STØTTET AF
Promilleafgiftsfonden for landbrug

Implementation and investment plans in 2 ID15 subcatchments at Funen, catchment to Odense Fjord in Denmark

Effect, construction, costs and farmers' opinions

Searching for constructed wetlands. Photo: Frank Bondgaard, SEGES.

In the Waterdrive project, the catchment area of Odense Fjord has been selected as a case area. In the catchment to Odense fjord 2 subcatchments have been selected. In Denmark they are called ID15 because each of them covers around 1.500 hectares of arable land. There is approximately 3.000 ID15 subcatchments in Denmark.

"According to the River Basin Management Plan, nitrogen emissions to Odense Fjord must be reduced by a total of 549,3 tonnes N on 63.960 ha agricultural area. Of this, a reduction of 345,8 tonnes N has to be reached by 2021. The remaining reduction requirement has been postponed to the third Water Plan period."

The expected effort with constructed wetlands is according to waterplan 2 (2015 – 2021) 67,7 tonnes of nitrogen per year in the catchment area of Odense Fjord. A constructed wetland has an N-effect of approx. 580 kg N/hectare/year in average. This means that 117 hectares of constructed wetlands (67.700 kg : 580 kg/ha) should be established before 2021.
One ID15 catchment area is defined as 1500 hectares of arable land, so there should be around 43 ID15 catchment areas in the catchment of Odense Fjord, which means 3 hectares of constructed wetland/ID15 --catchment area before 2021.

Activities in Waterdrive in 2019

1. Meeting with Centrovice and the farmers union and SEGES
2. Focus group meetings with the farmers, advisors and catchment officers
3. Field visits - examine drainage systems and places for environmental measure
4. Waterdrive meeting with the municipality. They deliver their knowledge about the drainage system
5. Focus group meetings with the farmers, advisors, catchment officers, municipality and SEGES (10 December)

Activities in Waterdrive in 2020

1. Field visits - examine more drainage systems and places for environmental measure together with representatives from the municipality
2. Examine different environmental measures at the locations
3. Calculation of catchment size, size of measure and N & P effect
4. Calculation of the total cost of environmental measures in the area
5. Examine – will landowners establish different environmental measures? Why/why not?
6. Focus group meetings with the farmers, advisors, catchment officers, municipality and SEGES – and maybe more people

Focus group meetings
During 2019 and 2020 we have had 3 focus group meetings with the farmers:

- **21 May 2019** for farmers talking about measures and mapping drains on a large map
- **10 December 2019** for farmers and representatives from two municipalities discussing possibilities and challenges
- **21 October 2020** for farmers discussing catchcrops, measures and the farmers view of them.
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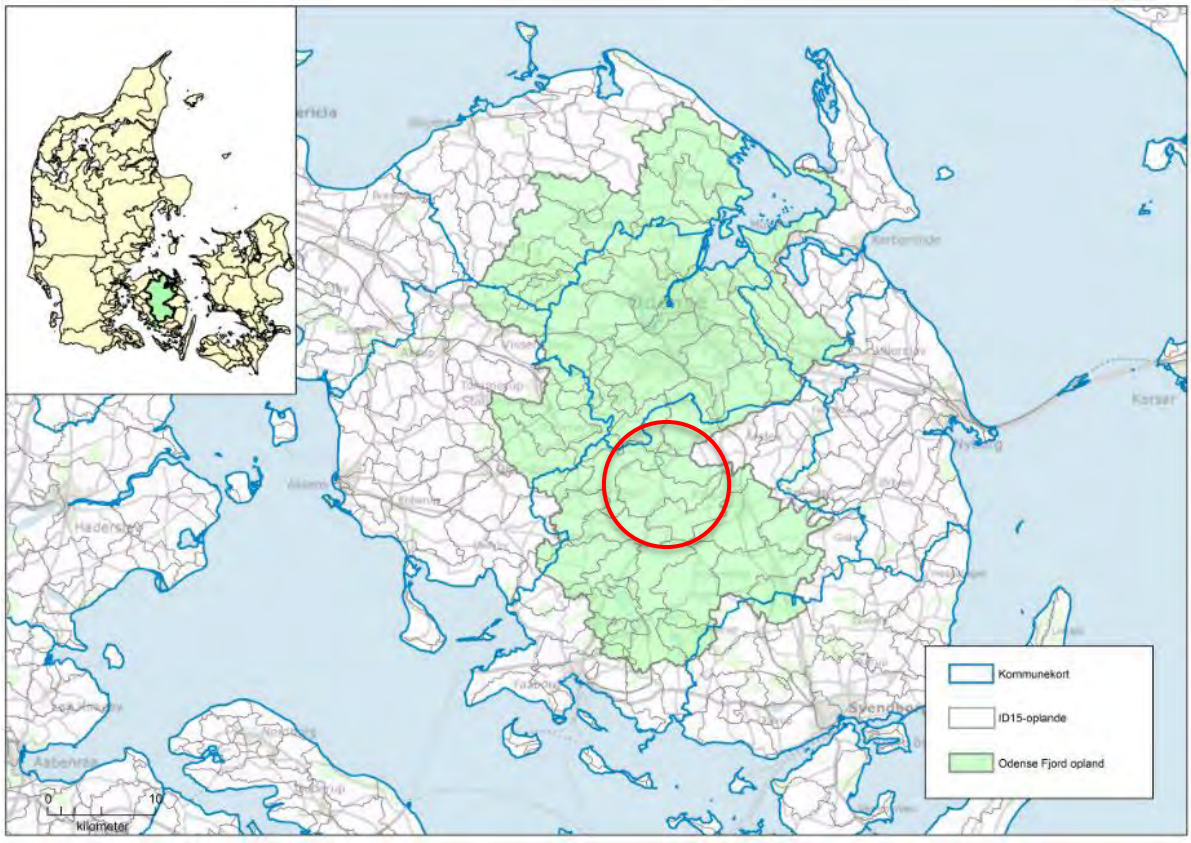
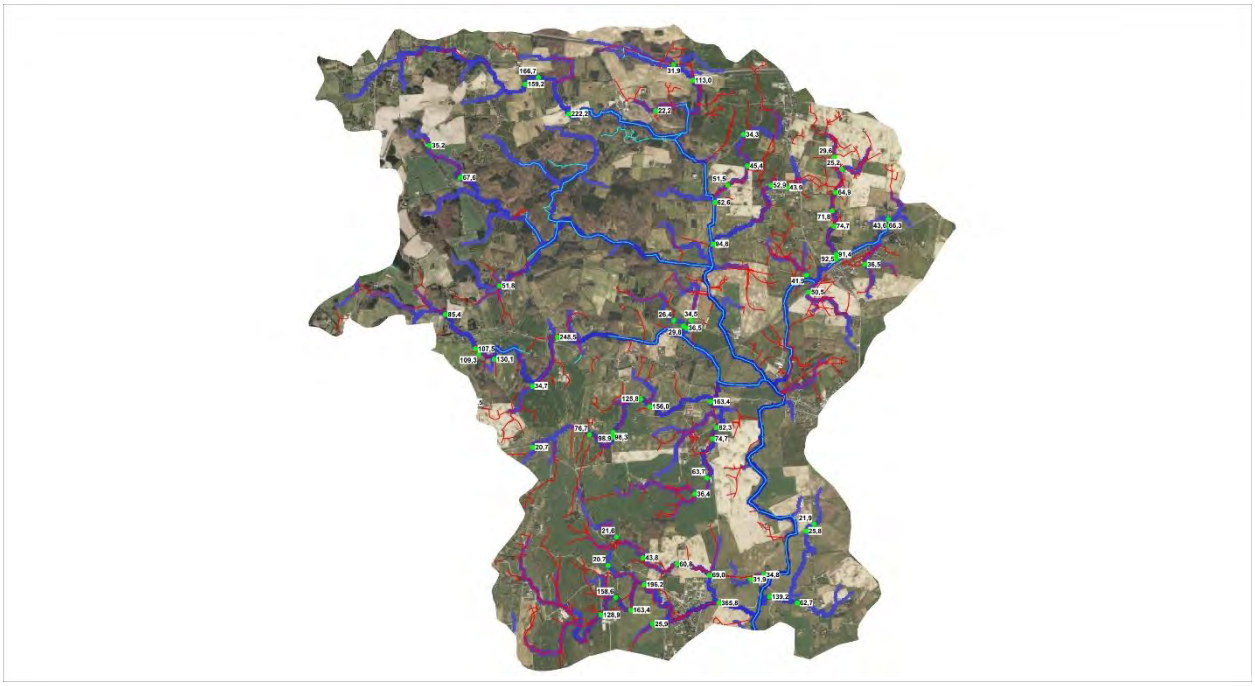
Moreover, we have had a trip around the area with a representative from the municipalities and a meeting with another representative in order to discuss specific projects for potential cooperation.

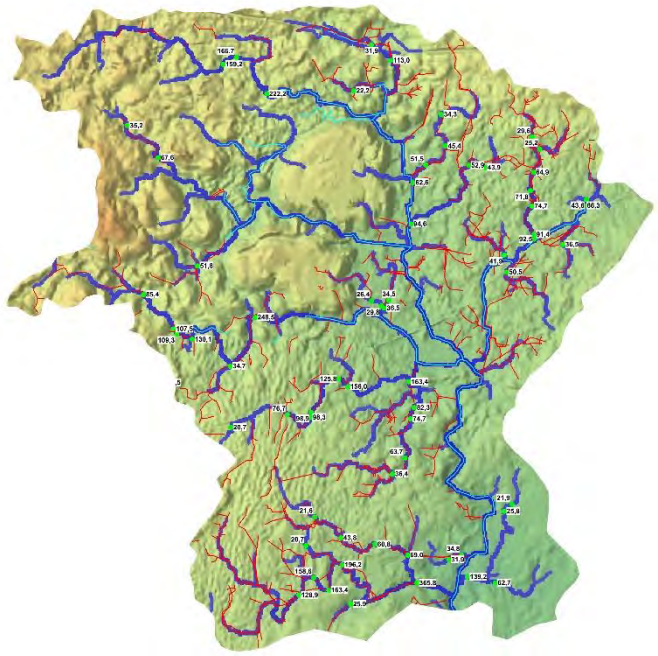
The case area
The catchment area of Odense Fjord is a part of the main water catchment area of Odense Fjord and constitutes an area of 105.600 ha of which the agricultural area constitutes approximately 63.960 ha.



The catchment to Odense Fjord in green and the case area in the red circle.



Theoretical drainage system verified through cross sector cooperation in 3.000 hectare between landowners, Velas, SEGES, Assens and Odense Municipality. The basis for finding optimal locations for environmental measures.



Theoretical drainage system in 3D verified through cross sector cooperation in 3.000 hectare between landowners, Velas, SEGES, Assens and Odense Municipality. The basis for finding optimal locations for environmental measures.

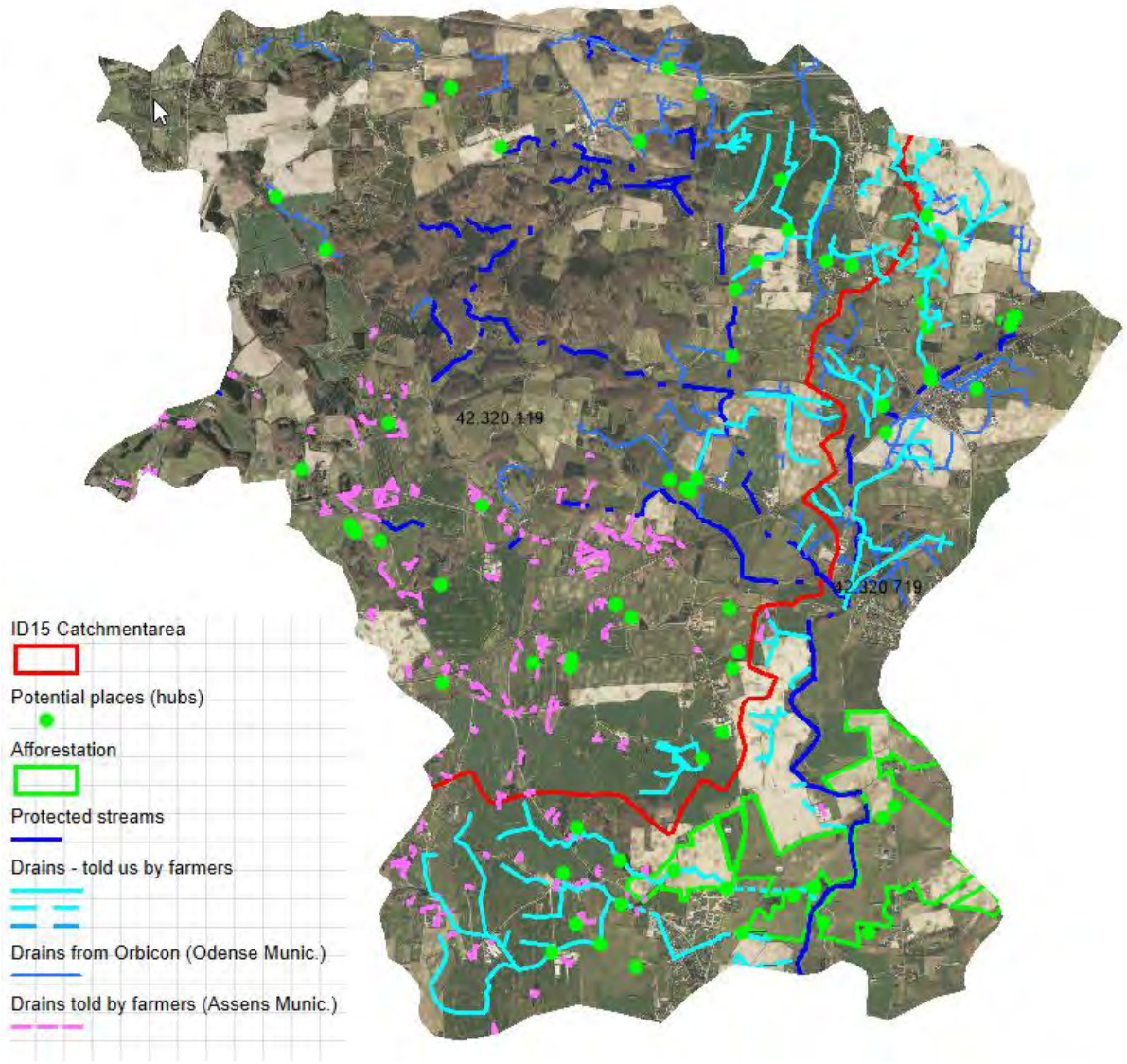
Strategy for each environmental measure at farmlevel

In the catchment area the potential sites are reviewed and divided into 3 groups:

CU	Can´t be used
PP	Potential place
OP	Optimal place
PC	Place confirmed of the landowner
AS	Application submitted

Information collected for most of the environmental measure

1. Location on ortho photo
2. Photos of the location
3. The size of catchment area in SCALCO
4. Construction of the environmental measure. The size and the estimated costs
5. Theoretically calculated N & P effect
6. Comments from the landowner/landowners



The two catchment areas with known drains according to farmers, drains according to the two municipalities, potential places of environmental measures, area of afforestation, and protected streams.

As shown on above picture there are many potential places for environmental measures. Some of them are better than others.

On the following map the meaning of theoretically best places is explained. These are the crossings placed as long downstream as possible, that is as close to the stream as possible because the largest catchments will be cleaned here. It is seen, that crossing number 83.103 (approximately 92 hectares) is more downstream than crossing number 84.384 (approximately 65 hectares).

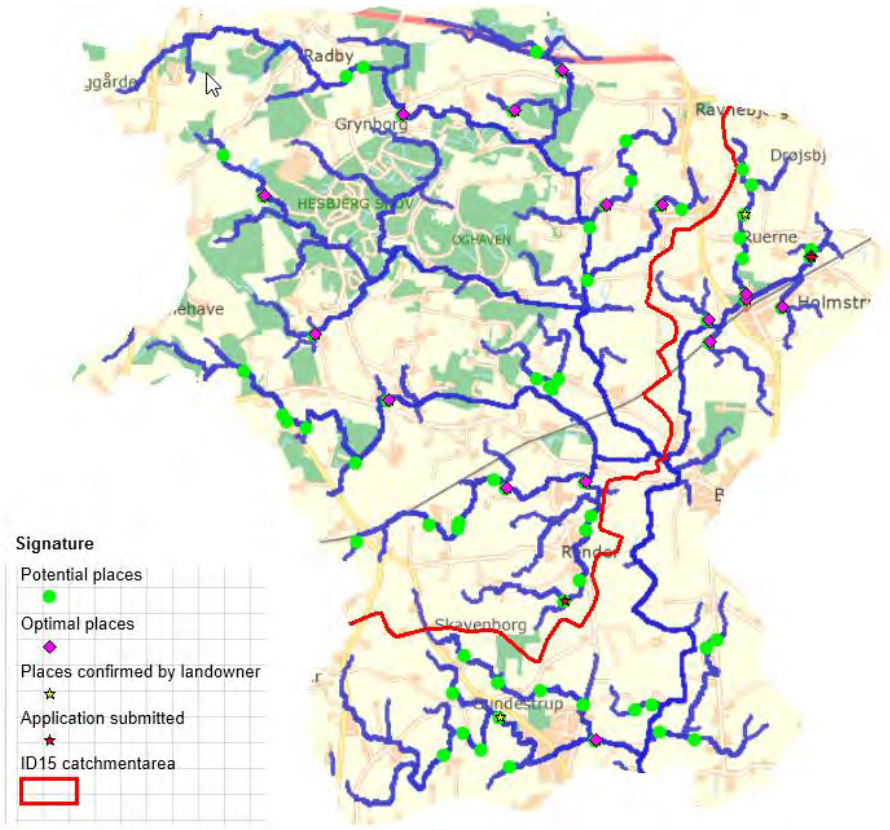
Some theoretical places for measures

On the following map the theoretically optimal places are shown. Ideally the measures should be placed here. The same map also shows:

- Potential places
- Places confirmed by landowner
- Places, where application has been submitted

When pointing out the optimal places we have taken into consideration, that som potential wetlands can be seen on the IMK (map from the Agricultural Agency – Internet field maps). The first step is to implement large wetlands. If this not is possible, the next step will be to investigate the possibilities for implementation of constructed wetlands.

In the following, we will go through the theoretical places and places where we have been in contact with the farmers and discussed the possibilities. In some places, it was impossible to realise measures.



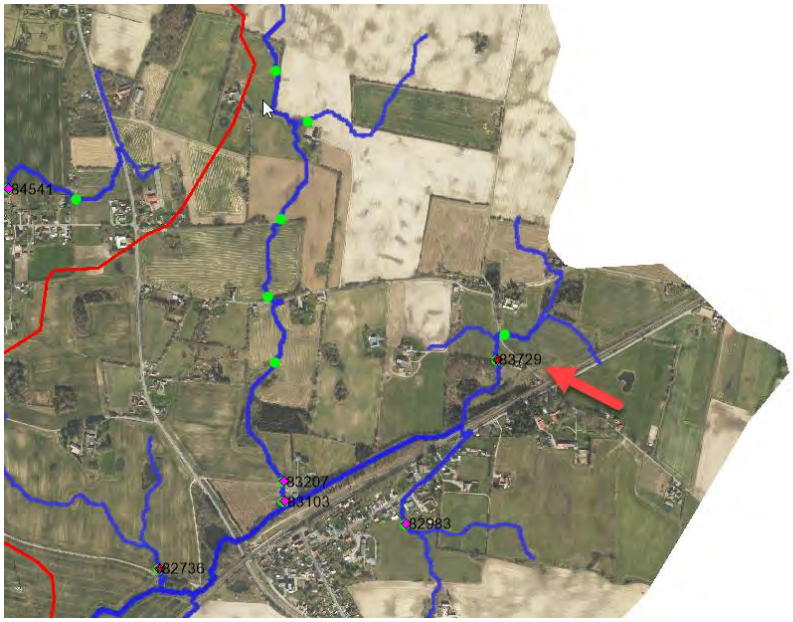
Prerequisites for the calculations

The prerequisites for the following calculations are as follows (Technical details in the Danish guideline for constructed wetlands in Denmark 2020):

- The effect of a constructed wetland is calculated using 1,1 % of the catchment area as the area of wetland, since that is the size I normally use.Example: If the catchment area are 100 hectare. Then the famer need to allocate 1,1 hetare of land to the constructed wetland. The calculations are based on a spreadsheet made by SEGES.
- The costs of the wetland are calculated using 1 % of the catchment area as area of the wetland, since that is the size from which the grant is calculated. If the catchment area are 100 hectare.

In the following text, the area of the constructed wetland is written with two areas, one area for calculating the effect (1,1 % of the catchment area) and one area for the economic calculations (1 % of the catchment area) for example 6.050 sqm (5.500 sqm).

ID15 catchment - 42.320.719
Location 83.729 (83.831) – AS



The location is situated northeast of Holmstrup.

Late autum 2019 the area looked as on below photo:

The theoretical catchment area is around 67 hectares.

Since this constructed wetland project is expected to be realised, Waterdrive has chosen to go on with the applied project.

The catchment area is 55 hectares, and a constructed wetland of 6.005 sqm (5.500 sqm) is planned with a pump because there is small fall on the drain.

The grants lies in the amount of 65.000 € (484.000 kr.) plus 6.465 € (46.000 kr.) as compensation (granted in 2019).

Since it is very unlikely that farmers will invest more money in the projects than the grant covers, we assume that this will also be the maximum cost. If it becomes more expensive, the measures are unlikely to be realised.

The effect of this constructed wetland is calculated to be 284 kg N/year and 2-2,3 kg P/year.

Effekt af virkemidler på oplandsniveau

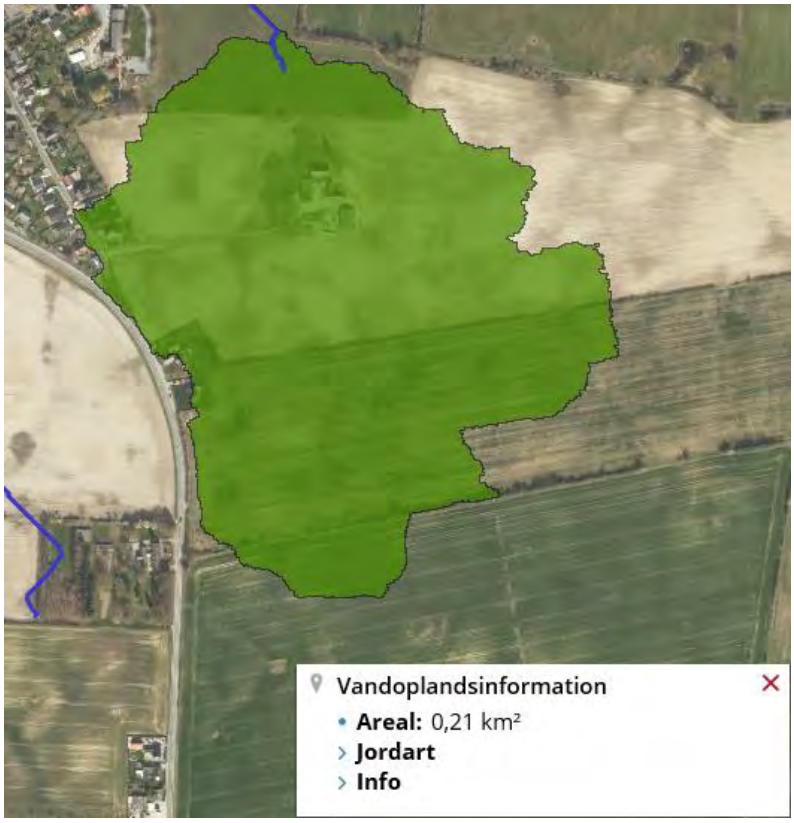
ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
83.729	Minivådområde	55	81	0,605	579,4	284	2,0 - 2,3

Location 82.983 - OP
It is situated to the south of the eastern part of Holmstrup.

The area is quite hilly.

Calculated with Scalgo.com, the catchment area is approximately 21 hectares.



This catchment area means, that a constructed wetland should be constructed with a watersurface of 2.310 sqm (2.100 sqm).

In 2020 it will be possible to receive:

Constructed wetland of 2.100 sqm: around 35.000 € (270.000 kr.)
Plus compensation for the land used for the wetland.

The effect of a constructed wetland is shown in below table:

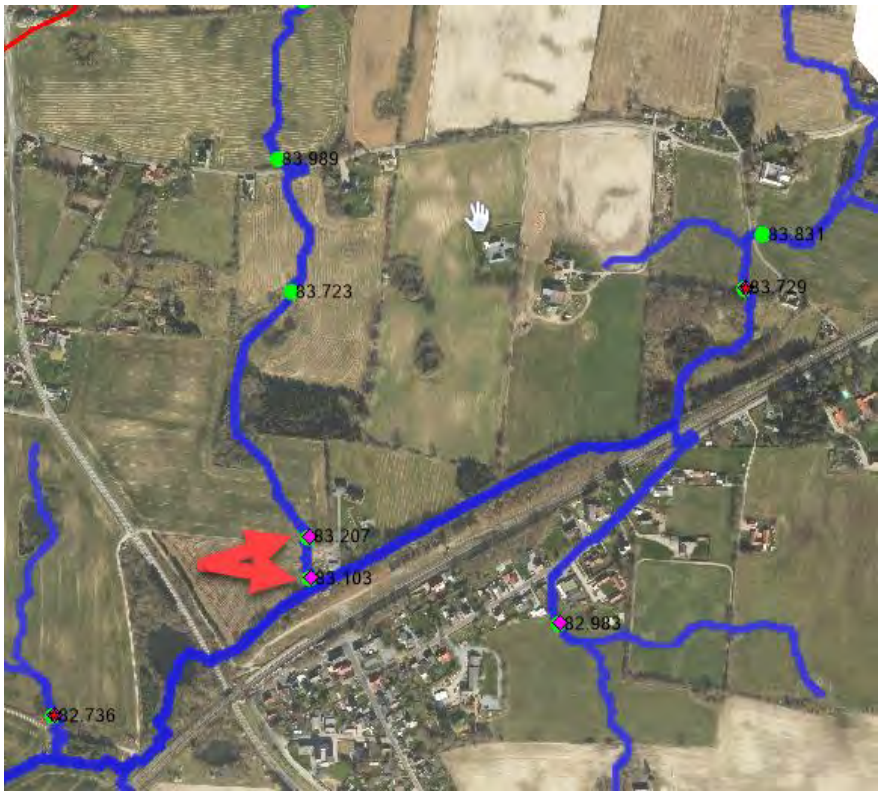
Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
82.983	Minivådområde	21	92	0,231	579,4	123	0,8 - 0,9

The effect of this constructed wetland is calculated to be 123 kg N/year and 0,8-0,96 kg P/year.

Location 83.207 and 83.103 - OP
The two locations are situated close to each other and therefore described together.
They are situated in the same catchment area apart from 0,5 hectares.



Late autum 2019 the area looked as on below photo:

The point 83.207 seen from the road looking to the north.

The point 83.103 seen from the road looking to the south.

The area is very hilly, and presumably it will only be possible to make a constructed wetland if a pump is used.

Many farmers are not interested in constructed wetlands with a pump unless the existing drainage conditions are bad and will be improved in connection with the project.

Calculated with Scalgo.com the catchment area is approximately 92 hectares.

This catchmentarea means, that a constructed wetland should be constructed with a watersurface of 10.120 sqm (9.200 sqm).

In 2020 It will be possible to receive:

Constructed wetland of 9.200 sqm with a pump: around 94.000 € (700.000 kr.)
Plus compensation for the land used for the wetland.

The effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)		

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
83.103	Minivådområde	92	82	1,012	579,4	481	3,4 - 3,9

The effect of this constructed wetland is calculated to be 481 kg N/year and 3,4-3,9 kg P/year.

Location 82.736 - OP
This location is placed west-south-west of Holmstrup.

Calculated with Scalgo.com the catchment area is approximately 42 hectares.

This catchment area means, that a constructed wetland should be constructed with a watersurface of 4.620 sqm (4.200 sqm). So close to the stream, I assume that the constructed wetland can be made without a pump.

In 2020 It will be possible to receive:

Constructed wetland of 4.200 sqm: around 46.000 € (343.000 kr.)
Plus compensation for the land used for the plant.

The effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

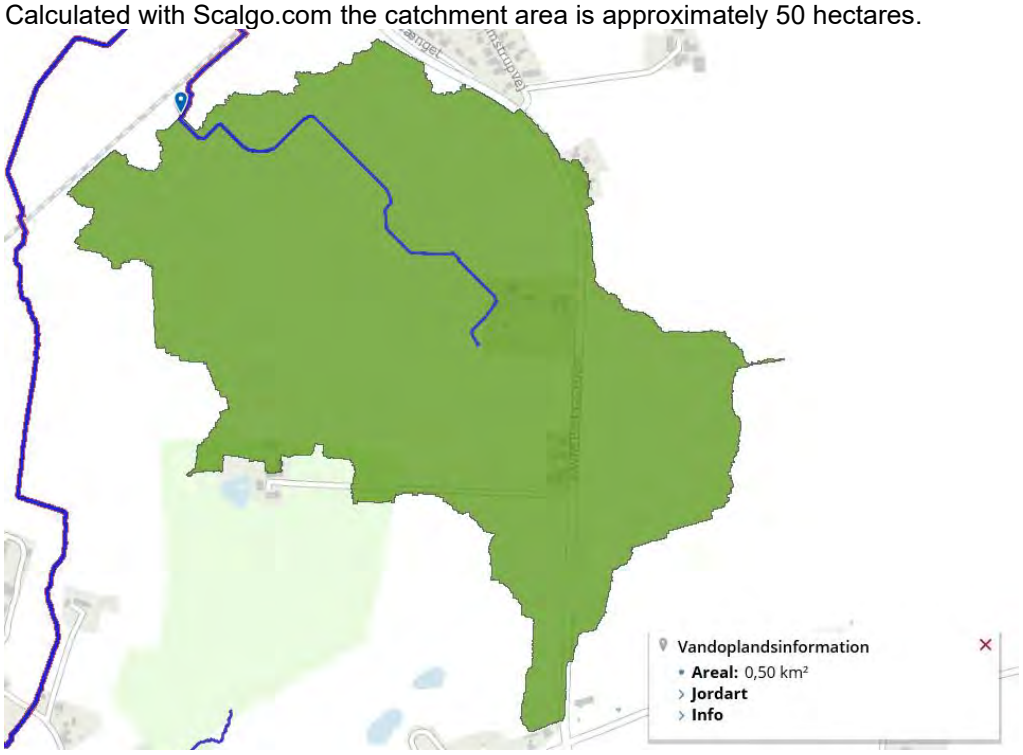
ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
82.736	Minivådområde	42	75	0,462	579,4	201	1,6 - 1,8

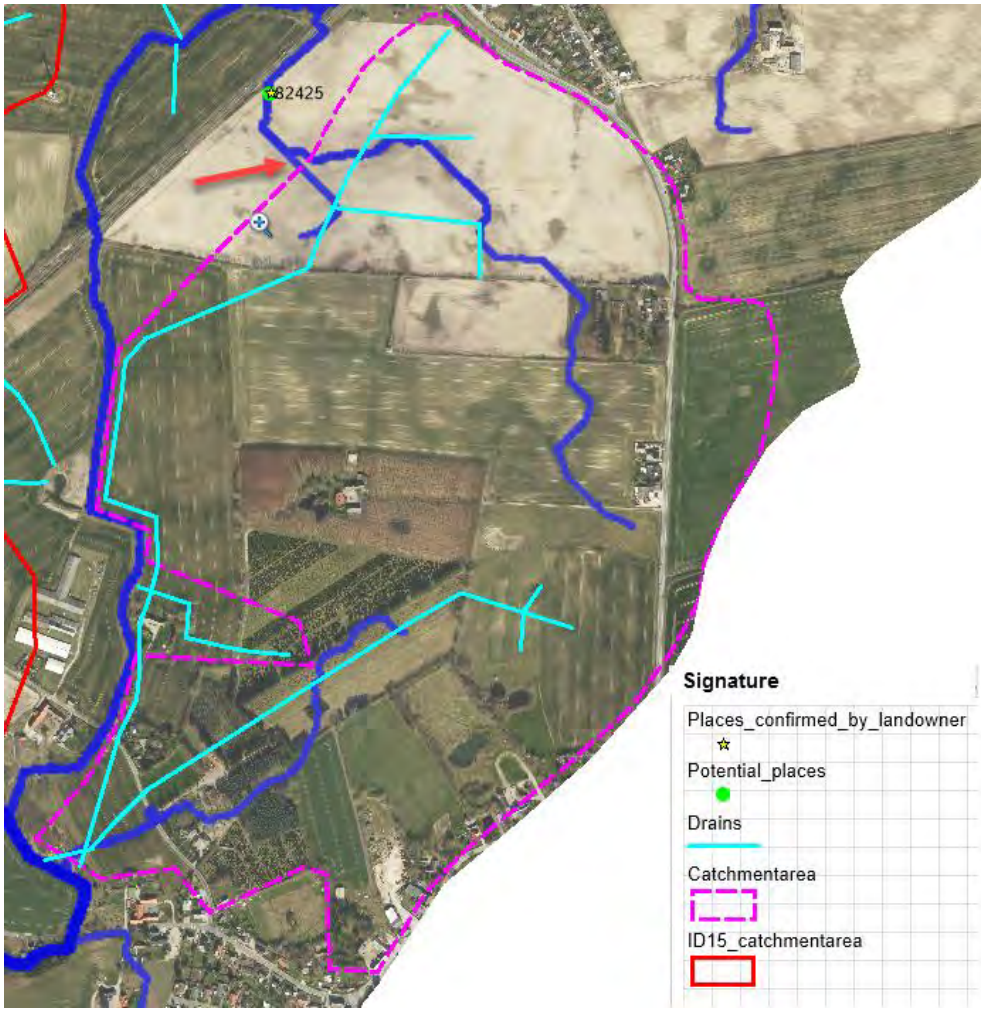
The effect of this constructed wetland is calculated to be 201 kg N/year and 1,6-1,8 kg P/year.

Location 82.425 - OP
This location is placed west-south-west of Holmstrup (just south of the previous location).

Calculated with Scalgo.com the catchment area is approximately 50 hectares.



Interviewing the owners it turnes out to be a wrong catchment area calculated by SCALGO. The drains run towards south, not west. The drains can be seen here on below picture. The farmers knowledge is very important.



It is marked with a red arrow in which area the drains differ from the theoretical flow path.
The real catchment area is 87 hectares.

This catchment area means, that a constructed wetland should be constructed with a watersurface of 9.570 sqm (8.700 sqm). It might be possible to make without a pump. So the cost is calculated with that assumption.

In 2020 it will be possible to receive:

Constructed wetland of 8.700 sqm: around 90.000 € (670.000 kr.)
Plus compensation for the land used for the plant.

The calculated effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)		

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
82425, adjusted	Minivådområde	87	66	0,957	579,4	366	3,2 - 3,7

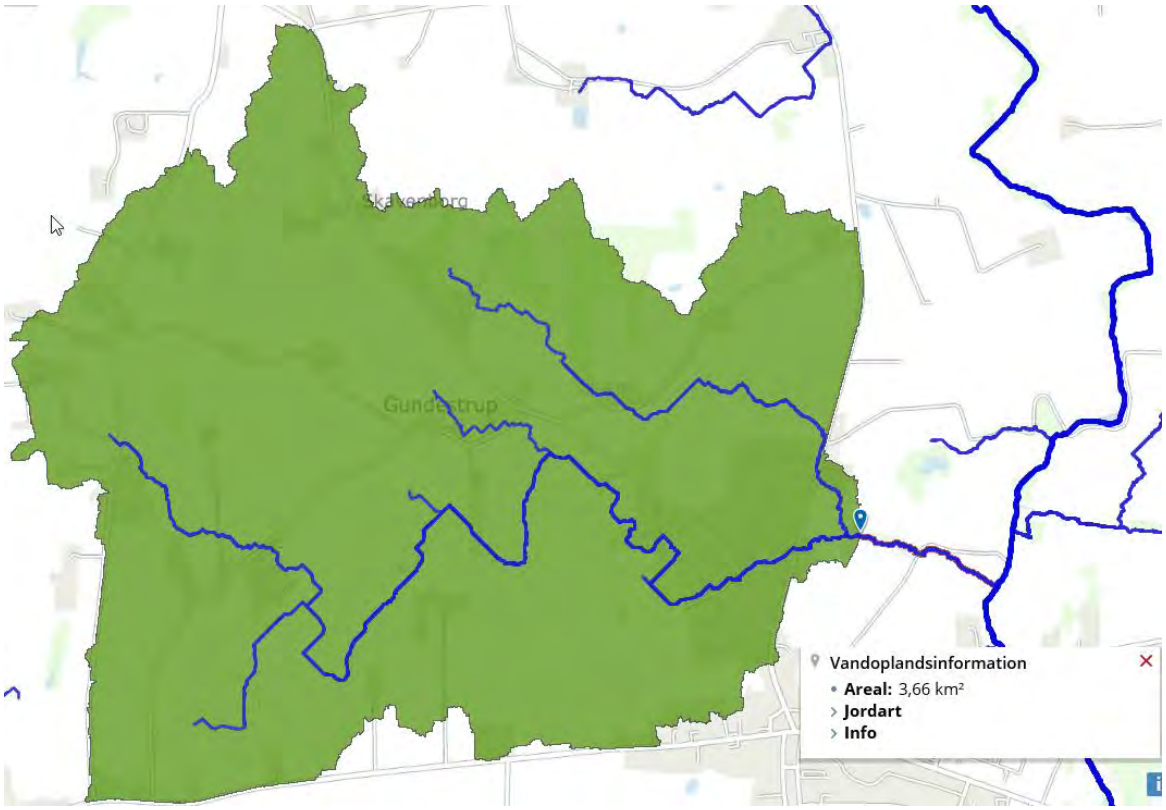
The effect of this constructed wetland is calculated to be 366 kg N/year and 3,2-3,7 kg P/year.

Location 76.550 - OP
This location is placed east of of the northern part of Brylle.

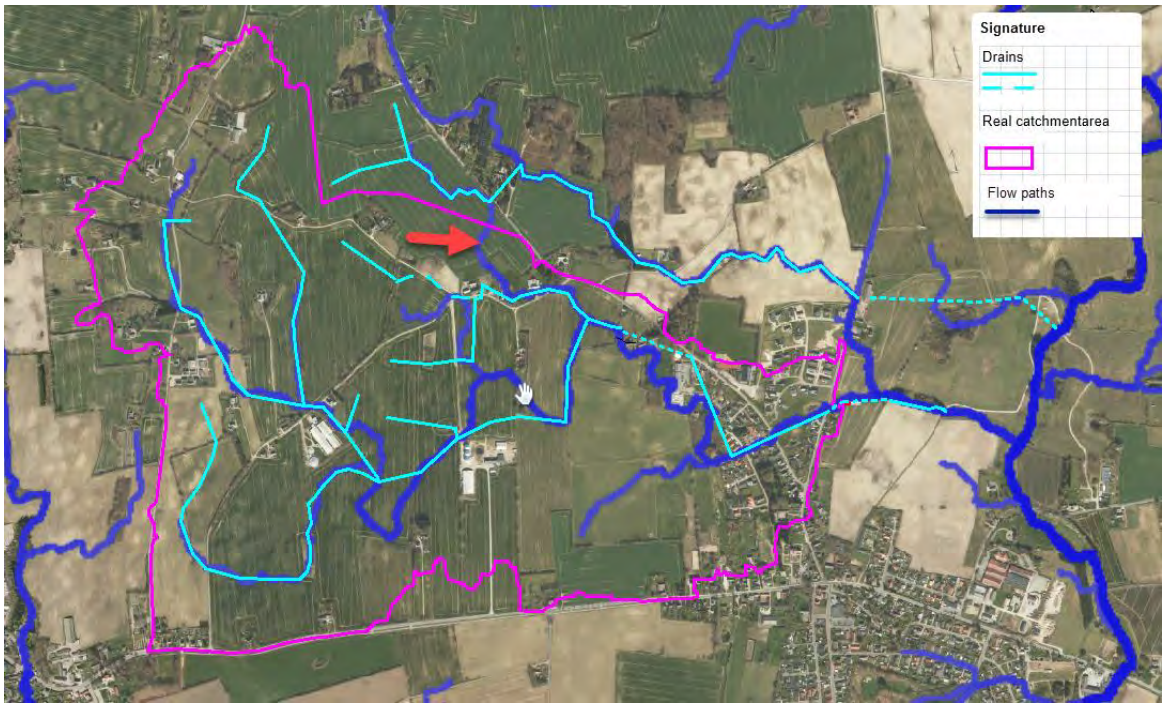
In the summer of 2019 it looked as on below picture:

The point 76.550 seen from the road looking to the east.

Calculated with Scalgo.com the catchment area is approximately 366 hectares.



However, talking to the landowners, we found out, that in reality this is not the correct catchment area. As shown on above picture the drains run in two independent “branches”.



The place, where reality differs from theory is shown with the red arrow.
So there is a catchment area of approx. 247 hectares instead of 366 hectares shown with the pink line.

The northern part of the drains passes through an area with afforestation, so constructed wetland is not at good idea in this area, which is the reason why, we have not pursued our work in this area.

The drains lie deep in the ground, so in order to avoid moving too large amounts of soil, it will be appropriate to use a pump.

This catchment area means, that a constructed wetland should be constructed with a watersurface of 2,717 hectares (2,47 hectares).

In 2020 It will be possible to receive:

Constructed wetland of 2,47 hectares with a pump: around 197.000 € (1.466.000 kr.)
Plus compensation for the land used for the plant.

The calculated effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel
76550, adjusted	Minivådområde	247	65	2,717	579,4	1023	9,1 - 10,4

The effect of this constructed wetland is calculated to be1.023 kg N/year and 9,1-10,4 kg P/year.

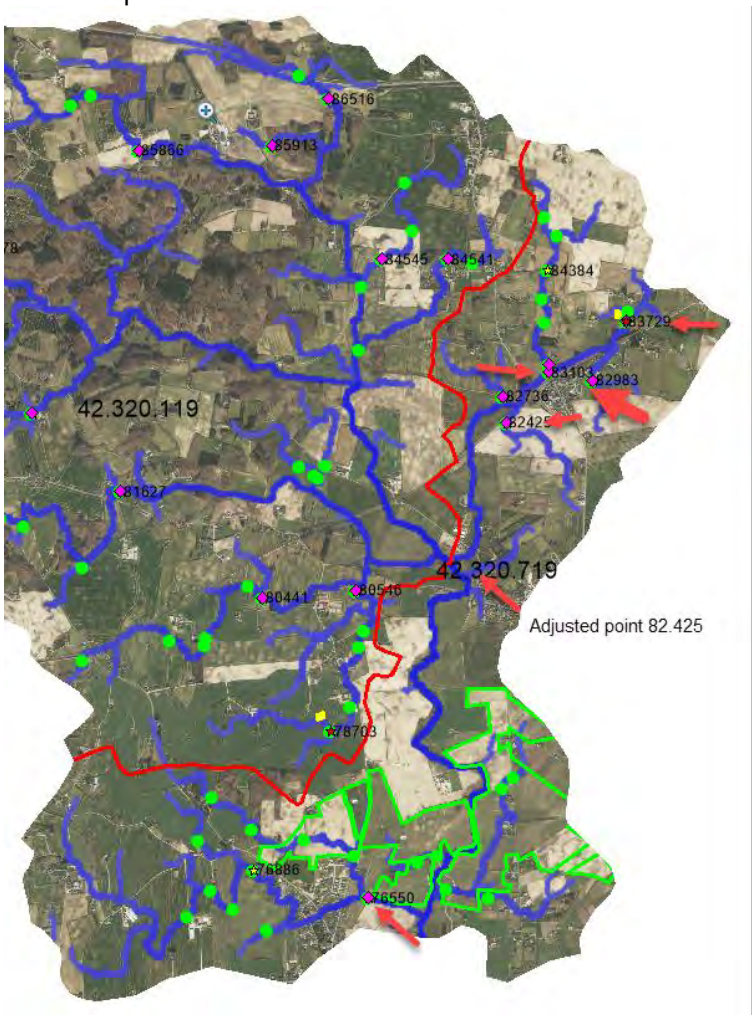
Actually drainage water from this catchment area ends up in a meadow, where some of the nitrate must be expected to be denitrificated naturally.

This place seems very good for a constructed wetland, but it is § 3 protected (protected by the Nature Conservation Act), which means that due to the rules, we not are allowed to establish constructed wetlands at this location.

It is unfortunate, but a problem we meet quite often, since the lowest parts of the landscape are the best places for constructed wetlands, but they are often protected meadows.

Another question is how big the natural denitrification is and how much we would actually gain if anything by making a constructed wetland.

Possibilities for optimal placement of constructed wetlands in ID15 catchment area 42.320.719
Since quite a lot of afforestation has been going on in the southern part of this ID15 catchment area there are only few theoretical optimal places in the middle of the catchment area as shown on the map below.



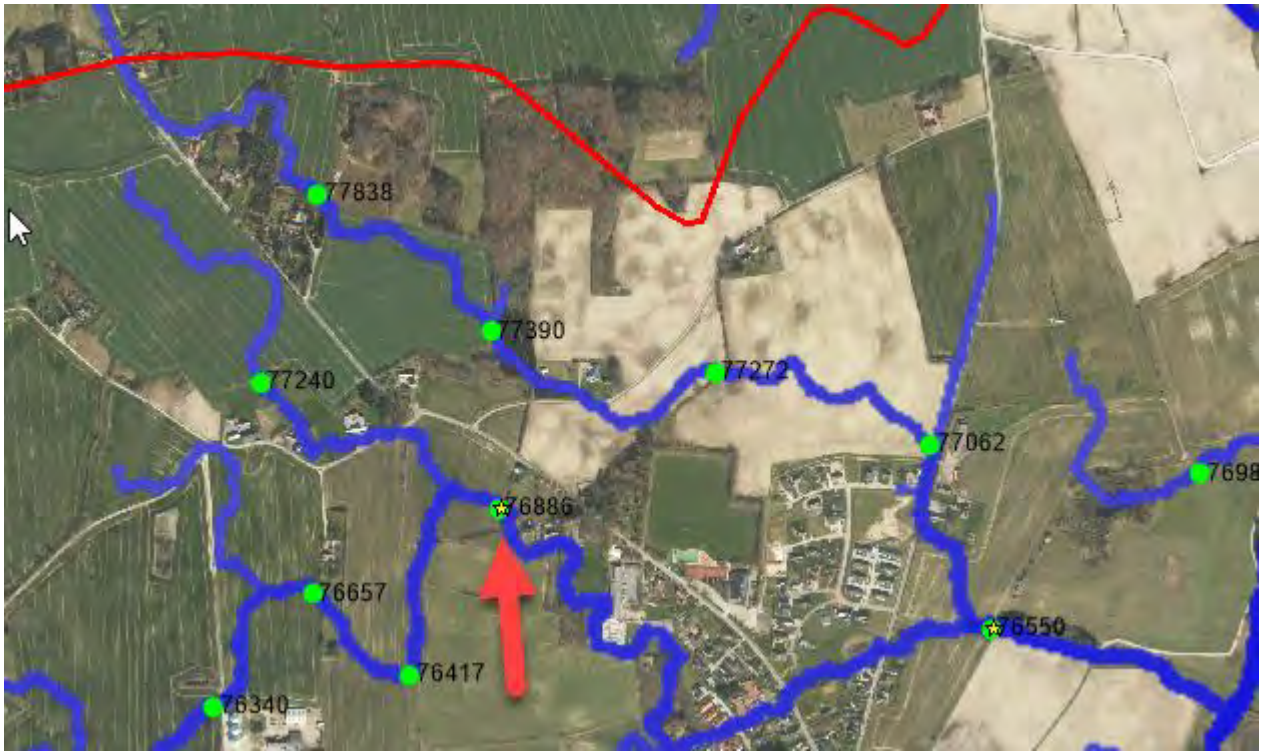
The sum of the theoretical places is shown below, however, not more teoretical, than the catchment areas have been adjusted corresponding to the collected informations.

ID15 42.320.719 east of Tommerup Station						
Location number	Environmental measure PP/PC/AS	Catchment In hectare	N-effect	P-effect		Total cost of the measure in Euro (1 Euro=7,45 dk)
83.729	Constr. wetland	55	284	2,0	2,3	70.000
82.983	Constr. wetland	21	123	0,8	0,9	47.000
83.103	Constr. wetland	92	481	3,4	3,9	95.000
82.736	Constr. wetland	42	201	1,9	2,1	61.000
82425, adjusted	Constr. wetland	87	366	3,2	3,7	92.000
76550, adjusted	Constr. wetland	247	1.023	9,1	10,4	200.000
Total		544	2.478	20,4	23,3	567.000

The theoretical effect on Nitrogen an Phosphorus in the drainage water has been calculated to be 2.478 kg N/year and 20,4-23,3 kg P/year from 6 constructed wetlands equivalent to 6 hectares of watersurface and a total construction cost of 567.000 €. To this cost comes compensation for not beeing able to cultivate the field used for the complete projec tarea, estimated to 1,75 % of the catchments, which is 9,5 hectares or 60.000 € as a one-time compensation. The price all together can in this way be calculated to 627.000 €.

It should be noted that this is a lasting measure, so when the constructed wetlands is established, it will go on reducing in the future - perhaps with a little maintenance like digging up sludge from the bottom of the sedimentation bassins as opposed to e.g. catchcrops which have to be sown every year.

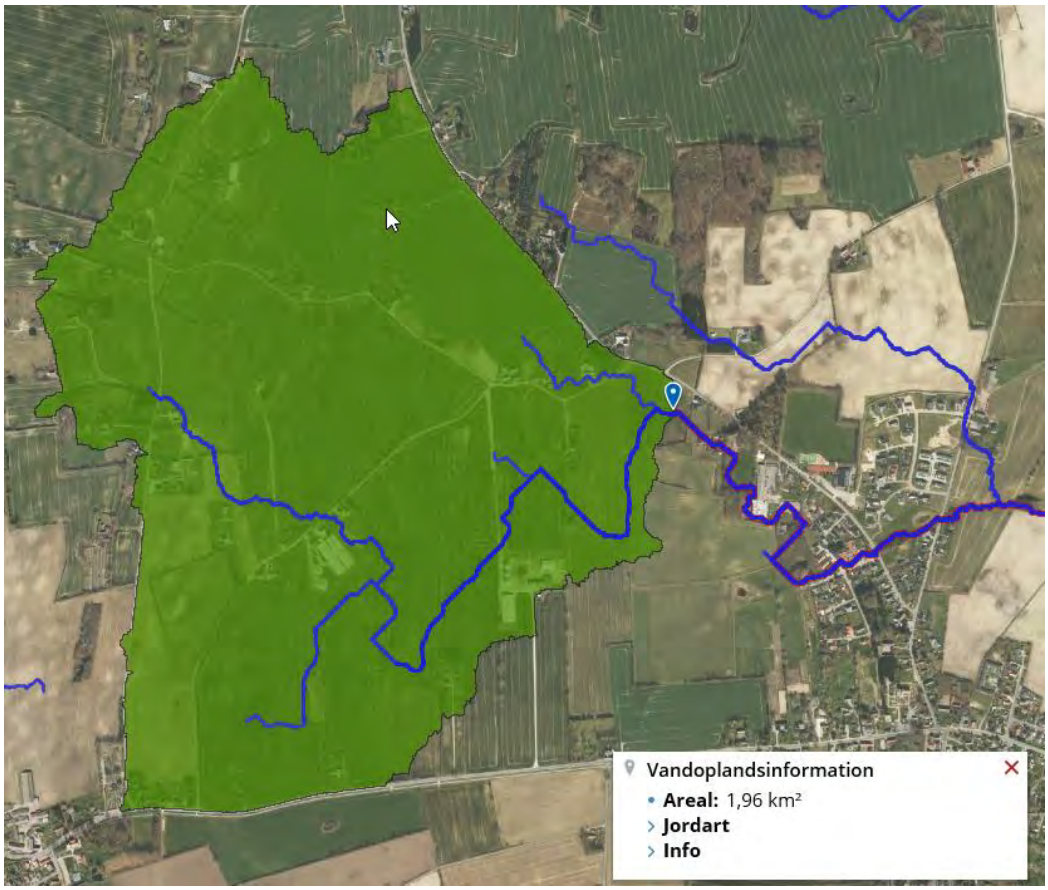
Working with alternatives to the point 76.550
Location 76.886
Since it is probably not realistic to establish a constructed wetland on the position of point 76.550, we have worked on an alternative place further upstream.
This location is placed approx. 850 m west of the point 76.550.



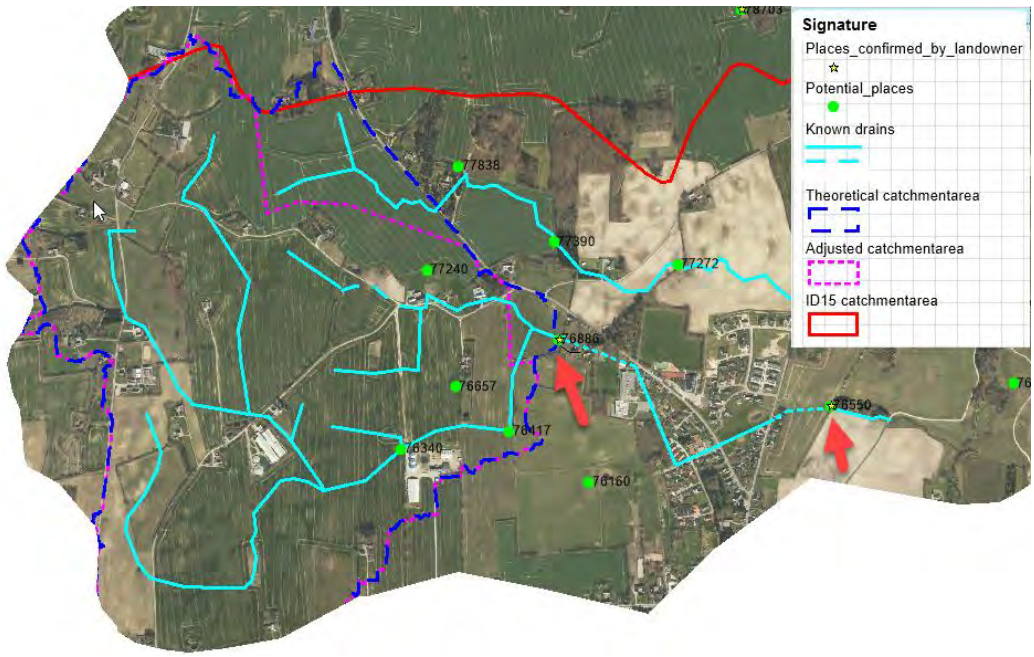
In the Summer of 2019 the field on this location looked as on below picture:

The field at the point 76.550 seen from the neighbouring field.

Calculated with Scalgo.com the catchment area is approximately 196 hectares.



However, talking with the landowners we found out, that in reality this is not the correct catchment area. The catchment areas is shown below with the two points marked with a red arrow.



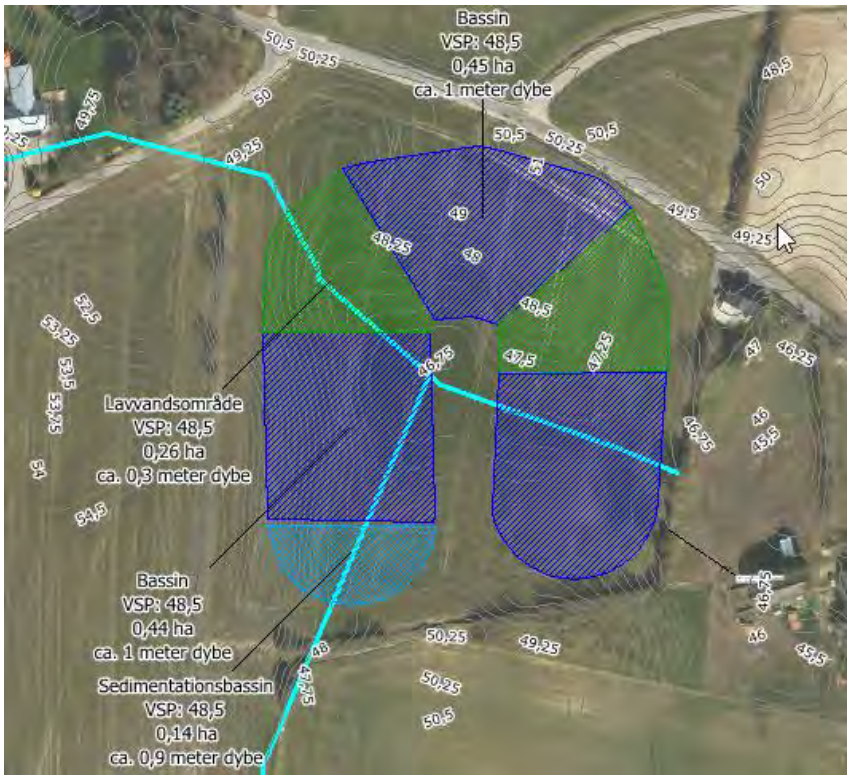
The theoretical catchment area is approximately estimates to 196 hectares by SCALGO. The correct catchment area is around 177 hectares.

The drains lie deep in the ground, so in order to avoid moving too large amounts of soil, it will be appropriate to use a pump.

This catchment area means, that a constructed wetland should be constructed with a watersurface of 1,947 hectares (1,77 hectares).

In 2020 It wil be possible to receive:

Constructed wetland of 1,77 hectares with a pump: around 150.000 € (1.118.000 kr.)
Plus compensation for the land used for the wetland.



A contructed wetland of 1,77 ha would take up all of the field space.

Calculated with the so-called “Diggingtool” the theoretical amount of soil to be digged will be approximately 76.000 – 78.000 sqm because of the deep drains (app. 2 meters).
Whereas approximately 13.350 sqm would have to be digged up and moved, if the wetland was constructed with a pump. But who is to pay for the operation costs of the pump during the next 10 years? The farmer is not keen on that.
Could a pump-union be a solution?
And is it reasonable to emit CO2 in order to remove nitrate from the drainage water?

The calculated effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
76.886, adjusted	Minivådområde	177	76	1,947	579,4	857	6,5 - 7,4

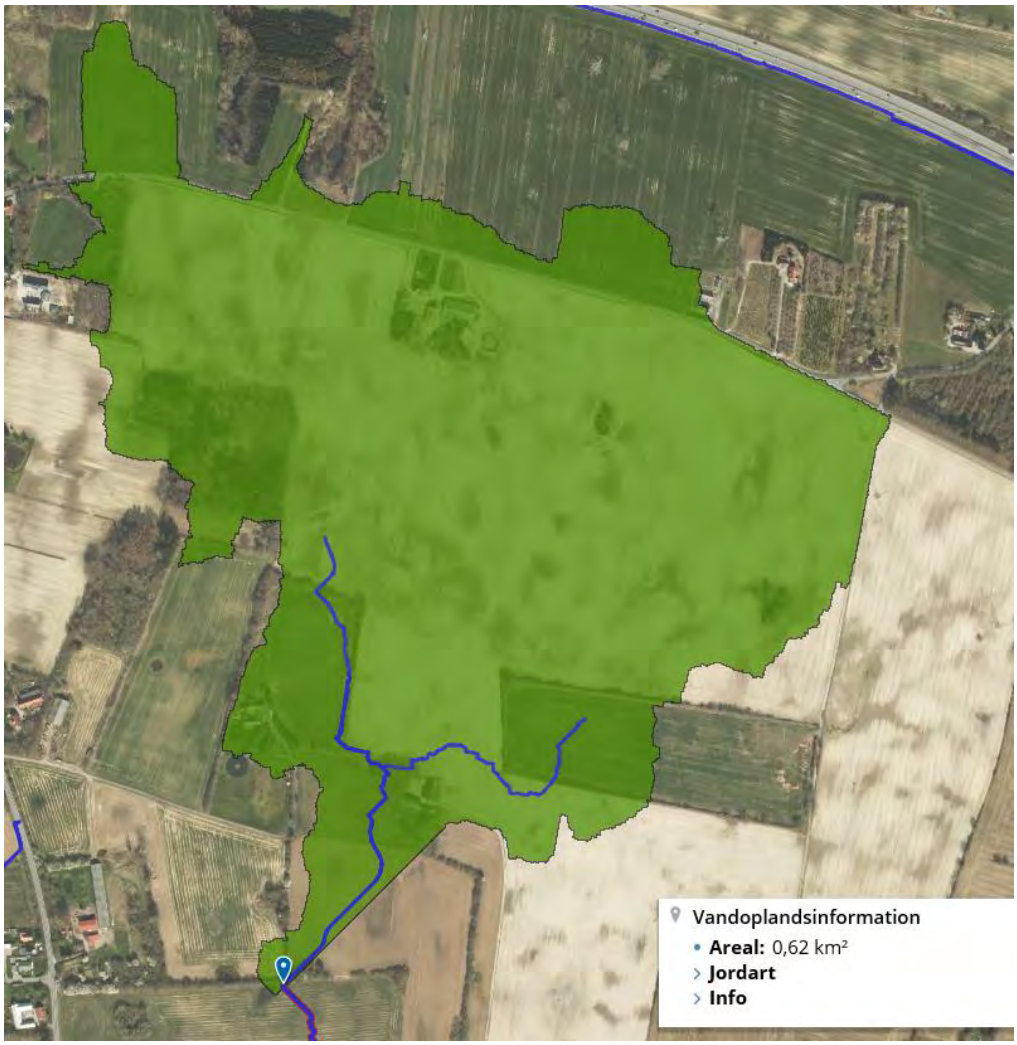
The effect of this constructed wetland is calculated to be 857 kg N/year and 6,5-7,4 kg P/year, which is 166 kg N/year and 2,6-3,0 kgP/year less, than the adjusted point 76.550.

Working with alternatives to the point 83.207/83103
Location 84.384
Since it is probably not realistic to establish a constructed wetland on the position of point 83.207/83.103 we have worked on an alternative place further upstream.
This location is placed approx. 700 m to the north of the point.

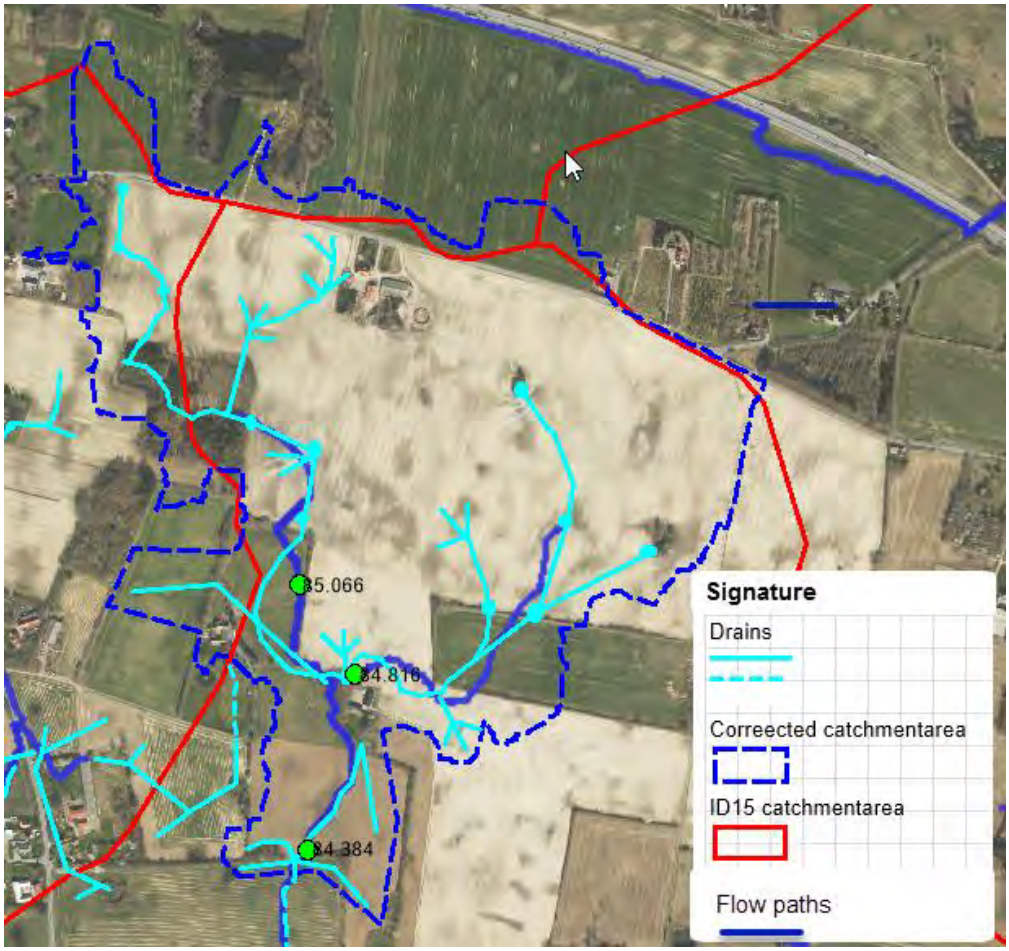
In the summer of 2019 the field with the point looked as on the photo below looking to the west:

The field next to the point 84.384.

Calculated with Scalgo.com the catchment area is approximately 62 hectares.


Vandoplandsinformation
Areal: 0,62 km²
Jordart
Info

Talking to the landowners, we recorded the drains seen below and have adjusted the catchment area slightly. The area seems to be approximately 66 hectares.

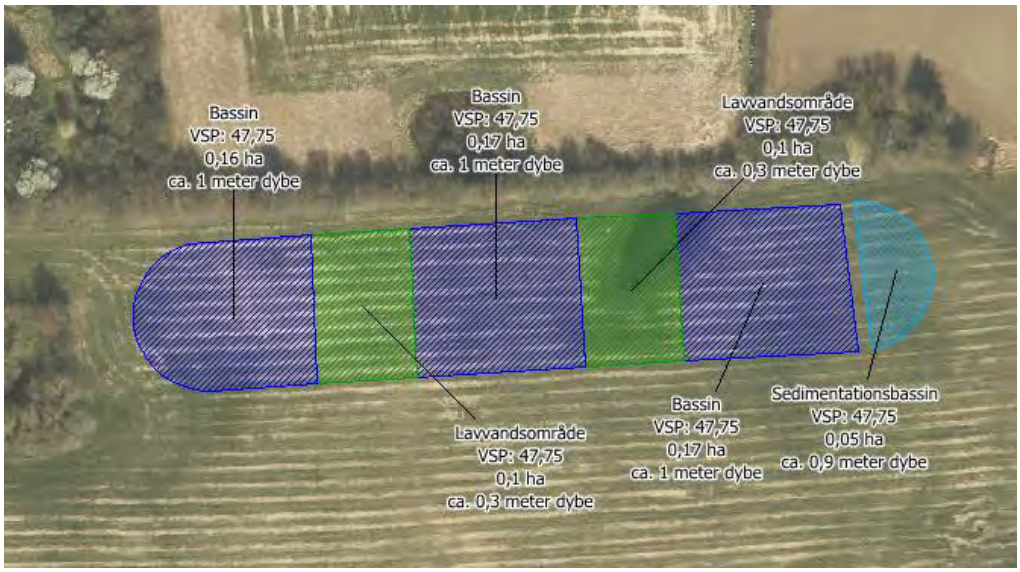


This catchment area means, that a constructed wetland should be constructed with a watersurface of 7.260 sqm (6.600 sqm).

In 2020 it will be possible to receive:

Constructed wetland of 6.600 sqm: around 59.000 € (440.000 kr.)
Plus compensation for the land used for the wetland.

The constructed wetland could be placed along the border of the field, not very organic, but space saving.



The calculated effect of a constructed wetland is shown in below table:

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

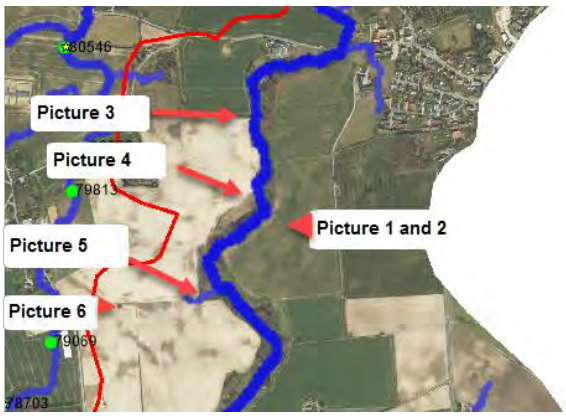
Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
84.384	Minivådområde	66	83	0,726	579,4	349	2,4 - 2,8

The effect of this constructed wetland is calculated to be 349 kg N/year and 2,4-2,8 kg P/year.

The drains are not lying very deep here, however, the hilly landscape means that quite a lot of soil would have to be digged off for the establishment of a constructed wetland.

A walk along the stream

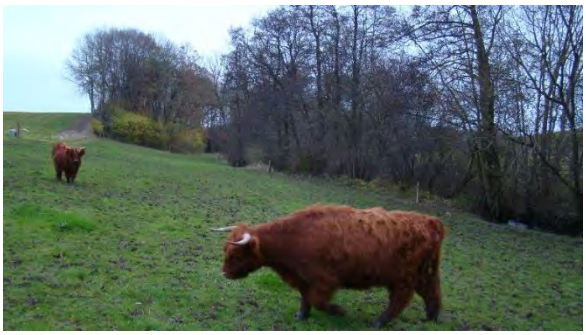
In order to find good places for the establishment of constructed wetlands, we took a walk along part of the stream south-east of Brændekilde with some of the farmers. Suitable places for the establishment of constructed wetlands are not found behind a desk looking at maps.



Not many of these fields are drained, which leaves few possibilities for measures.

1

2



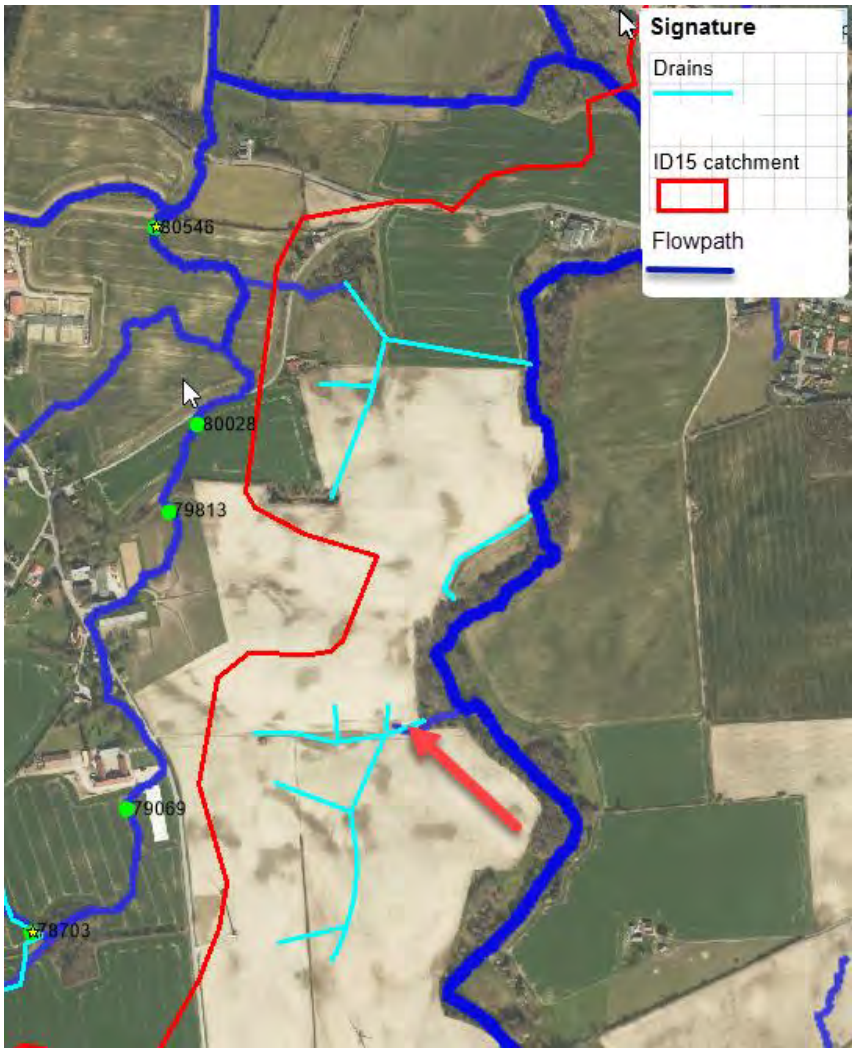
3

4

5

6

The known drains in this area are shown below:



In the place shown with the arrow there might be possibilities for making an intelligent bufferzone (picture 5 and 6).

The catchment area to this point is with Scalgo.com calculated to be around 10 hectares.

A possibility might be an intelligent bufferzone (IBZ) or perhaps more likely a sedimentation bassin.

The expected effect of an intelligent bufferzone from 10 hectares is calculated to be 38 kg N/year and 0,4 kg P/year based on 65 sqm IBZ/hectare.

Effekt af virkemidler på oplandsniveau

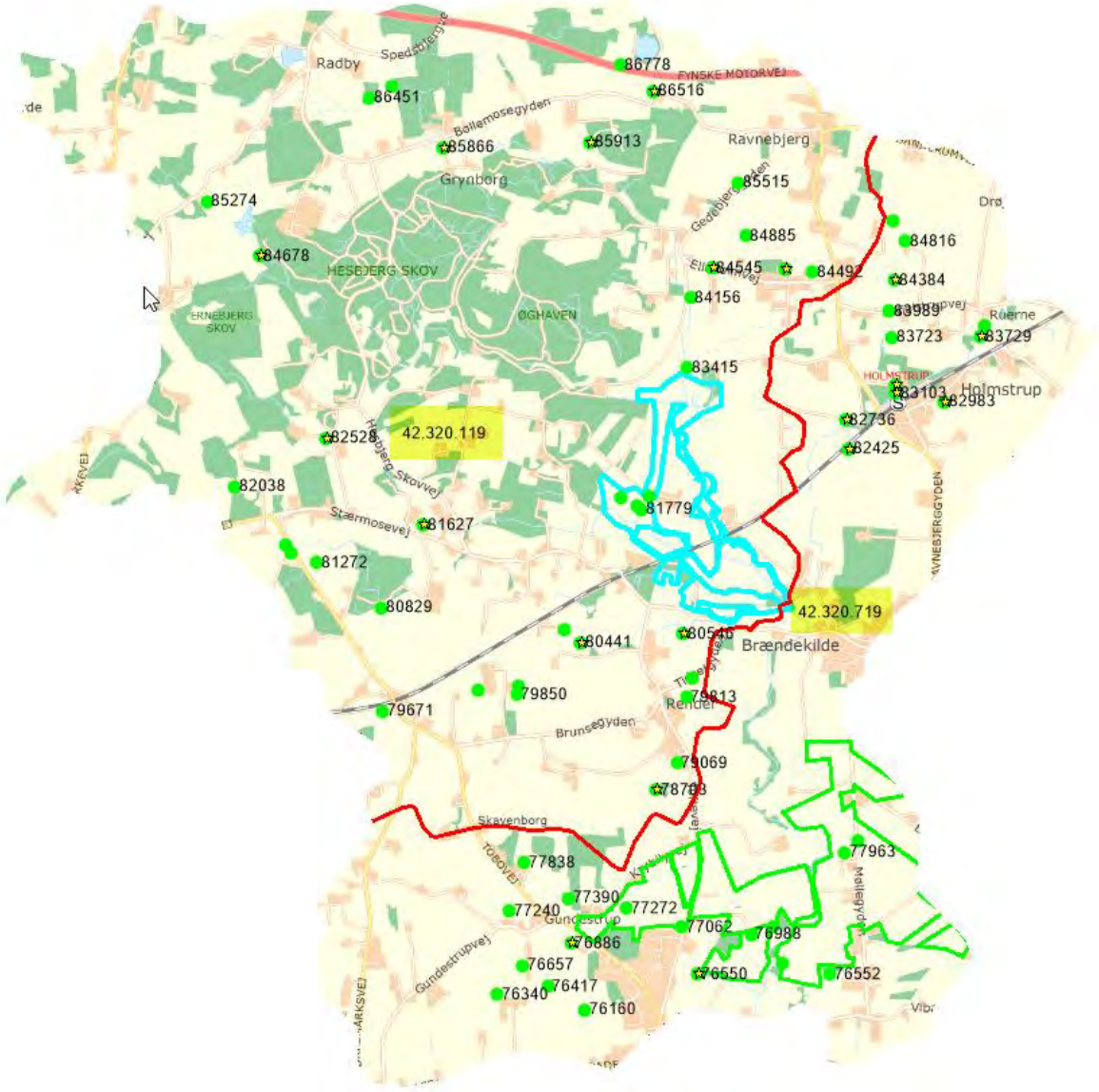
ID15-nummer	42320719	1135	ha	LOOP-opland	Fyn (lerjord)

Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg
	Intelligent bufferzone	10	100	0,065	579,4	38	0,4 - 0,4

The price for an IBZ is estimated to be 13.400 € for 10 hectares catchment area and 650 sqm IBZ.

An intelligent bufferzone

ID15 catchment 42.320.119
ID15 catchment 42.320.119 differs significantly from ID15 catchment 42.320.719.



42.320.119 is a larger ID15 catchment than 42.320.719. It is 2.143 hectares, whereas 42.320.719 is 1.135 hectares, so almost twice as large. Probably, the reason for this is that there is a lot of forest in 42.320.119. In 42.320.719 there will be a great deal more forest in the future, since quite a large area has been afforestated - close to 145 hectares.

There are more villages in 42.320.719.

In 42.320.119, 60 hectares are reserved for public wetlands, which means that this area and the fields draining directly to this area are irrelevant for constructed wetlands.

This catchment area has not been analysed as systematically as 42.320.719. We have only worked with places confirmed by farmers.

Location 84.541 - PC
This place is situated to the south-west of Ravnebjerg. The area is quite high, and most of the drains are lying very deep in the field – up to 2-2,5 metres.

This is a theoretical catchment area of 53 hectares, which means a constructed wetland of 5.830 sqm (5.300 sqm).

In 2020 It will be possible to receive:

Constructed wetland of 5.300 sqm with a pump: around 68.000 € (500.000 kr.)
Plus compensation for the land used for the plant.

The effect of a constructed wetland can be seen in below:

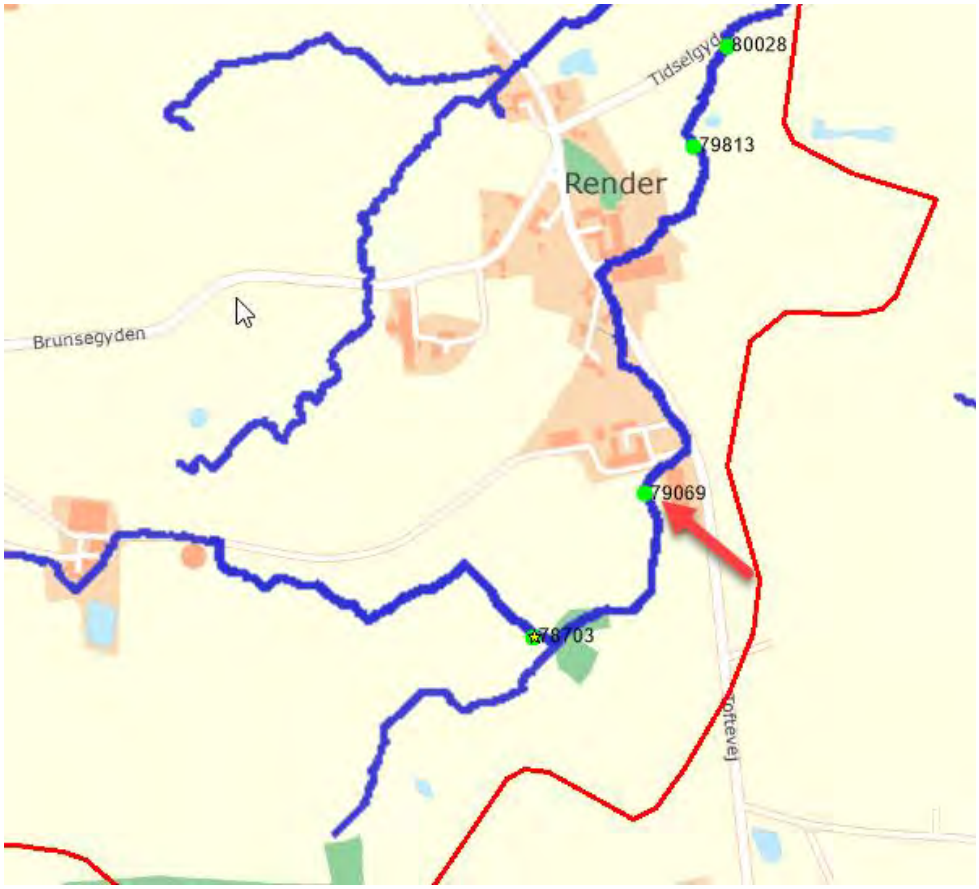
Effekt af virkemidler på oplandsniveau

ID15-nummer	42320119	2143	ha	LOOP-opland	Fyn (lerjord)

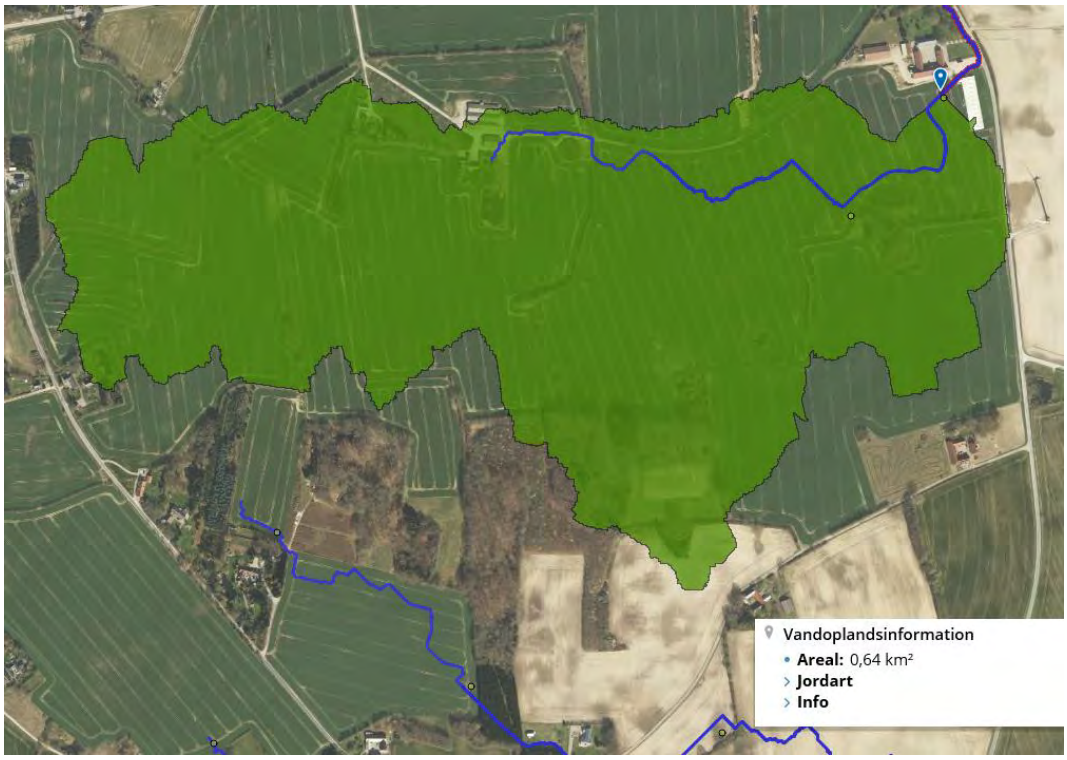
Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
84.451	Minivådområde	53	56	0,583	594,6	194	2,0 - 2,2

The effect of this constructed wetland is calculated to be 194 kg N/year and 2,0-2,2 kg P/year.

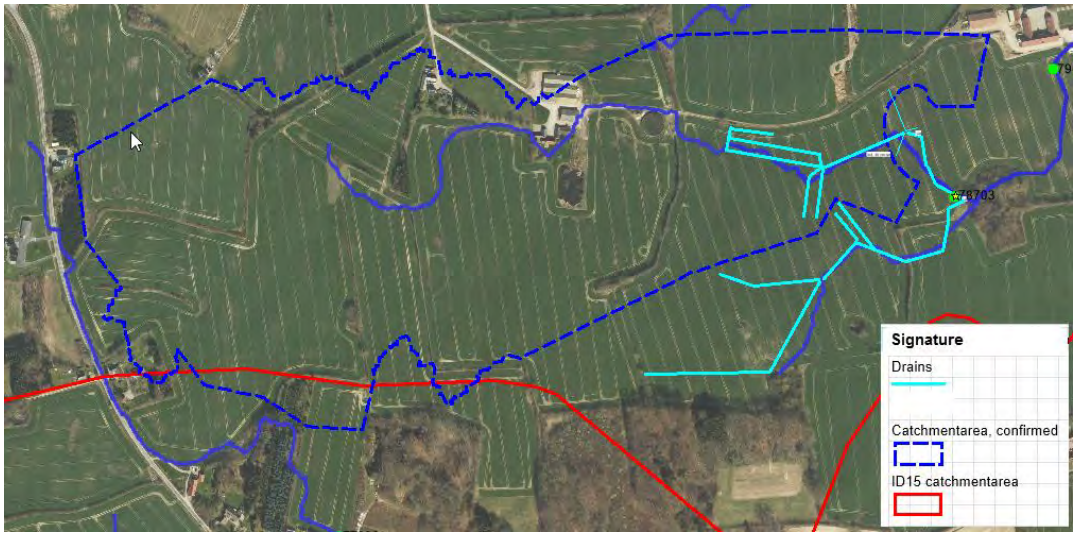
Location 79.069 - AS
This point is placed south of Render:



The catchment area in point 79.069 is with Scalgo-com calculated to be 64 hectares.



It is not possible to establish a constructed wetland at this place, but it is expected that a constructed wetland will be realised in part of the catchment area.



This catchment area is approximately 43 hectares.

Effekt af virkemidler på oplandsniveau

ID15-nummer	42320119	2143	ha	LOOP-opland	Fyn (lerjord)		
Lodsejer	Virkemiddel	Drænopland ha	Omdriftsprocent %	Virkemiddel ha	Effekt kg N pr. ha virkemiddel	Effekt af virkemiddel kg N	Effekt af virkemiddel kg P
78.703, adjusted	Minivådområde	43	90	0,473	594,6	253	1,6 - 1,8

The effect is calculated to be 253 kg N/year and 1,6-1,8 kg P/year.

The grants from 2018 was: 48.000 € (360.000 DKK)

A wetland project is planned in this catchment area.

Focus group meetings

During the last 2 years there has been 3 Waterdrive focus group meetings in the Waterdrive project area. A strategy called collective start-up meetings in Denmark has been used at the focus group meetings. Involvement of 13 landowners in 2 sub-catchments to Odense Fjord.

The first focusgroup meeting in May 2019

Second focus group meeting in December 2019

Third focus group meeting with corona restrictions in November 2020. Photo: Frank Bondgaard, SEGES.

Main conclusion from focus group meetings are available here:
https://www.landbrugsinfo.dk/public/9/e/7/natur_vandmiljo_waterdrive

What do the landowners think of the measures
Many farmers are very positive to the idea of establishing measures, but few are keen on using some of their best fields for this purpose. They prefer the idea of placing the constructed wetlands in corners of the fields, preferably on wet spots that can be hard to cultivate.
Few farmers do not at all sympathise with the idea of establishing measures. They find it needless and think that if they have to establish measures, it should be of benefit to them, not the community of farmers.

Objective reasons that stop projects are typically:

- Too litle farmed land in rotation in the catchmen tarea – the requirement is 80% of the catchment area in order to be able to apply for grants. Only few of the catchment areas described here meet this requirement.
- The place where the farmer wants to etablish measure is not suitable according to definition by the state, which means he will not be allowed to establish measure in that spot.
- The drains lie too deep so a pump is necessary. Many farmers are not keen on using a pump unless they obtain better drained fields at the same time. They don't want to have

to pay the operating costs of the pump for the next 10 years, if it is only for the sake of the constructed wetland.
- The drain is not a drain, but a piped stream, which means that some municipalities will not allow us to lead the water through a constructed wetland.
- Lack of liquidity - although the landowners/farmers receive 50% of the grant before they have had the expenses not everybody has the liquidity for the costs of establishing the constructed wetland.

The cooperation with the municipalities
The cooperation varies a lot from municipality to municipality, from municipal caseworker to municipal caseworker, from case to case, and from catchment officer to catchment officer.
It is very difficult to put up a general formula of cooperation, but it migth be a good idea to provide more freedom to act, fewer squared rules and more time to interact informally (the municipal caseworkers and the cathcment officers). Good cooperation grows from knowledge and respect of each other, and this is only obtained by getting to know each other with open minds.

Application for grants
In the whole catchment area of Odense Fjord 8 applications for grants have been applied for 8 constructed wetlands calculated to remove about 5.000 kg N/year, so we still have a long way to go. There is not an exact number of constructed wetlands to be applied for, but the goal is 67,7 tons N/year.

Conclusions
Theoretically it is possible in the catchment 42.320.119 to establish approximately 6 hectares of constructed wetlands with an effect of 2.478 kg N/year and 20,4 – 23,3 kg P/year at a cost of approx. 591.000 €. Realistically, it is unlikey that this amount of hectares will be realised. The reasons for this may vary between places and landowners.

Theoretically there are many possibilities of placing the measures, and the farmers are generally positive towards making the measures, but in reality we meet many challenges. Based on this project and my job as a catchment officer my experience is that some of the reasons are:

- The demands to the catchment area of having 80% area with crops in rotation
- Deep drains - are pumps the solution to this?
- § 3 protected nature where we are not allowed to place constructed wetlands
- Possible costs to pumps for 10 years – are “pump-unions” the answer to this?
- Open drain ditches protected by § 3 in Nature Conservation Act, so we are not allowed to lead the water trough a constructed wetland
- Obtaining permits from the municipalities sometimes takes a very long time

I think it would promote solutions, if first of all rules were less strict, if we had more possibilities and if we (advisors and representatives from the municipality and sthe state) generally learned to cooperate more closely in order to see all possibilities and choose the best. We ought to have the same goals.

Thanks
Thanks to all partners in this project – that is farmers, representatives from farmers union, representatives from the municipality and colleagues.

Farmers visited in the project
Peter, Isa og Lars Hansen I/S
Peer Risager Jørgensen
Kurt Jørgensen
Tøjsbo Landbrug og udlejning
Martin Møller Drud
Wrang Agro Aps
Stenbogård Aps
Paw Pedersen
Morten Højskred Hansen
Karen Margrethe Andersen
Jens Erik Olsen
Ole Nørregård Jensen

Appendix

Success story in Denmark – Implementation of new drainage measures

Environmental measures in Denmark:
Constructed wetlands
Intelligent Bufferzones
Saturated Bufferzones
Wetlands

The nitrogen effort in the catchment to Odense Fjord

Potential for further wetland restoration in the Odense River Catchment and nitrogen and phosphorous retention.

Constructed wetlands

Wetlands info on SEGES