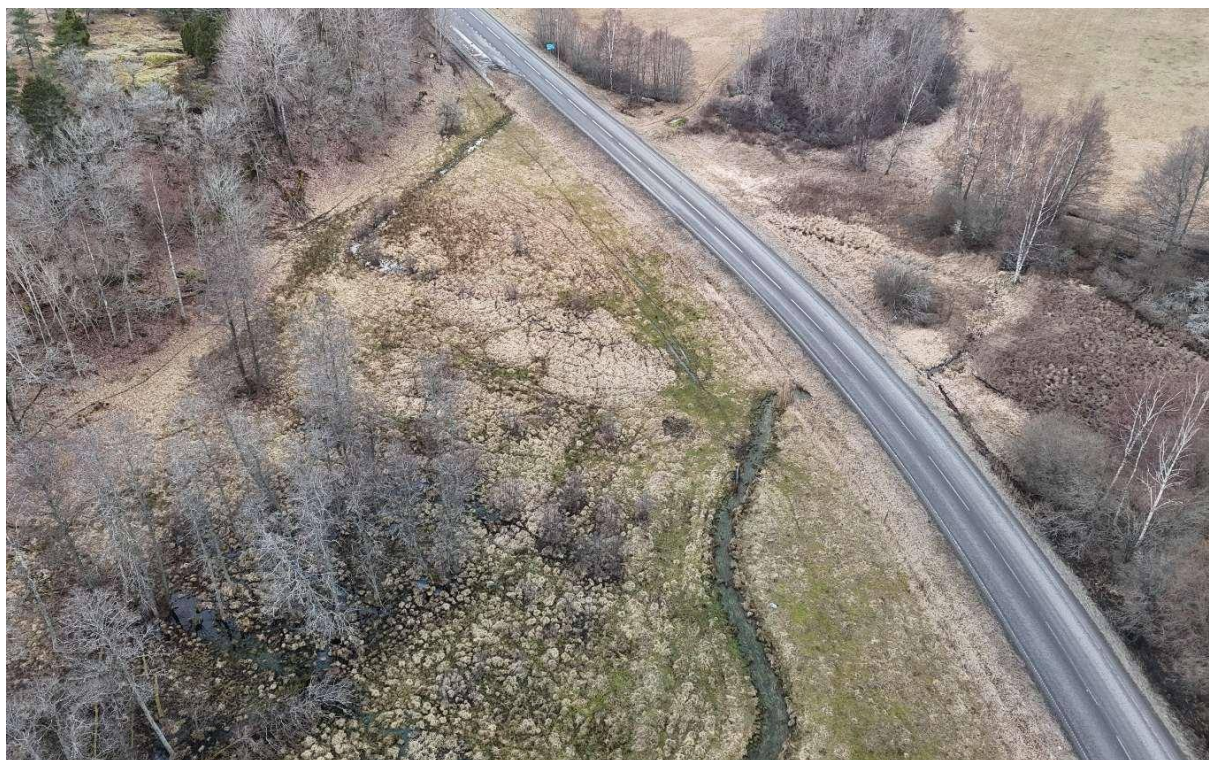


- Wetland Proposal, Kyrkviken, Värmdö



*Aerial photo of the upper part of the area, where the incoming main ditch is clearly visible.
Photo: Sören Eriksson.*

Measurements taken in SWEREF 99 TM and RH 2000.

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1. Purpose

An investigation to develop a proposal for wetland restoration at Kyrkviken, Värmdö. The purpose is to use relatively simple means to create valuable habitats that can benefit biodiversity, act as flow attenuation, and also help reduce nutrient leaching into Prästfjärden. The project has taken shape in collaboration between the landowners, Rotary Värmdö and the County Administrative Board of Stockholm.

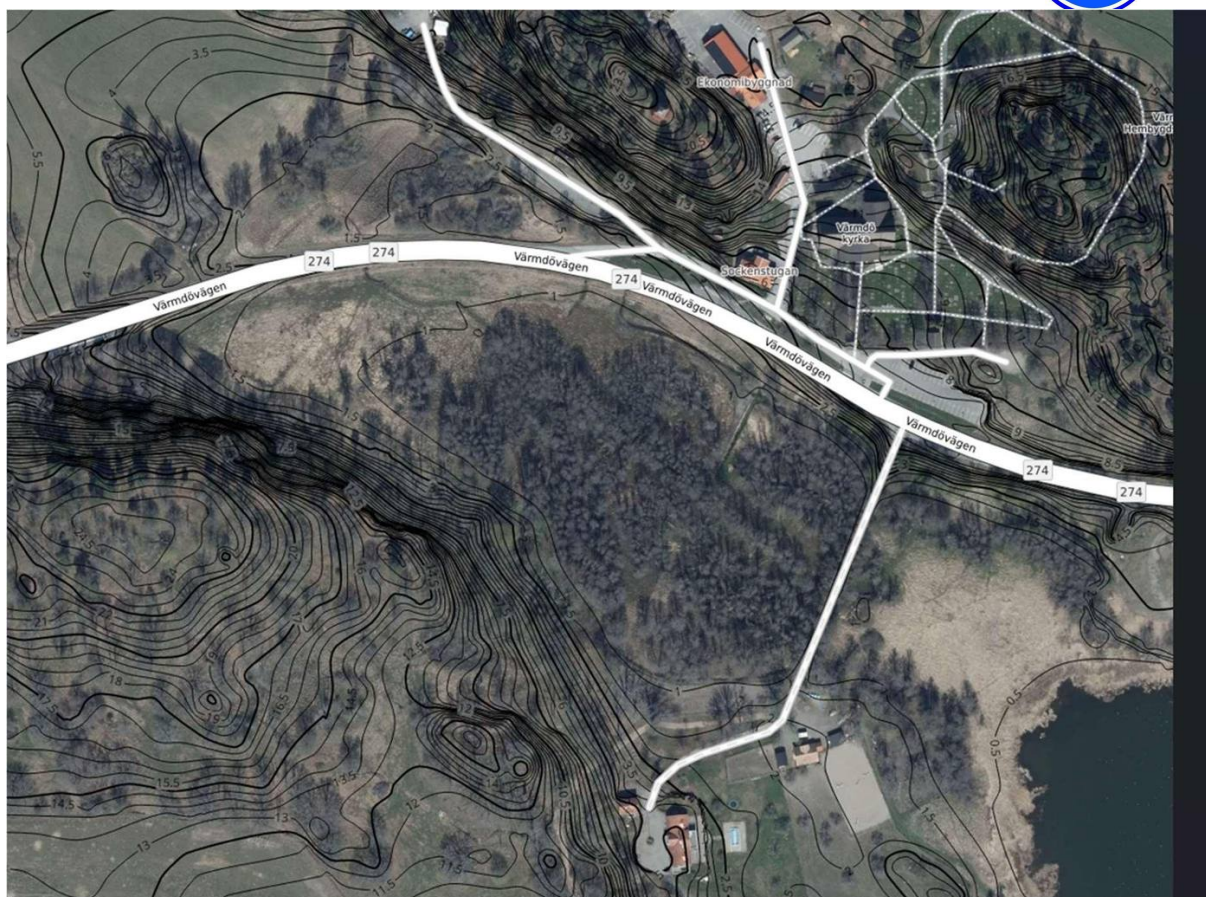
At the same time as benefiting biodiversity, the landowners also want to enhance the area's recreational value and appeal to visitors. Any restoration work will be carried out with care and will also take existing natural values into account.

2. Landowners and location

The site in question is located in northern Värmdö, on the opposite side of the road from Värmdö Church. The area is owned entirely by the church and has the property designation Värmdö Prästgård 2:1.



Overview map showing the location of the site in question.



Orthophoto of the area. This shows how large parts are today overgrown with alder swamp forest. Towards the lake, a dense belt of reeds grows. Most of the water comes from the north and flows into the area via the culverts under Road 274.

3. Site description

The site itself is a 4-5 ha low-lying area, situated only a few decimetres above lake level. Almost the entire area lies below the +1.0 level. The land has historically been arable land for a long time, with clear main ditches and smaller cross ditches. The 1960s map clearly shows that the land was still open arable land. The map from 9175 shows that overgrowth is starting to take hold. Today, the overgrowth is so far advanced that a coarser alder swamp forest has formed on the lower parts. The upper, drier parts, however, are still open grassland. The public road itself runs right alongside the area, just to the north. The road is low enough that it rules out any larger impoundments. The culvert under the road, for example, is at +0.12 (the bottom of the pipe), which is only marginally higher than normal sea level. The area is fenced and grazed. A larger ditch comes down from the fields to the north and drains into the area. Today the ditch is only 2-3 dm deep where it flows into the alder forest itself. At high water in the sea, large parts of the area lie under water. During the site visit in February, the water was at most 2-3 dm deep in the lowest-lying spots. In summer the area dries out, even inside the alder swamp forest.



Photos of the area. Top row: The main ditch, where it flows into the alder swamp forest itself, and the area upstream of the road. Bottom row: An open area among the alders, and the drier, upper part of the pasture. Photo: Wilhelm Amcoff and Sören Eriksson.

4. Impact / protection of nature and cultural heritage

A wetland here must not affect the public road in any way. This means that impoundment cannot be carried out downstream of the road culvert; open water areas must instead be created by excavation.

As the area is close to Värmdö Church, there are cultural heritage interests to take into account here. There are no known remains within the area itself, but remains related to shipping/jetties may occur. Any restoration measures will not reduce accessibility to the area or worsen living conditions for animals/plants, so a shoreline protection exemption ("strandskyddsdispens") should be able to be granted. Existing natural values are present in the area, linked to the coarser alder swamp forest, as well as an area next to the road with snake's-head fritillary ("kungsängslilja"). No impact may occur on other properties. The main ditch is subject to biotope protection.

5. Proposed design

The proposal that has been developed aims to increase variation within the area by creating a number of smaller wetlands and ponds. These will partly function as phosphorus ponds intended to stop nutrient leaching, and partly serve as shallow biodiversity wetlands.

The proposal comprises five smaller wetlands/ponds, distributed across the whole area. Several smaller, excavated wetlands and ponds make it easier to spread the excavated material well. They blend well into the landscape, since they are dug out rather than built up with high pond embankments or other tall structures.

Summary

- Open water areas totalling 0.5 ha, distributed across 5 small ponds.
- Water depth approx. 1 m in the phosphorus ponds and the larger biodiversity pond.
- Water depth approx. 50-60 cm in the shallower ponds.
- Excavated material will be spread out alongside, in ridges/mounds no more than 70-80 cm high. It is important not to build tall structures.
- Water levels in the lower ponds will partly fluctuate with sea level. No active impoundment may take place here, for the sake of the road. In the two upper ponds, the water surface can be kept somewhat higher, at around +1.0 and +1.3 respectively. In summer, levels in particular in the "breeding pond for amphibians" ("groddammen") may drop.

Description of ponds.

1. On the upper side of the public road, a first phosphorus pond is created, at the outlet of the incoming main drain from all the arable land above. Up to around 100 ha of land drains to this point. There is currently an unmanaged area here that can be put to effective use. The vegetation here is mainly meadowsweet, willow scrub and tussocky tall grass. The pond is created by placing the excavated material below the pond, forming an embankment that retains the water here. Water levels can be set close to the bottom of the incoming main drain. This slows the flow and allows an initial sedimentation of soil particles here, which reduces phosphorus leaching.

2. A shallow wetland in the western part of the area, primarily for amphibians. The pond receives water from a smaller catchment, but can hold water well into the summer. Here, water levels can be kept higher, level with the existing ground level, which reduces the amount of excavation needed. The wetland will likely dry out partly in late summer, which would make it completely fish-free. Instead, it can have high value as a breeding pond for amphibians. Water levels can be kept at +1.0 at most, when the pond is full.

3. A larger, somewhat deeper wetland that holds water all year round. The purpose is to benefit birdlife, but also to benefit amphibians and possibly fish, if they are able to migrate up here. The depth is varied so that the central parts remain free of overgrowth, while the shore zones are made shallower. The shores are made flat

enough that grazing animals can easily reach them to graze. Water levels fluctuate between +0.3 and +0.6. The ditch bottom downstream is what governs the levels. No active impoundment is carried out, as the road culvert is too low for that. A small breeding island could be included here, to benefit ducks.

4. A smaller phosphorus pond is also created downstream of the outlet coming from the churchyard, via a road culvert. During the site visit this water appeared nutrient-rich, which indicates a need for a treatment pond here. The pond is created by straightforward excavation down to a suitable bottom depth.

5. A smaller, shallow wetland surrounded by older alder swamp forest. The purpose is to create a body of water with sheltering trees around it, which will benefit somewhat different bird species than the more open pond further upstream. Spawning fish may also be able to reach this point during high water in spring. They probably already migrate up here today, but lack suitable conditions for spawning, as the ground dries out too early. If a small pond is created here, fish fry could thrive better and survive until they have grown larger. There is some uncertainty as to how easily fish can reach this point, particularly at low water, since the reed belt is relatively dense just outside.

Inlet/outlet

Inflows come from open ditches and the surrounding land. Outflows are open, discharging to the existing ditches, since no impoundment takes place. The levels are therefore governed by the existing ditch bottoms. Only the uppermost phosphorus pond is impounded with a pond embankment, in which a fixed outlet sill is installed. An alternative is to also install a control structure/pipe ("regleringsmunk") so that the flow can be actively controlled here.

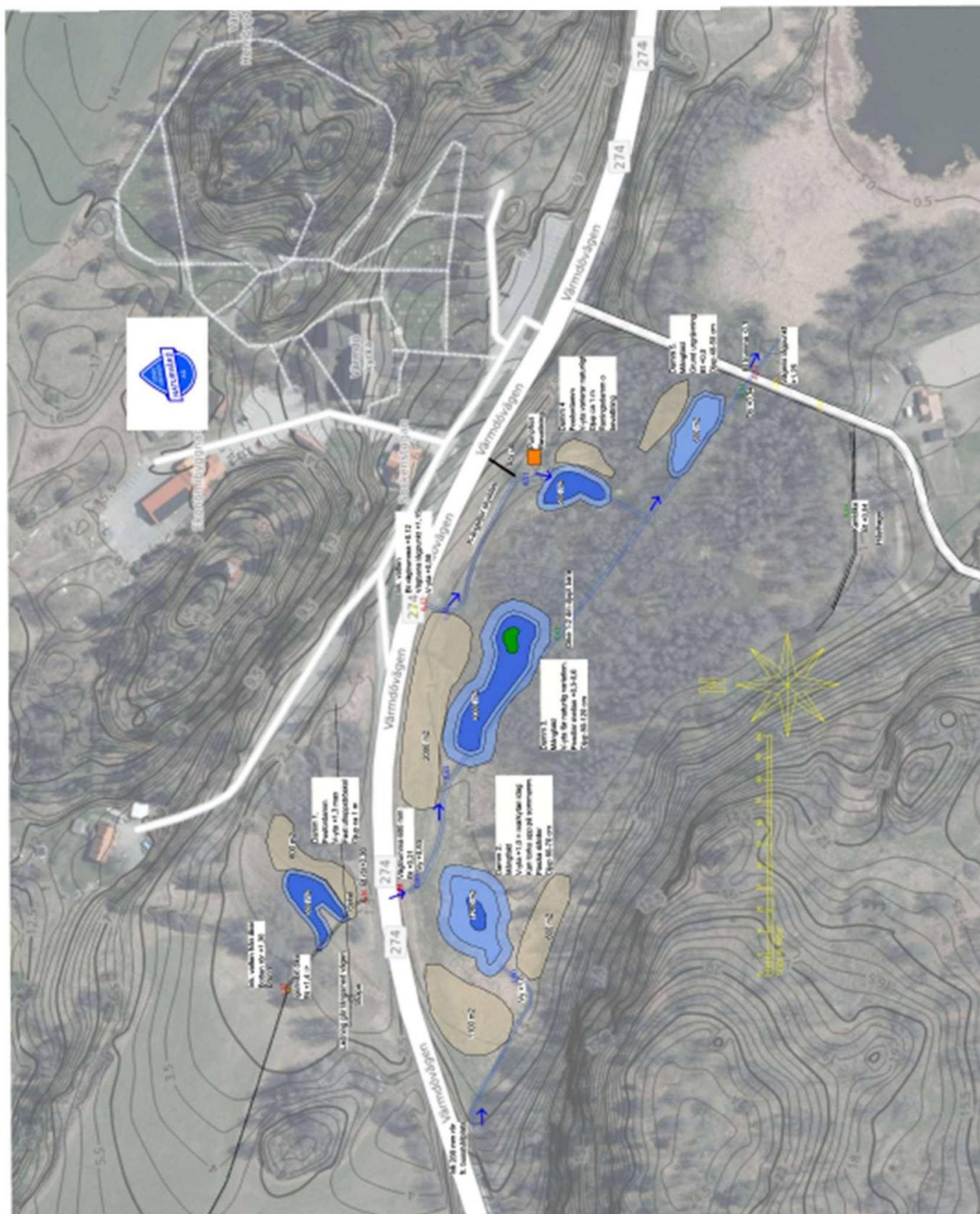
Excavation volumes

The ponds are positioned where the bottom is expected to be clay, which is easier to work with and spread out. The estimated volume of excavation is as follows:

- Deeper sections will have an average excavation depth of 1-1.2 m. Approx. 2,000 m².
- Shallower sections and slopes, only 50-60 cm in excavation depth. Approx. 2,800 m².
- Estimated excavation volumes 3,500-4,000 m³ (excluding any outer pike spawning water).

Tree layer/shrubs

The only clearing required is to create pond 3, where a stand of younger alders will be felled. The area affected is on the north side of the ditch, towards the road. No mature/large alders will be felled at all.

[illegible]

Wetland proposal with all six ponds marked.

6. Ongoing management

Most of the management will be carried out through grazing. Active regulation of water levels will not be needed here. If necessary, grazing can be supplemented by clearing any emerging scrub and coarse vegetation such as bulrush/reed. Mechanical measures are not carried out before Midsummer, so that birdlife can finish breeding first.

Maintenance of control structures and outlets is carried out on an ongoing basis, so that debris does not accumulate here. Islands are managed manually, to create a good mix of open areas and any scrub.

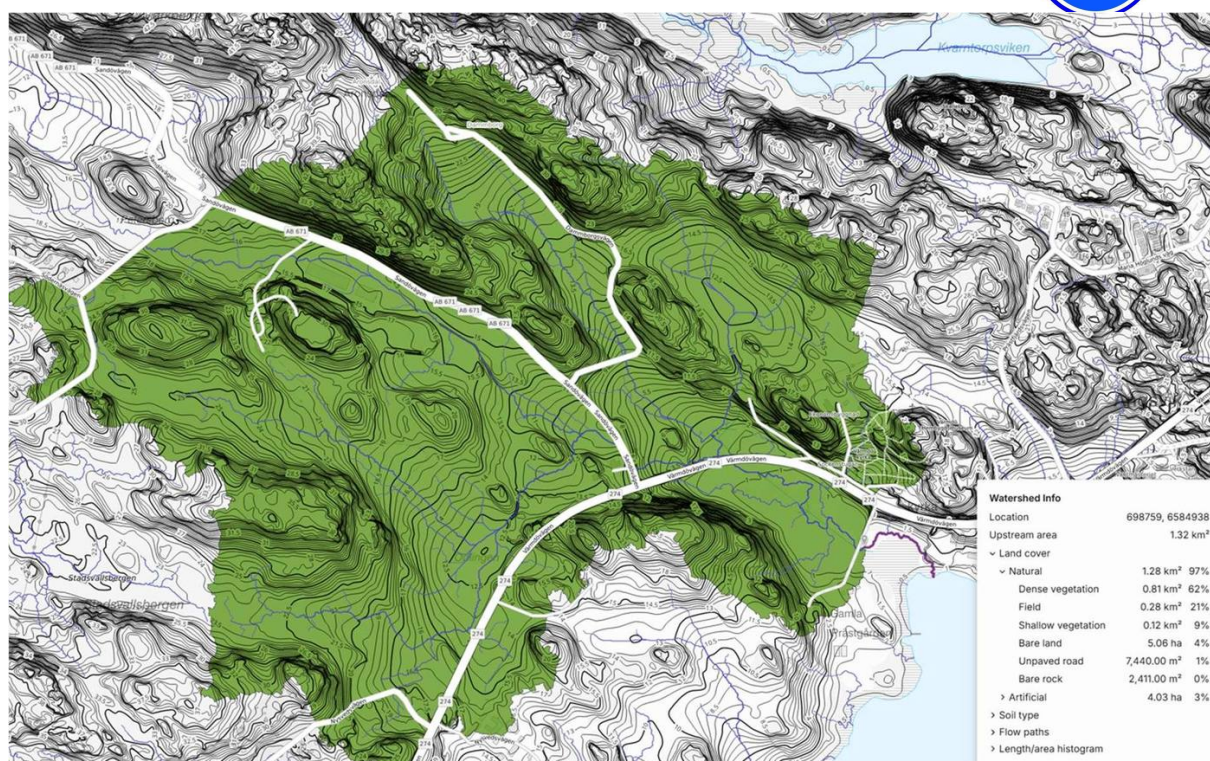
7. Environmental benefit

The wetlands as a whole will serve several purposes, primarily as biodiversity wetlands, but they also help limit nutrient leaching from arable land/churchyard/road surface.

8. Maps



Elevation map of the area, showing half-metre contour levels, and that virtually the whole area lies below +1.0 m in elevation. Map from Scalgo.



128 ha drains out to Kyrkviken via the site in question.