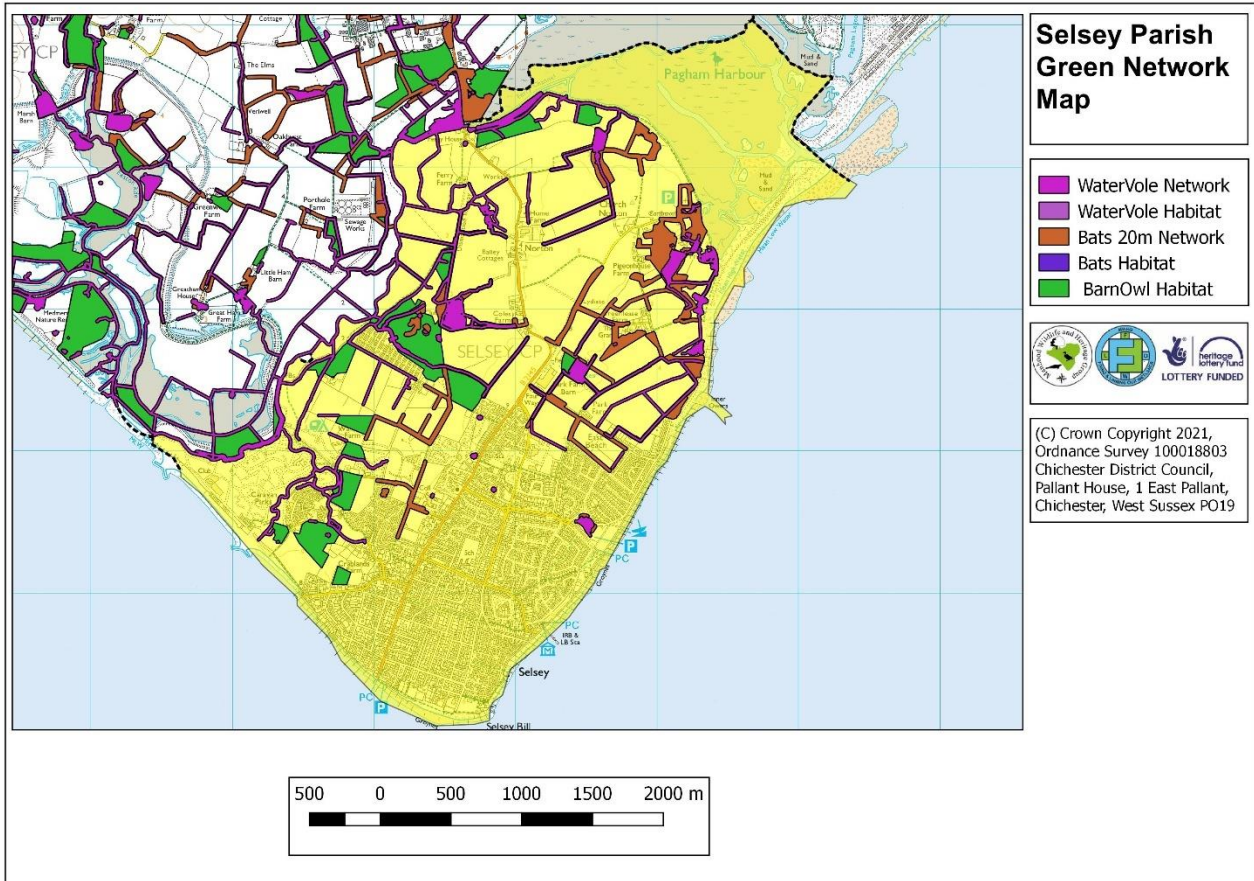
As the FLOW team walked around the parish and examined most fields, they were able to ground truth these maps and to check their accuracy at the time of surveying.

The suitable waterways for water voles were noted and the meadows and margins for barn owls. The hedgerow condition map reflects the good hedgerows found for bat use.

Selsey has a main rife that contains water for much of the year and is host to water vole populations along its length. The rife links the wider area to Medmerry, which has designed into its scheme, 6 km of specialised water vole habitat. There is now a strong population established and the rifes and ditches of Sidlesham allow water voles to disperse out across the area, boosting the genetic diversity of other water vole colonies. As this rife also joins up with Pagham Harbour, it acts as an important wildlife corridor.

Figure 21: Updated CDC Green network survey results for Selsey

Selsey Parish ditch condition assessment results and habitat improvement plan



10. Work Timescales

Work must be planned to fit in with the boundaries set by the wildlife and Countryside Act 1981, amended 2006, so that the birds breeding, and nesting season is avoided and also the water vole breeding season. This begins at the end of February and runs to the end of July, and during that time no removal of tree or hedgerow vegetation can take place, or ditches that may contain water voles (unless they are checked, and voles absent or removed with a NE license).

Work may be best carried out between the end of July and the end of October, before the ground is too wet for heavy vehicles, and when the ditches are dry and do not have water voles in them – subject to checking. Where ditches have no records of water vole activity (can be checked via the Sussex Biodiversity records Centre <http://sxbrc.org.uk/>). Advice should be sought from the EA's Biodiversity Department (lead agency for water vole conservation) before carrying out any work on or around water vole habitat and Natural England (www.gov.uk/guidance/water-voles-protection-surveys-and-licences). Water voles can breed as late as October, dependant on the weather and therefore surveys must take place before any work is proposed. It may be that mitigation will be necessary.

The presence of ground nesting and wading birds would need to be considered during the winter months, but the work recommended in this report does not affect their habitat directly but may take place adjacent to farmland and indirectly disturb them.

11. Management priorities

Appendix iii is a plan of potential work with a detailed description of the actions and an estimate of the funds required.

Ditch Management

Many long-term drainage and habitat issues can be solved with sympathetic monitoring and maintenance actions. Capital works can be paid for with grants or carried out by local councils but unless the work is followed up with regular management this money will have to be spent again 5 years or so down the line for the work to be repeated.

Ditches need to be managed carefully for drainage purposes and so that they function as good wetland for wildlife. This does not have to be mutually exclusive and by sympathetically cutting vegetation on the banks of ditches, not totally removing it, this provides better erosion resistance, which in the long term can affect the carrying capacity of ditches.

Where hedges are associated with a ditch it is common for the field side only to be managed and this allows the ditch to recover quickly and continue to offer wildlife habitat. Hedges next to ditches should still be gently cut back to prevent shading of the water but all debris should be removed, or it will block up the ditch, prevent water flow and potentially cause problems.

Refer to EA document '*delivering consistent standards for sustainable asset management*' Version 3 March 2012 for different cutting regimes that takes wildlife and water heights and conditions into consideration.

The debris from vegetation cuts around ditches, and hedge management, should be removed from site and not left in the ditch. This will only cause problems. Any silt removed from the ditch channel, where possible, should be left on the bank for 48 hours, to allow invertebrates to re-colonise the water, but should then be removed. Putting nitrogen rich sediment on the edge of the bank will cause some of the loose material to fall back into the water if it rains, negating the work done, and it will produce a flush of nettles and reduce biodiversity along this edge. Where possible, time the work with ploughing of the field, and with an EA D1 exemption certificate, this nitrogen rich material can be spread across the field.

Ensure that no manure or silage is stored on ditch margins but kept away from waterways so that the nutrient rich runoff cannot pollute the water.

The wider the margin between the ditch and / or hedge, and the farmed land, the more wildlife potential the network will have, especially if it is not mowed more than twice a year and the debris removed. This could provide pollen rich and wildflower areas for invertebrates and birds to use.

12. Sources of future help

i Funding - grants

For the larger physical works to be carried out, landowners who have the equipment will be encouraged to do this work where possible. However, it may be that contractors or vehicles can be hired in to do the work, but the issue of spoil removal will also need to be considered.

West Sussex County Council Operation Watershed fund - this has been supplied by WSCC for use by local flood groups and organisations in the County for flood relief work and applications and information about the grants can be found on the West Sussex website:

<https://www.westsussex.gov.uk/leisure-recreation-and-community/supporting-local-communities/operation-watershed/>

This fund maybe finishing at the end of March 2021 and it is unclear at this time whether there will be another source of money for local groups to take action against flooding.

Countryside Stewardship, managed by Natural England, can be considered in some cases with Mid-Tier and Capital Grants for wetland creation and improvement work:

Other grants that could be applied for

Chichester District Council Communities Fund – looking at parishes south of Chichester and one of their priorities is to improve the wildlife value of the area – any wetland or hedgerow improvement could fall into this category. <http://www.chichester.gov.uk/article/24324/Funding-opportunities>

National Lottery Heritage Fund – through the FLOW project – some monies maybe found to finance works, but in-kind contributions would be sought from landowners and farmers to maximise the benefits. Any applications would have to be made by community groups and charities to manage the work.

There may also be **biodiversity grants** available from private companies Biffa, Viridor and Veolia, and plastic bag and other smaller grants that can be applied for from a range of supermarkets and retailers.

ii Labour – volunteer led work

MWHG use local volunteers across the MP to manage wetland and other habitat sites. Their knowledge and experience can be utilised to get working parties going and to lead improvement work.

Vegetation clearance work will need to be carried out on a rotational basis. The initial work, on overgrown ditches will be time and labour intensive but in future years this should be easier as only one years' worth of growth is tackled. A regular programme of works in each Parish, focussing on those particularly important ditches is the key, and making it a fun team building community experience that involved everyone will encourage continual participation.

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The MWHG can organise and provide training in a range of areas and this can include learning more about the local fauna and flora, and also the practical aspects of habitat management. The training offered can include:

- Educational:
- Plant identification
 - Water vole surveying
 - Ditch condition assessment surveying
 - Hedgerow surveying
 - Reptile surveying
 - Bat surveying
 - Bird surveying
 - Mink monitoring
- Management:
- Health & Safety
 - First Aid
 - Hedge laying
 - Ditch management

A group of local volunteers carrying out management work in local ponds could be set up within the parish so that any improvement work is monitored and continued. Tools, training, and resources could be provided by the MWHG.

The Trust for Conservation Volunteer (TCV) have a local group in Chichester who carry out physical improvement and conservation tasks <http://www.chichesterconservationvolunteers.org.uk/>

All these volunteer resources should be realised and encouraged to carry out important clearance work to expose ditches in winter months and remove smaller low tree branches shading out ditches. Making these working parties a regular event and having a social aspect to them will make them more sustainable. Not everyone is required to carry out physical work and volunteers can add value by providing refreshments, helping to do surveys, draw maps etc.

13. References

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- 'The Manhood Peninsula Surface Water Management Plan' (CH2M HILL, 2015) https://www.westsussex.gov.uk/media/5607/manhood_peninsula_swmp_final_report.pdf
- Chichester Harbour AONB Management Plan 2014 -2019 (Chichester Harbour Conservancy 2014)
- 'Options for the future of South West Internal Drainage District – business case' (TAW for West Sussex IDD Steering Group Dec 2013)
- 'Delivering benefits through evidence – quantifying the benefits of flood risk management actions and advice' (EA Report –SC090039/R Stage 3, March 2015)
- 'The Water Vole Conservation Handbook – 3rd edition', Rob Strachan, Tom Moorhouse, and Merryl Gelling, (WILDCRU, 2011)
- 'The Water Vole Mitigation Handbook' (the Mammal Society Mitigation Guidance Series), Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.
- Personal Comment - Tom Monnington, Mapsons Farm, Sidlesham, January 2016
- QGIS Wein 2.8.4 (2015) <http://qgis.org/en/site/>
- 'Water Vole (*Arvicola amphibious*) distribution and abundance in water courses and ponds within the Manhood Peninsula, West Sussex and the effect of habitat quality'. Lipop, C. (2017) University of Oxford.
- Downs & Harbours Clean Water Partnership. <http://www.cleanwaterpartnership.co.uk/>
- '*delivering consistent standards for sustainable asset management*' Environment Agency, Version 3, March 2012
- Notes of visit to Stroud Rural SuDS project – April 16 - Alastair Driver, National Biodiversity Manager Environment Agency

14. Appendices

i. Ditch Condition Assessment Form (MWHG)

Ditch Assessment – Score Sheet				
Survey Information				
Location		Survey Ref.		Grid reference
Recorder		Date		Recent rainfall
Water present	Y/N	Depth (m)		Flow direction
Attribute				
Scoring criteria				Score
Water availability	Dries out = 0; unsure = 1; always wet = 2			/2
Ditch profile				
Ditch width	<0.5m = 0; 0.6m-1m = 1; 1.1m-2m = 2; 2.1m-4m = 3; >4m = 4			/4
Ditch depth	<0.5m = 0; 0.6m-1m = 1; 1.1m-2m = 2; >2m = 3			/3
Banks slope	neither bank slope between 30° and 60° = 0; one side only = 1; both sides = 2			/2
Bank structure	Concrete = 0; gravel/sand/earth etc. = 1			/1
Total				/10
Environment				
B1* buffer width	0m = 0; 0.1m – 1m = 1; 1.1m – 2m = 2; 2.1m – 4m = 3; > 4m = 4			/4
B2 buffer width				/4
B1 buffer quality	Bare/managed lawn/nettle dock or thistle dominated = 0			/1
B2 buffer quality	Diverse plant and shrub communities/scrub = 1 (if no buffer enter NA)			/1
Bank erosion	Medium/high = 0; none/low = 1			/1
Litter	Abundant = 0; present (1-2 items) = 1; absent = 2			/2
Total				/13
Water quality				
Turbidity	High (water appears opaque) = 0; moderate = 1; low (almost clear water) = 2			/2
Algal bloom	Present throughout ditch = 0; present in part of ditch = 1; absent = 2			/2
Pollution e.g. oil	Present = 0; absent = 1 (comment on nature and possible source overleaf)			/1
Total				/5
Bankside vegetation				
B1 trees	/2	B2 trees	/2	Absent = 0 Present (1-50%) = 1 Abundant/dominant (>50%) = 2
B1 bushes	/2	B2 bushes	/2	
B1 riparian forbs	/2	B2 riparian forbs	/2	
B1 sedges	/2	B2 sedges	/2	
B1 rushes	/2	B2 rushes	/2	
B1 reeds	/2	B2 reeds	/2	
B1 long grass	/2	B2 long grass	/2	
Total		/14	Total	
Total				/28
In-channel vegetation				
Open water	<40% = 0; 41%-60% = 1; >60% = 2 (if dry enter NA)			/2
Aquatic plants	>60% = 0; 41%-60% = 1; 1-40% = 2 (if none enter NA)			/2
Non-aquatic	>60% = 0; 41%-60% = 1; 1-40% = 2 (if none enter NA)			/2
Total				/6
Management				
Rotation	Both sides managed together = 0; different timings/types = 1			/1
Shading	Watercourse >80% shaded by vegetation = 0; 40%-80% = 1; <40% = 2			/2
Sediment depth	>25cm = 0; 5-25cm = 1; <5cm = 2			/2
Invasive species	Any non-native invasive sp. = 0 (record info in sketch); none present = 1			/1
Total				/6
Overall score:				/70

*B1 = north or east bank of ditch, B2 = south or west bank of ditch

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Ditch Assessment – Additional Information

Additional ditch information				
Drainage issues	Previous flood events in vicinity			Yes / No
Connectivity	Number of adjoining ditches (if culverted more than 10m = no connection) Include ditches at either end of surveyed section			
Adjacent land use	B1	Arable Pasture Residential Garden Road Commercial Other	B2	Arable Pasture Residential Garden Road Commercial Other
Hedgerow present	B1	Yes / In-part / No	B2	Yes / In-part / No
Hedgerow survey	B1	Yes / No	B2	Yes / No

Pipes/culverts in ditch section		
Please record the location and condition of any pipes the ditch flows through, including at the start and end of the surveyed section.		
Ref. number (please label on map)	Condition description e.g. clear / blocked / collapsed / unknown	Approximate size
1		
2		
3		
4		
5		

Additional comments	
<i>e.g. any recent disturbances, blockages, information received from local people, concerns about invasive species, nature of any pollution, etc.</i> Include a diagram if necessary	

Annotate the survey map with the following information:

- Direction of flow where evident
- The location of any pipes/culverts with the reference number used on this form
- The location of any points of note e.g. sewage locations, blockages, invasive species, water vole signs etc.
- Mark any areas of flooding or very wet ground
- The location of any ash trees

Photo taken?

ii. Hedge Survey Form



Sussex Hedgerow Reference.....

Hedgerow details - OS map grid ref (10 digits required):

--	--	--	--	--	--	--	--	--	--

Landowner.....

Parish / town.....

Site / Road name.....

Please attach a sketch map showing the location of the hedge

What kind of shrubs are in your hedgerow?

Look at leaf shapes shown. Please circle any you find. Please list other species here

Does the hedgerow join with other hedgerows? Yes / No (please circle)

What is the land used for either side of the hedgerow? (e.g. garden/road, field/farmyard)

How long is it?.....

How tall is it?.....

How wide is it?.....

One adult stride is roughly a yard/metre

At ground level

Is the hedge dominated by any particular species? Yes / No (please circle)

If yes, which one(s)?

Any other comments on the character of the hedgerow?

Would the hedge benefit from having gaps filled? Yes / No (please circle)

Is the hedge suitable for laying? Yes / No

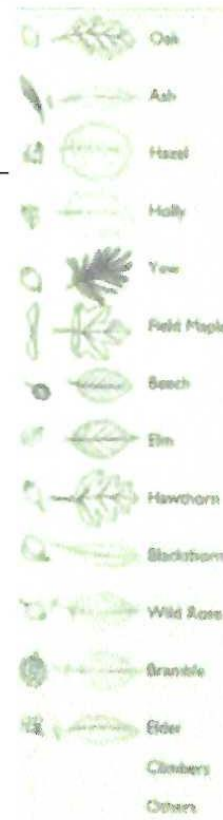
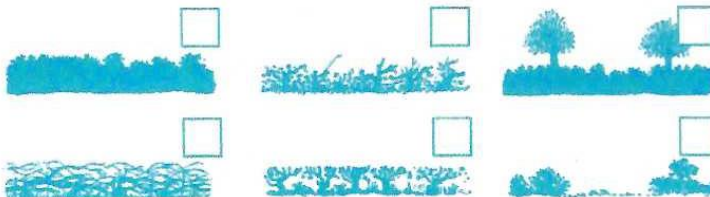
Is the hedge suitable for Dormice? Yes / No

(good mix of tree species, gently managed and connected)

Does the hedge contain a good floral margin or thick vegetated base? Yes / No

Is there a ditch next to the hedge? Yes/No

Which of the following drawings does the hedgerow best resemble? Please tick



Your details

Name

.....

Entered into hedgerow spreadsheet? Yes / No

Date:

