



**'Mill Network at Kinderdijk-Elshout'** (The Municipalities of Nieuw-Lekkerland and Alblasserdam, Province of South-Holland)

The World Heritage Mill Network at Kinderdijk-Elshout comprises 19 drainage mills. It is by far the largest concentration of existing wind-driven machines in the Netherlands and in the world today. Combined with their function as a part of a centuries-old drainage system, this was the most important reason for placing the network and the nearby infrastructure of watercourses, dykes and storage basin areas on the World Heritage List in 1997.

The 'Mill Network at Kinderdijk-Elshout' dates from the middle of the 18th century and basically comprises two rows of eight drainage mills working in parallel. Both rows, independently, drained a polder area further down in the Alblasserwaard, covering approximately 24,000 hectares. The facing rows each have eight mills dating from 1738 and 1740. The construction of the mills differs per row: one row consists of round, brick mills; the other consists of octagonal, wooden mills with thatched roofs. There are three other mills, two of which are also octagonal, made of wood and have thatched roofs. These latter mills are smock mills, which means that only the top section and the sails are turned into the wind. The third mill has a square floor plan with a pyramid shape structure and is made of wood on a brick base. It is partially thatched, whereas the top part of the mill which can be turned into the wind is made mainly of wood. All of these mills are so-called 'ground-sailers': their sails skim over the ground as they turn. The 19 mills are still in operating order, but are not longer used for drainage. Two steam-driven pumping stations were installed at Kinderdijk in 1868. One of these stations – the Wisboom pumping station, electrified in 1926 – still exists, but its function has been taken over by an new electrically driven pump. This World Heritage site also comprises (former) district water board houses. The 19 drainage mills together with the watercourses and storage basin areas they drained form a unique 'drainage landscape'.

Windmills are not a rarity on a world scale, nor is it unusual for them to be used as machines for raising water, which is generally considered typical for the Netherlands. These so-called mill courses or mill ladders still occur in several places in the Netherlands. A mill network comprises two, three or four mills operating in a series (one after the other), which makes it possible to bridge a water level difference of up to six metres. Another system was also applied in which a number of parallel mills (situated alongside each other) had to quickly pump enormous quantities of water out of a large storage basin. The two rows of eight mills at Kinderdijk were used for pumping water into two neighbouring upper storage basins. From the basins the water was discharged to the river Lek by two sluices.

### **The Mill Network at Kinderdijk-Elshout, a brief history**

The Mill Network at Kinderdijk was constructed to solve drainage problems in the parts of the Alblasserwaard that lay upstream and more towards the east. During the Middle Ages peat and river clay soil was brought under large-scale cultivation. Ditches and watercourses were dug to guide surplus water to other natural streams in the area. There used to be many of these streams but only two, the Alblas and the Giessen, still exist. After passing through these streams the water flowed into large rivers and river branches. This is how polders first came to be created in this area. Initially, the water could drain freely but constant drainage caused the level of the ground surface to drop, resulting in problems when water levels were high. This process of the ground level dropping through dehydration is called 'settling' and it occurs mainly in peat and clay soil. The soil loses volume not only through settling; oxidation also causes the ground level to drop.

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Peat soil can drop as much as one metre every 100 years. Consequently, the Alblasserwaard encountered increasingly greater problems during the course of the 13th and 14th centuries, which eventually could no longer be solved locally. To cope with these problems the Polder Boards joined forces and formed two large drainage bodies, namely the Water Boards of the Overwaard (roughly in the east and north of the Alblasserwaard, which has discharged for centuries along the Giessen) and of the Nederwaard (south and west of the Overwaard and discharging via the Alblas). Count Floris V decreed in 1277 that a Polder Board also be established for the entire Alblasserwaard. Immediately after the Board's implementation, a ring dyke was constructed around the entire polder, with sluices in the Giessen and the Alblas, so that water could be discharged at low water levels southward into the Merwede. But when this, too, proved no longer sufficient, it was decided to make two separate outlets at points where the water outside the polder was the lowest. That was the most north-western point of the Alblasserwaard, at Elshout/ Kinderdijk. The existing drainage via the Giessen was subsequently moved northwards to the Ottolandse Vliet in 1366 and then directed west via the Achterwaterschap. The entire drainage canal thus measured approximately 17 km in length. Four years later, in 1370, the old drainage via the sluice in the Alblas at Alblasserdam was also moved to Elshout/ Kinderdijk, which required a much shorter link: the Nieuwe Waterschap. The old Achterwaterschap and Nieuwe Waterschap discharged independently of each other via several sluices, although they were separated by only a narrow quay at their north-western tips – and still are more than 650 years later. By extending the two watercourses the storage capacity for surplus water was enlarged making it easier to deal with high water peaks. The combined watercourses and water storage basins are called reservoirs.

Roughly two centuries later, this system no longer sufficed and so in ca. 1620 the soil was levelled and quays were raised to expand the storage capacity of the watercourses. This again offered some relief, but again one century later it was decided to create storage basins (reservoirs). The surplus water in both water board districts could then be drained by means of drainage mills (actually they should be called 'storage basin mills') into two separate basins surrounded by dykes. Under favourable conditions the water could then be discharged into watercourses outside the polder. The Nederwaard switched to multi-stage discharging in 1738; the Overwaard followed suit in 1740. From then on, water transported westwards via the Nieuwe Waterschap and the Achterwaterschap respectively was pumped over the adjoining dyke into a 'high storage basin' from where it was discharged into the river at low water.

The eight new mills of the Nederwaard are round, brick, ground-sailers. The eight Overwaard mills are octagonal, thatch-roofed ground-sailers constructed of wood. Ground-sailers are mills whose sails skim the ground as they turn. The vanes can be set to the wind by rotating the mill cap (the upper section). To catch the wind the vanes are covered to various degrees with sailcloth. All the drainage mills are fitted with a waterwheel, made either of wood or steel, to lift the water. The eight mills of the Nederwaard have a name in addition to a number. The span of their sails varies from 27.30 metres to 29.50 metres.

The three other mills, the Lage Molen (Low Mill), the Hoge Molen (High Mill) and the Blokker, belong to a number of adjacent polders and are true drainage mills (as opposed to the 'storage basin mills'). The Hoge Molen and the Lage Molen are both thatch-roofed octagonal mills; the former has an Archimedean screw and the latter a waterwheel for transporting water. Their vanes span 28.0 metres and 27.50 metres respectively. The Blokker's span is slightly less, namely 26.90 metres. The Blokker is a smock mill dating from ca. 1620. Its base is pyramid-shaped topped by a more or less cubic, rotating structure. The mill is fitted with a waterwheel.



The 19 mills are no longer in use for drainage purposes, but they still operate regularly as this helps to conserve them. There are other valuable structures at Kinderdijk as well besides the mills, such as pumping stations and two district water board houses.

Each water board district had eight mills to pump water up from the basin to the upper storage basin, but in 1868 they were supplemented by two steam-driven pumping stations. The pumping station of the Overwaard – the Wisboomgemaal – still exists today, but is no longer in operation, having been replaced in the 1990s by an electrically driven pumping station. There is another old, but smaller, pumping station in the area for draining the Nieuw-Lekkerland polder.

The Wisboomgemaal drained water from the low storage basin of the Overwaard into the high storage basin by means of four waterwheels. In 1924 the installation was dismantled and the chimney stack beside the pumping station was torn down. Two centrifugal pumps were then installed and two electric motors provided power. The pumping station was eventually shut down in 1995 when the new Overwaard pumping station was completed. The ‘Wisboom’ has been restored and still boasts the installation of the 1920s. The ‘Wind, Water and Wings’ exhibition was opened in the pumping station on 29 June 2005. This exhibition is intended for groups of schoolchildren and (by appointment) for groups of tourists.

The other pumping station – the Van Haaftengemaal – was built in 1868, modernised in 1927 and replaced by the J.U. Smit pumping station in 1972. The Van Haaften was largely demolished when the Smit was built. The Smitgemaal was built with three Archimedean screws, driven by diesel engines. It drains the low storage basin of the Nederwaard.

The pumped up water is discharged via a drainage basin into the River Lek. Initially, the water was discharged via a sluice but in 2002 an additional pumping station was installed in the dyke so that water can also be drained when water levels are high outside the polder. This system is called the third drainage stage.

In spite of this modernisation, the mills have been kept completely intact and are all still fully functional. The 18th-century system of a low and high storage basin with pumping plant is therefore still present for all to behold, including a discharge system and lengthy watercourse dating from the Middle Ages and what is left of a 17th-century enlarged storage basin. There are also examples of several generations of pumping stations, which can be considered the successors of the old system. As such, Kinderdijk displays facets of the history of the Netherlands' struggle against water over a period of roughly seven centuries.

### **The Mill Network at Kinderdijk-Elshout today**

The mills at Kinderdijk-Elshout lost their hydraulic function in 1950, after having been indispensable during World War II due to fuel shortages. They were restored and became national listed buildings. Furthermore, the mills and the upper storage basin areas of Kinderdijk-Elshout were also included on the list of Protected Cityscape and Townscapes in 1993. The area is also protected through the Nature Conservancy Act.



The mills at Kinderdijk and their surroundings are a unique ensemble of 18th-century technology based on wind energy in a magnificent polder landscape and with a drainage system that goes straight back in time to the Middle Ages and the early 17th-century. The mills at Kinderdijk attract thousands of tourists every year from all over the world. Groups of visitors can be received in the Wisboom pumping station, where an exhibition has been set up. Guests can also visit the 'visitor's mill' (mill no. 2 of the Nederwaard) and the former district water board house of the Nederwaard, which now serves as a restaurant. Boat tours are also available. Inscription on the World Heritage List has contributed largely to the international interest in the mill network. This interest is indicative of ongoing appreciation for the Dutch windmill and Holland's 'man-made' landscape.

Thanks to its inscription on the World Heritage List, continued attention will be paid to the mill network at Kinderdijk/ Elshout and the unique role it has fulfilled in helping to keep a part of the wet, low-lying Netherlands habitable. This attention results primarily from the Dutch government's duty to maintain the site ensuing from its inscription on the World Heritage List.

### **Literature and information on the Mill Network at Kinderdijk**

H. Ouweneel

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L.F. Teixeira de Mattos

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<http://www.stichting-kinderdijk.nl>