Appendix A

Geosites descriptions

Geosite: GS_01 **Significance : International** **Coordinates (RD): 197704, 404015**	**Name** Maasheggen
Municipality	Land van Cuijk
Province and country	Noord-Brabant
Protection status	UNESCO MAN & BIOSPHERE status, Aardkundig waardevol gebied (AWG)
Site management organizations	Staatsbosbeheer; Steering and Core Group De Maasheggen
Accessibility	The area can be accessed via several “gateways”, where parking is available. At these locations, Maasheggen Ambassadors are present, who can provide further information about the area. The area can only be entered on foot or by bicycle
Relevance for tourism	Numerous signposted walking and cycling routes traverse De Maasheggen.
Relevance for education & information	Family routes, Museum Ceuclum in Cuijk, Maasheggen weaving workshops, treasure hunts. Various children’s activities.
Teaching equipment	
Scientific interest	Woolderink et al., 2018

Description

1. Location

De Maasheggen represents a landscape and comprises a chain of nature reserves along the River Meuse between the Noord Brabant towns of Vierlingsbeek and Cuijk. It is a 25 km long, elongated area of 6,700 ha, directly adjacent to the Meuse. The Maasheggen are best preserved in Noord Brabant, between Vierlingsbeek and Sambeek; this area forms the geosite.

2. Landscape formation and description

Origin of the landscape:

Since the last Ice Age, the Meuse has shifted in a north-easterly direction on the tectonically tilting Venlo Block. During the Holocene, there have been above-average shifts in the river valley of the Meuse, recognisable by abandoned meander bends. The stream valleys, which developed mainly after the Younger Dryas, indicate a drainage system caused by tilting, originating at the Tegelen Fault and discharging into the Meuse. The Maasheggen lie in the western floodplains of the Meuse and display a landscape where, for thousands of years, woven hedges have been used to demarcate pastures. This has created a unique landscape with a mosaic of hedges, meadows, drinking pools, and ancient pollarded trees.

Geomorphology:

This geosite lies in the floodplains of the present-day Meuse and also features some abandoned Meuse meanders due to human intervention.

Hydrology:
The hydrology of the Maasheggen is strongly influenced by the proximity of the Meuse and the presence of drinking pools, which serve as water sources for livestock and other animals. Water safety is one of the greatest challenges for the Maasheggen, situated along the Meuse. The dense hedge structure, consisting of hawthorn and other shrubs, helps retain rainwater and reduce surface runoff, thus preventing the soil from drying out quickly. The damming effect caused by additional hedges in the Meuse valley must be compensated by water-lowering measures. The hydrology of the Maasheggen is therefore a complex interplay between the Meuse, the hedge structure, drinking pools, and the soil. The challenge is to take the necessary water safety measures, taking into account regional ambitions and the cultural-historical and ecological values in the northern Meuse valley.

Deposits & Fossils:
The subsoil of the Maasheggen mainly consists of Holocene Meuse terrace deposits (Oost-Maarland Member, Beegden Formation). These comprise moderately to extremely coarse and gravelly sand, fine to coarse blue-grey gravel, locally even boulders and blocks. To a lesser extent, sandy loam and clay layers are present.

River & Streams:
The Meuse is a major factor in the area's hydrology. The river influences the groundwater level and can cause flooding, which in turn affects the hedges and surrounding farmland.

3. Geosite Interests

Cultural History
The Maasheggen were once found along all the floodplains of the Meuse. However, with the invention of barbed wire (and later electric fencing), the decline of hedges as field boundaries began. Especially shortly after the Second World War, there was a sudden surplus of barbed wire, and the woven hedge virtually disappeared everywhere as a field boundary. The Maasheggen area on the border of Noord Brabant and Limburg has, however, been preserved and thus forms the oldest cultural landscape in the country. Nowhere else in Europe are nature, landscape, economy, and culture so visibly and enduringly intertwined. The Maasheggen is the only biosphere reserve in the Netherlands.

Romans: In Roman times, Cuijk was an important crossing point for the Romans. At Cuijk—then called Ceuclum—there was a bridge that enabled the Romans to cross the Meuse. In Roman times, there was a busy traffic route along the Meuse, from Tongeren and Maastricht to Nijmegen. In some places, the road surface has been found during excavations, allowing the Roman road to be largely reconstructed. The road can be followed over a greater distance in certain places by the differences in elevation in the landscape, which can be experienced along the designated cycle route "the Roman road".

Flora & Fauna:
Thanks to the shelter and protection provided by the kilometres of woven hawthorn and blackthorn hedges, De Maasheggen is home to many special and sometimes even endangered animals (beaver, badger, fieldfare, lesser spotted woodpecker, little owl, black redstart, butterflies) and plants (various varieties of hawthorn and blackthorn, spindle, cuckoo flower).
The drinking pools in the meadows are not only important water sources for livestock, but also home to toads, frogs, and newts. These amphibians lay their eggs in the pools in spring. The most characteristic is the rare great crested newt.

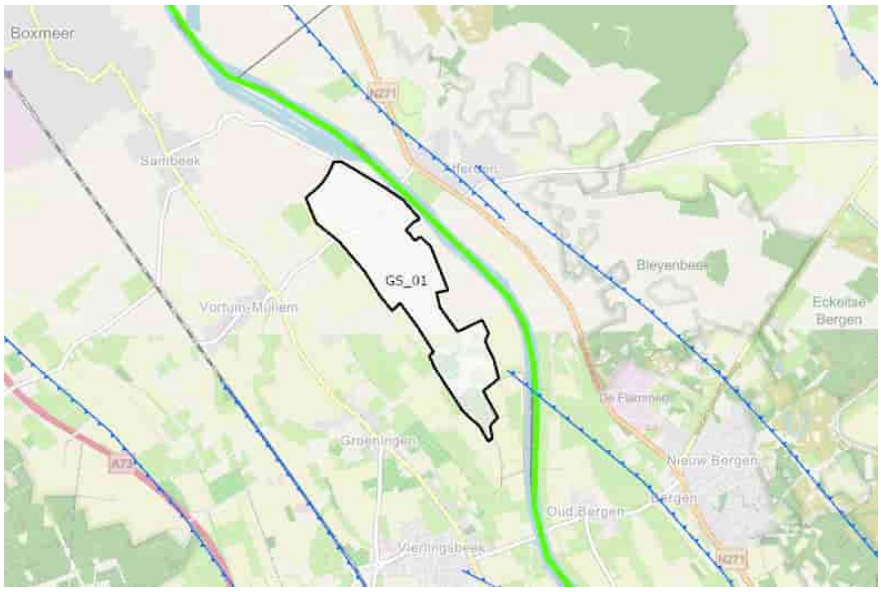
De Maasheggen is an important source for seeds. Of the more than one hundred authentic Dutch seeds preserved in the world seed bank in Svalbard, Norway, over sixty come from De Maasheggen.

Industrial & Economic:

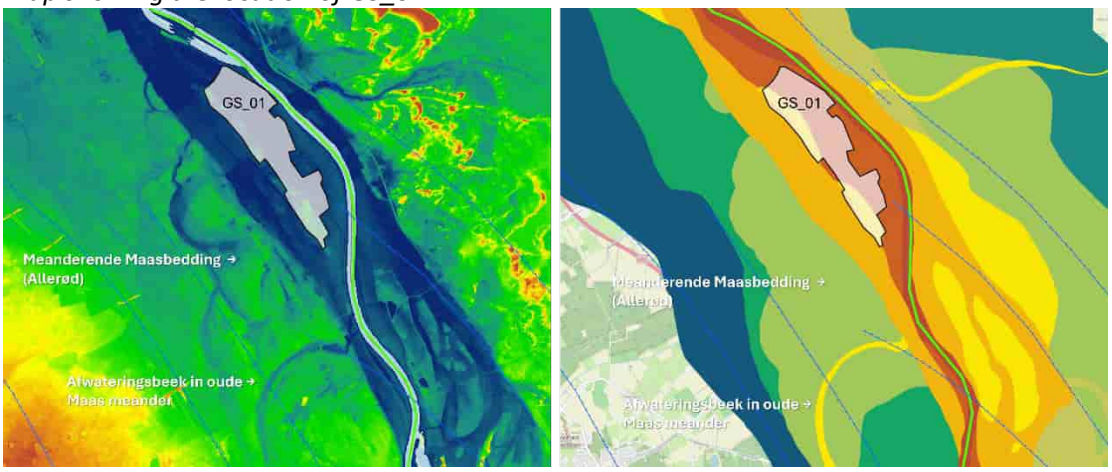
4. Relation with other geosites

5. Documentation & Resources
www.maasheggenunesco.com

6. Maps, photos and figures



Map showing the location of GS_01



Left: AHN image of the current Meuse bed with the Maasheggen alongside abandoned Meuse beds. Right: reconstruction of old Meuse courses (Woolderink et al., 2018). Green – meandering Meuse before the last Ice Age, Yellow = braided Meuse during the last Ice Age, orange = meandering Meuse after the last Ice Age

Characteristic landscape of the Maasheggen with the Meuse in the foreground. (Source: www.vierlingsbeek-groeningen.nl/recreatie/maasheggen)

"Maasheggen" (Source: www.vierlingsbeek-groeningen.nl/recreatie/maasheggen)

Geosite: GS_02 **Significance : International** **Coordinates (RD): 181365, 412593**	**Name** Steilrand Mill
Municipality	Land van Cuijk
Province and country	Noord-Brabant (NL)
Protection status	Aardkundig waardevol gebied (AWG)
Site management organizations	
Accessibility	The area is easily accessible from all directions.
Relevance for tourism	Numerous marked and unmarked cycling and walking paths provide excellent access to the relatively undulating, varied, and attractive landscape. The infrastructure is well developed, with rest benches and information panels.
Relevance for education & information	The area contains information panels, mainly about ecological and landscape features
Teaching equipment	Guided educational activities.

Description

1. Location

This geologically valuable area comprises the prominent, up to 7-metre-high steep edge between the Peelhorst and the Pleistocene Meuse river landscape to the northwest and southeast of Mill. The area is relatively long and narrow: approximately 10 km in a northwest-southeast direction but only 1 to 2 km in a southwest-northeast direction.

2. Landscape formation and description

Origin of the landscape

The steep edge was formed by river erosion (of an existing fault-determined terrain step) during the last two ice ages in the Middle and Late Pleistocene, between approximately 370,000 and 30,000 years ago. The Meuse in the current Meuse valley northeast of the Peelhorst was occasionally joined by the Rhine during cold periods. Erosion by both rivers shifted the steep edge, originally further northeast, southwestwards to its current position. Geologically, the Steilrand van Mill also marks the boundary between older, Middle Pleistocene Meuse deposits on the higher Peelhorst and younger, Late Pleistocene Meuse and partly Rhine deposits to the northeast..

Geomorphology:

Prominent steep edge up to 7 metres high: A uniquely visible steep edge at the transition from the Peelhorst to the Meuse valley, intersected by stream valleys. The Graafseweg runs from Grave to Mill and features several fine slopes. As shown on the fault map, this elevation difference lies between two faults.

Hydrology:

Deposits & Fossils:

River & Streams:
Stream valleys (formed as meltwater valleys), gullies and flats (remnants of a braided river system).

3. Geosite Interests

Cultural History
Valuable landscape elements include the prominent windmills 'De Korenbloem' in Mill and the Heimolen southeast of Mill. The settlement of Bruggen contains several characteristic farms. The military defences of the Peel-Raamstelling along the Defensiekanaal (Peelkanaal) are a well-preserved and coherent example of a casemate line in the tradition of permanent fortress construction from 1939–1940. The low-lying open stream valley of Mill, between the old village centre and post-war expansion districts and included in the Peel-Raamstelling, has high cultural-historical value.

Flora & Fauna:
Valuable historic green structures include scattered woods and hedgerows on the northwest edge of the area (Reeksche Bergen), on the Russendaal estate, the hedges, hedgerows and scattered small woods of the De Tongelaar estate near the Kammerberg, the wetland areas along the Graafsche Raam and parts of the Beerse Overlaat along the northeast boundary. Linear green structures of high cultural-historical and ecological value include the old railway embankment east of Mill and the hedgerows and tree belts along the Peelkanaal. Ecologically valuable landscape elements are found near the Graafsche Raam, Langven and Kammerberg. Much of the woodland on the steep edge slope and on the high side of the steep edge forms part of the Ecological Main Structure. The Peelkanaal and valley landscape at Mill form an ecological corridor.

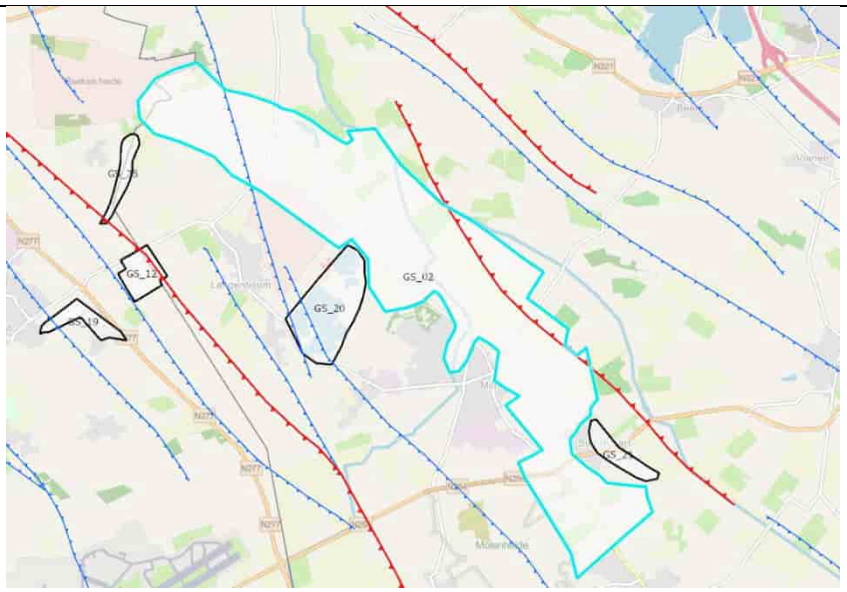
Industrial & Economic:

4. Relation with other geosites

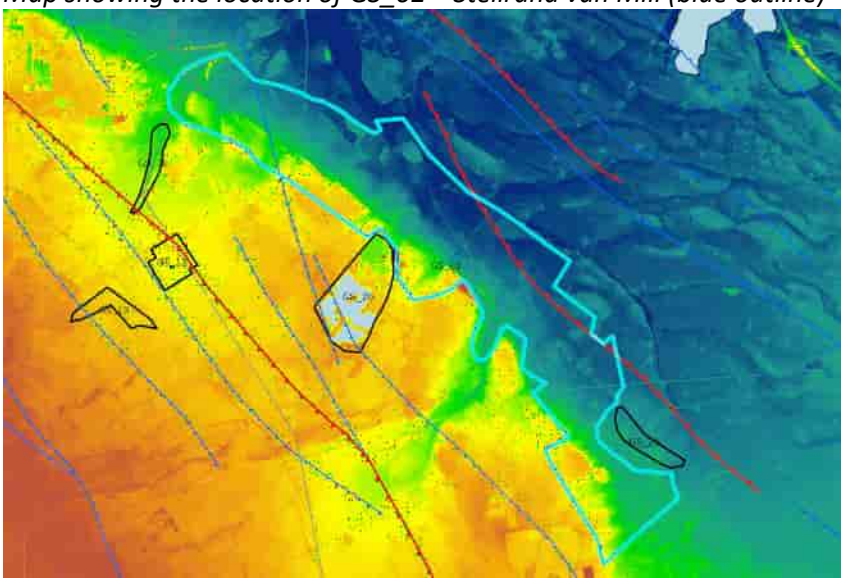
Northeast and at the foot of the steep edge, the geologically valuable area adjoins the existing AWG 'Maasterrassen'. This landscape is characterised by a relief of 'gullies' and 'flats', remnants of a braided river system from the last ice age.

5. Documentation & Resources

6. Maps, photos and figures



Map showing the location of GS_02 – Steilrand van Mill (blue outline)



AHN image of the Steilrand van Mill (GS_02, blue outline) and several stream valleys

Geosite: GS_03 **Significance : National** **Coordinates (RD): 184676, 384046**	**Name** Bijzonder Brabants
Municipality	Deurne
Province and country	Noord-Brabant
Protection status	
Site management organizations	Private
Accessibility	Access to the garden is via the barn side. If arriving by car, you may park under the trees on the grass by the barn, then walk into the garden and enjoy the many special vegetables cultivated by farmer Henk and the Peel Boundary Fault.
Relevance for tourism	Unforgettable vegetable garden on the Peel Boundary Fault. An excellent location to discover the Peel Boundary Fault. Tickets can only be purchased in advance via the website. Accredited guides from VVV, Heemkunde, IVN, Staatsbosbeheer, schools and the Geopark organisation may visit the Peel Boundary Fault at Bijzonder Brabants and lead group tours.
Relevance for education & information	Vegetable farm Henk Kerkers: Information boards explaining the geology of horsts and grabens. Observation wells to demonstrate the difference in groundwater levels on either side of the fault. There is also a very large photographic print of a geohydrological fault profile.
Teaching equipment	Lessons can be booked that provide detailed information about the Peel Boundary Fault and its effects on the landscape and natural environment. Educational programmes for schoolchildren.
Scientific Interest	Recent (May 2025) research focuses on the activity of the geological fault system in the subsurface of (among others) Deurne using the fibre optic network..
Description	

1. Location

The vegetable garden Bijzonder Brabants is situated on the Peel Boundary Fault, just outside the village of Deurne.

2. Landscape formation and description

Origin of the landscape

Of the five research locations, this is the site where the impact of tectonics in this area is most clearly demonstrated.

Geomorphology:

Uniquely, the Peel Boundary Fault runs directly through the vegetable garden. This is a geological

fault line that runs from Roermond to Uden in the Netherlands. In the garden, the Peel Boundary Fault and its underground waterfall are made visible by the installation of a metal plate.

Hydrology:
At the fault, a steel plate has been driven into the ground. Above the fault, with its high groundwater level, the soil remains intact, while below the fault, part has been excavated against the fault/steel plate. At the excavation site, you stand below the fault at a lower level and face the fault. The steel plate contains holes through which water flows or seeps. Wells have been installed on both the horst and graben sides, with well rings and an internal measuring scale showing the actual groundwater level. This allows visitors to see for themselves the significant difference in groundwater levels.

Deposits & Fossils:

River & Streams:

3. Geosite Interests
Cultural History

Flora & Fauna:
Around the visible underground waterfall, an informative and educational landscape has been created with plantings characteristic of the Peel Boundary Fault on both the horst and graben sides. In farmer Henk's vegetable garden, around 100 special vegetables and 100 different herbs are grown each year. Farmer Henk cultivates the most remarkable vegetables and herbs as naturally as possible (climate-conscious and sustainable) in the open air..

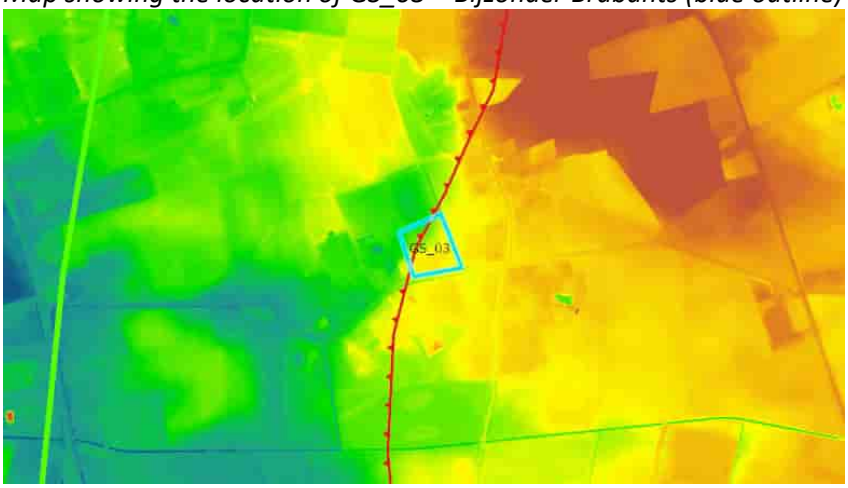
Industrial & Economic:

4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures

Map showing the location of GS_03 – Bijzonder Brabants (blue outline)



AHN image of geosite Bijzonder Brabants (GS_03, blue outline) situated on the Peel Boundary Fault (in red)

The farm Bijzonder Brabants is located on the Peel Boundary Fault (photo: www.landvandepeel.nl)

Groundwater wells illustrate the difference in groundwater levels on either side of the fault (photo: www.landvandepeel.nl); information board in the background.

Geosite: GS_04 **Significance : International** **Coordinates (RD): 189748, 383860**	**Name** Griendtsveen and surroundings.
Municipality	Horst aan de Maas, Deurne,
Province and country	Noord-brabant, Limburg
Protection status	Bechermd Dorpsgezicht
Site management organizations	Landschap Horst aan de Maas?
Accessibility	
Relevance for tourism	Toon Kortooms park (peat cutting demonstrations, museum). Starting point for walking and cycling routes through the Peel, such as the "Verheven Peel" route.
Relevance for education & information	Toon Kortooms museum. Peelmuseum – America, also with peat cutting demonstrations.
Teaching equipment	Walking route with information boards featuring quotes from Kortooms and explanations about his life and work. "Expedition De Peel" is an interactive activity immersing visitors in the world of Peel workers, combining team building with knowledge about life in the Peel in the past

Description

1. Location

Griendtsveen and the Toon Kortooms museum are located on the northern side of the Deurnse and Mariapeel, around the border between Noord-Brabant and Limburg. The protected area covers 87.7 hectares and lies entirely within the province of Limburg. The Peelmuseum – America is situated on the main road from Griendtsveen to America (corner of Griendtsveenseweg and Middenpeelweg) in Limburg and is housed in the former D.U.W. camp. The relatively small Peel remnant, the Grauwveen, lies north of the Helmond–Venlo railway and falls within this geosite.

2. Landscape formation and description

Origin of the landscape

Water was unable to penetrate the poorly permeable subsurfacesoil of the Peelhorst, resulting in the formation of small lakes that became vegetated as the climate warmed after the last Ice Age. This vegetation initiated the formation of low peat. As the peat layer thickened, the groundwater level dropped, making it increasingly difficult for plants to access nutrient-rich groundwater, ultimately ending the formation of raised bog. The high elevation of the Peel also contributed to this process. For a long time, these wet peatlands were difficult to access, but eventually they were reclaimed for peat exploitation. Within the aUGGP, the Deurnsche Peel and Mariapeel represent unexploited areas where remnants of peat moss are still present. Griendtsveen is a reclamation village located on the northern edge of the peatland. The Grauwveen is a small unexploited area just north of Griendtsveen and is one of the few places where the upper peat layer has not been systematically excavated. This layer is known as bonkaarde, pale peat or "grauwveen". In most of the Peel, this layer was excavated in the early 20th century for the production of peat litter. The area has geological value because a relatively complete raised bog profile can still be found here, although the soil has changed due to

desiccation and mineralization.

Geomorphology:

Hydrology:
Griendtsveen belongs to Horst (Limburg) and here the water is pumped up so that it can flow to the Meuse. The drainage of the village of Griendtsveen takes place via the Griendtsveen Kanaal in an easterly direction. This is remarkable because Griendtsveen lies on the west side of the watershed through the Mariapeel, and the natural gradient thus goes westward. The explanation is that this is a kind of 'political drainage'. The village belongs to the Limburg municipality of Horst and the Limburg water board, and therefore the drainage has been artificially directed eastward. This is done by a small pumping station that pumps the water over a weir into the canal. After that, it is high enough to flow eastward naturally

Deposits & Fossils:
In Grauwveen, the raised bog profile has been preserved, but desiccation and mineralization have changed it.

River & Streams:
The Helenavaart between Griendtsveen and Meijel is 15.7 km long and was dug to transport peat from the Peel and also served for drainage of the peatland. The Helenavaart runs between the Mariapeel and the Deurnsche Peel after Helenaveen.

3. Geosite Interests
Cultural History
In 1853, the brothers Van de Griendt purchased 610 hectares of peatland from the municipality of Deurne and started the first industrial peat extraction. The village of Griendtsveen was founded in 1885 by the brothers Eduard and Jozef Griendt. Griendtsveen has a very picturesque location and a protected village view. The history of Griendtsveen is closely linked to the reclamation of the Peel. The Eindhoven–Venlo railway, built in 1866, was crucial for the reclamation of the peatland. The contractor for this railway (from Helmond to Venlo) was Jan van de Griendt (1804–1882), a merchant from Den Bosch. In 1853, he was one of the founders of the "Society for the Reclamation and Peat Extraction of the Peel", later renamed "Society Helenaveen". Van de Griendt founded the village of Helenaveen. His sons Jozef and Eduard continued his work and founded the village of Griendtsveen; both villages are connected by the Helenavaart. Helenaveen is in Noord-Brabant, Griendtsveen in Limburg. In Griendtsveen, the Griendtsveen Peat Litter Company was active.
Over time, all the peat was excavated and the village became residential. It is perhaps the only village in Limburg that has never had an agricultural function. In 1956, the monopoly of the Van de Griendt company ended. With this normalisation, the reclamation of the Peel was completed. The entire village is a monument, as it is a fine example of a Peel reclamation village. Griendtsveen is one of the very few places in Dutch Limburg with a pure Brabant dialect.
The writer Toon Kortooms is buried in Griendtsveen. His father was director of the Deurne municipal peat company, which, along with their family home, was located "just" in the municipality of Deurne, but close to Griendtsveen. His social life therefore took place in the village of Griendtsveen. Kortooms' novels are mainly set in the Brabant Peel and are often based on his own experiences. The Toon Kortooms park includes a museum. The museum has grown on the site where the Kortooms family lived, immediately next to the foundations of the Deurne peat litter factory, which was a competitor

of the similar factory of the Van der Griendt company. In the Peelmuseum, visitors can experience the atmosphere of the hard life and heavy work of the diligent Peel workers during peat extraction and reclamation of the Peel from around 1900. The museum increasingly shows what happened in earlier years in this rugged landscape, and how people lived and worked there.

Flora & Fauna:
The Grauwveen features dry and wet heath, deciduous forest and marsh. There are still small areas with living raised bog and regenerating raised bog in the early stages. Much of the vegetation consists of birch-oak forest and bracken. Scattered small-scale peat excavations, so-called farmers' pits, are moist biotopes where raised bog has a chance to recover. The relatively untouched terrain is a refuge for various animal species. Management is also aimed at favorable conditions for the smooth snake and butterflies such as the large heath and the silver-studded blue.

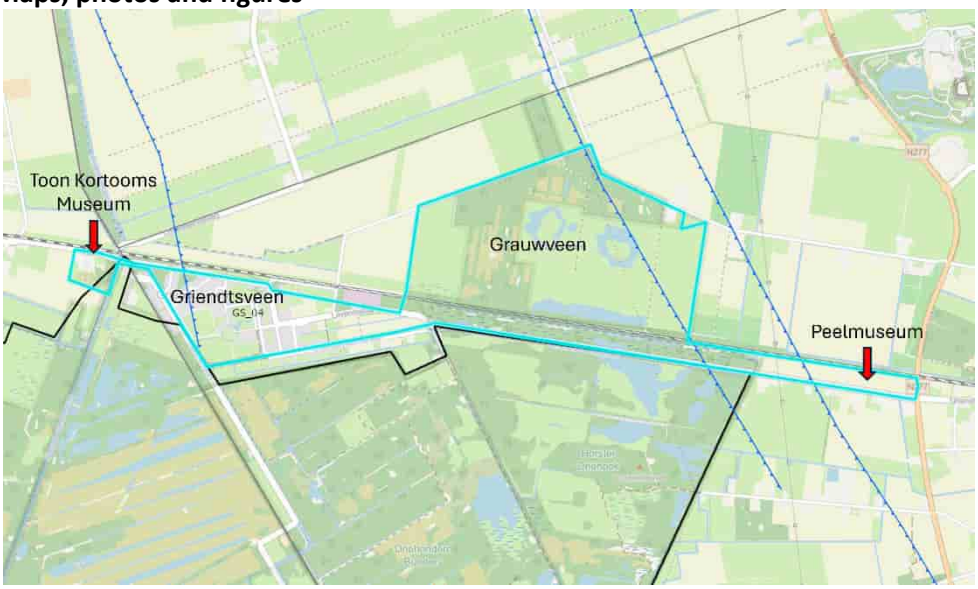
Industrial & Economic:
Griendtsveen is a typical reclamation village founded when industrial peat extraction began. The industrial method of peat extraction followed a strict pattern, employing hundreds of peat workers. In the peak year 1893, about 700 peat workers worked for the Griendtsveen company, excavating 107 hectares of peat bog, yielding 960,000 m³ of peat.

4. Relation with other geosites

Helenaveen (GS_18) is another peat colony on the south side of the Deurnse and Mariapeel (GS_11).

5. Documentation & Resources

6. Maps, photos and figures



Map showing the location of GS_04 – Griendtsveen and surroundings (blue outline)

Geosite: GS_05 **Significance: International** **Coordinates (RD): 167986, 416079**	**Name** Vorstengraf en Paalgraven
Municipality	Oss
Province and country	Noord-Brabant
Protection status	Archaeological monuments (2): Vorstengraf and Paalgraven
Site management organizations	Municipality of Oss
Accessibility	Via Zwaardweg in Oss; The Vorstengraf is part of the Brabant Nature Network, an initiative of the province to create more nature reserves.
Relevance for tourism	Finds from the Vorstengraf are exhibited in the National Museum of Antiquities (Leiden). Finds from the Vorstengraf (mound 7) at Zevenbergen have been transferred to Museum Jan Cunen..
Relevance for education & information	The graves are equipped with information boards.
Teaching equipment	
Scientific interest	Archaeological research: From 1997 to 2005, over 5 kilometres of trial trenches were dug in the surrounding area.

Description

1. Location

The archaeological monuments Vorstengraf Oss and De Zevenbergen are two areas with burial mounds, urn fields, and flat graves from the Dutch Bronze Age. The Vorstengraf near Oss is the largest burial mound in the Netherlands. The two areas are separated by a motorway and are 400 meters apart, but are accessible via a pedestrian bridge. The Paalgraven are also located to the east of the motorway.

2. Landscape formation and description

Origin of the landscape

The princely grave at Oss dates from the early Iron Age, with finds from around 700 BC. The burial mound was built on an older burial mound from the Bronze Age (circa 1800 BC). It is the largest burial mound in the Netherlands and originally had a height of about 3 meters and a diameter of 54 meters. A wealthy person of great esteem was buried there, as evidenced by the rich grave goods.

In 1932, a bronze bucket was discovered on the former Osse Heide while leveling a large hill, containing the cremated remains of the 'prince of Oss' and the grave goods that were given to the deceased. The most famous is the ritual around the bent sword. Swords from the Iron Age are a rarity. In addition, a knife, horse bits and harness, an axe, a whetstone, two razors, jewelry, and clothing were also found.

During the construction of the A50 near Zevenbergen, a second princely grave was found. In the vicinity of the princely graves, burial mounds with post circles (paalgraven) from the early Iron Age

were excavated. Some have been reconstructed, and many are located at the traffic junction aptly named 'Paalgraven'..

Geomorphology:
The area around the Vorstengraf lies on the Peel Boundary Fault fault and descends from 26 meters to 11 meters within a distance of a few hundred meters. The Vorstengraf is situated in a relatively high, well-visible location: precisely where the Maashorst, an extension of the Peelhorst, transitions into the lower terrain of the Maaskant. This last relief was formed by the incision of the Meuse.

Hydrology:

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History
During the period from the early Bronze Age to the early Iron Age (circa 2000 to 700 BC), there was a notable concentration of habitation on the northwestern edge of the Peelhorst, to the south of Oss. In prehistoric times, the existing elevation differences were utilized here. For those coming from the low-lying clay area in the north, the higher Peelhorst must have been a striking feature. At Vorsel and Zevenbergen, there were several urn fields and many burial mounds on the high edge, including the well-known princely graves of Oss. Burial mounds also served as markers of the 'property rights' of a local community. Therefore, they had to be conspicuous and were erected in prominent locations. Research has shown that the burial mounds around the princely grave of Oss were grazed by sheep at that time. This prevented the growth of shrubs that could obscure the burial mounds from view. Consequently, and due to their high location, the mounds were visible from a great distance (*Jansen and Van der Laan, 2011*).

Flora & Fauna:
In the area, natural processes, such as the decay of dead trees, are not actively countered. This offers opportunities for the development of diverse ecosystems. The province of Noord-Brabant aims to acquire agricultural lands and convert them into nature within the Brabant Nature Network. This process will proceed gradually, focusing on the preservation of archaeological heritage and the promotion of biodiversity.

Industrial & Economic:

4. Relation with other geosites

Slightly further south on the border of Uden and Nistelrode, the grave of the Prince(ss) of the Maashorst was found in 2005. Burial mounds and finds were also made in the area where the Peelhorst crosses the Meuse valley, for example in Baarlo (De Bong) and in Swalmen (Bosberg). Here too, the burial mounds are located on higher edges.

5. Documentation & Resources

- *Jansen and Van der Laan, 2011*

6. Maps, photos and figures

Map with the location of GS_05 – Vorstengraf and Paalgraven (blue outlined)

Cartoon map of the geosite GS_05 with the location of the Vorstengraf and the Paalgraven (source: Liselore Burgmans)


The monuments Vorstengraf (left) and Paalgraven (right). By Watisfictie (Own work, CC BY-SA 3.0) and Encyacht (Own work, Public domain, https://commons.wikimedia.org/w/index.php?curid=8876351)

Geosite: GS_06 **Significance: International** **Coordinates (RD): 182518, 401913**	**Name** Peelraamstelling
Municipality	Land van Cuijk
Province and country	Noord Brabant
Protection status	Rijksmonument
Site management organizations	
Accessibility	Roijendijk, Mill , Landhorst
Relevance for tourism	High experiential value
Relevance for education & information	
Teaching equipment	

Description

1. Location

The Peel-Raamstelling was a Dutch defensive line constructed in 1939 to halt or delay a potential German attack. On 10 May 1940, the first day of the Dutch war, the Peel-Raamstelling fell. The line was situated behind the Meuse Line, varying from 9 km to 21 km apart. It began at the Meuse near Grave, ran via Mill, through the Peel, and along the Zuid-Willemsvaart to the Belgian border near Weert. The Asperge Monument still commemorates one of the first German acts of war on Dutch soil. In the Land van Cuijk, between Grave and Landhorst, the remnants of the Peel-Raamstelling are still clearly visible:

- Stadsmuseum Grave
- The route of the former “Duitse Lijntje (German Railroad)
- Asperge Monument in Mill
- Waterweetjeswandeling in Landhorst
- Guided tour by Stichting Sporen van de Oorlog in Mill

2. Landscape formation and description

Origin of the landscape

The geology of the Peelhorst directly influenced the choice of location and nature of the defences, thus having strategic value. Between Meijel and De Rips, especially around Griendtsveen, the line benefited from natural protection by the marshy peat bogs of the Peel and several existing waters, such as the Graafse Raam, Helenavaart, and Noordervaart. Along the northern part, an artificial barrier was created in the form of the Defensiekanaal. Nearly 400 casemates were also constructed, along with barbed wire obstacles and clear fields of fire.

Geomorphology:

Hydrology:

Deposits & Fossils:

River & Streams:
The line could, between Meijel and De Rips, especially around Griendtsveen, benefit from natural protection by the marshy peat bogs of the Peel and several existing waters, such as the Graafse Raam, Helenavaart, and Noordervaart. Along the northern part, an artificial barrier was created in the form of the Defensiekanaal.

3. Geosite Interests

Cultural History
The Peel-Raamstelling remains largely intact and is still very recognisable in the landscape of the northern Peel due to a defensive canal with many casemates. Notable sections include the area between Griendtsveen and Vliegbasis de Peel (especially within the Heidsche Peel) and the site at Mill where the line crossed the so-called “Duitse Lijntje”. Here stands a monument commemorating the famous "armoured train incident". The monument consists of a pair of bent rails near the bridge, with the infamous "asparagus" obstacles (the actual derailment site is several dozen metres westwards), as well as the artillery monument, the restored casemate, and the monument 1-3RI. Casemates in the municipalities of Mill and Sint Hubert, Venray, Horst aan de Maas, and Deurne are protected as national monuments.

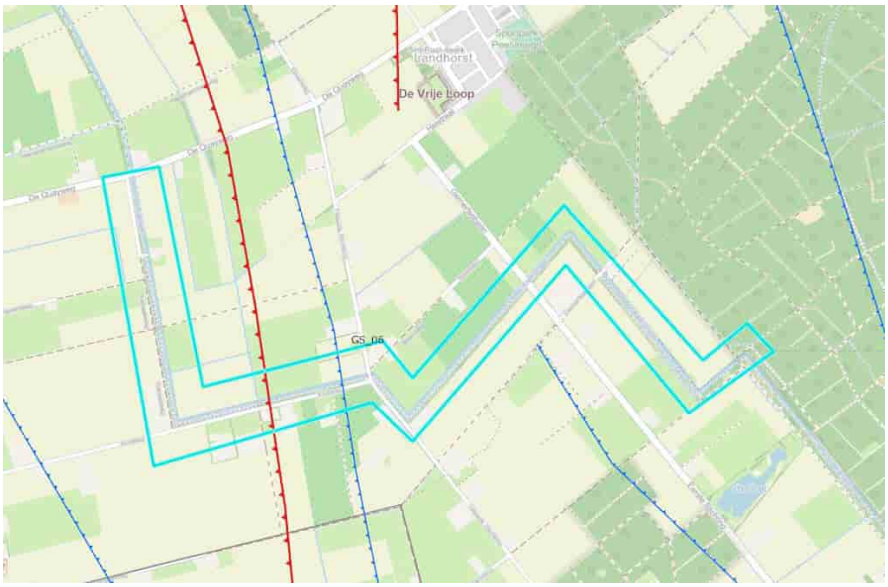
Flora & Fauna:

Industrial & Economic:

4. Relation with other geosites

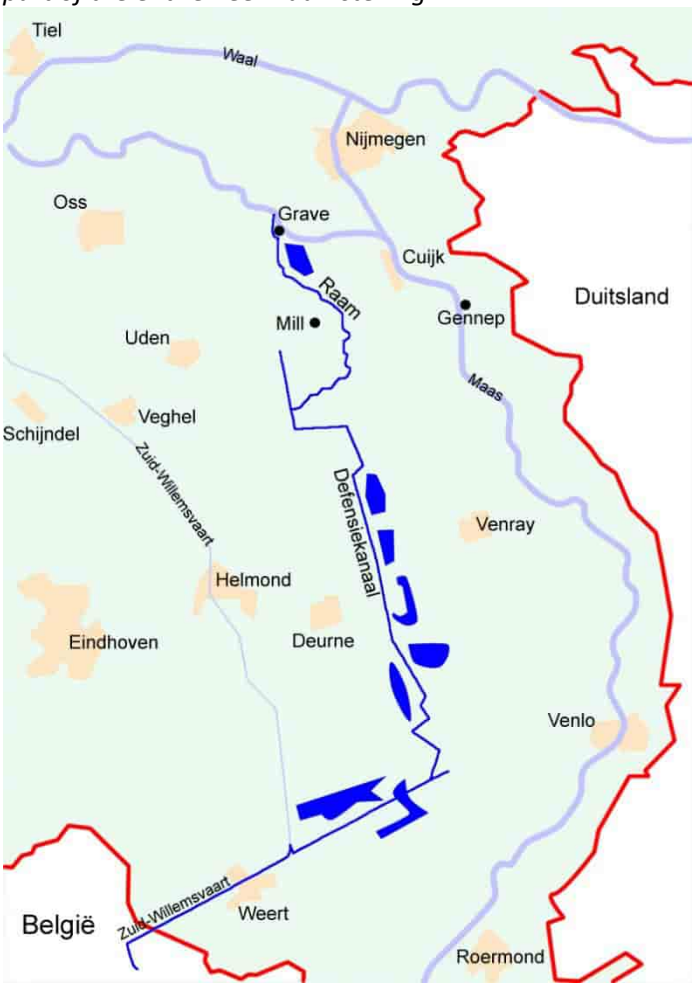
5. Documentation & Resources

6. Maps, photos and figures



Map showing the location of GS_06 – Peel-Raamstelling (blue outline). The geosite represents

part of the entire Peel-Raamstelling.



Overview of the entire Peel-Raamstelling from Grave in the north to Weert in the south..
(source: CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=498810)

Geosite: GS_07 **Significance: International** **Coordinates (RD): 168052, 409679**	**Name** Sint Annabos
Municipality	Maashorst / Bernheze
Province and country	Noord-Brabant
Protection status	The wijst area between Uden and Vorstenbosch was declared a geological monument in 2004. The area is one of five wijst reserves and has the status of “natte natuur parel”
Site management organizations	Staatsbosbeheer
Accessibility	Via Schansweg no. 10 in Uden, with a large car park.
Relevance for tourism	Circular walk along various phenomena related to the Peel Boundary Fault.
Relevance for education & information	Many manifestations in the Annabos are explained on information boards. Excursion opportunities. For education about Sint Annabos, one can contact IVN Uden, which organises nature activities and walks in the area.
Teaching equipment	
Scientific interest	Research trench (2018) at Lageburchtweg by VU to study various properties of the Peel Boundary Fault. The research in the trench examined fault structures, fault displacement, the age of displaced deposits, and variation in fault impermeability. Samples were also taken for geohydrological laboratory research.

Description

1. Location

The nature reserve “de Wijstgronden Uden” consists of three wet, seepage-rich sub-areas along the road from Uden to Vorstenbosch in Noord-Brabant. These are the Loose Beemden, the Raktse Beemden, and Kooldert, together covering about 41 hectares. The well-known Sint Annabos, west of Uden, is part of the (sub)area the Raktse Beemden and is the place where the Peel Boundary Fault is most visible through a great variety of manifestations. The wijst grounds of the Loose Beemden are similar and lie south of the Karperdijk.

2. Landscape formation and description

Origin of the landscape

Due to the poor water transmissibility of the faults, a narrow, wet zone has formed along the faults, the wijst grounds, with a unique variation in wetness and groundwater composition for the Netherlands. As a result, a great diversity of plants can be found in the narrow strip along the fault. Characteristic species from twenty plant communities grow on these wijst grounds. The water that rises along the faults is rich in iron.

Geomorphology:

Sint Anna Bos is the place where the Peel Boundary Fault is most visible, as the landscape suddenly rises about three metres via a steep slope. The height difference is bridged by following the boardwalk with the wooden bridge, where the landscape suddenly rises about three metres. Sometimes the fault itself is visible at the surface. In the asphalt of the biking lane on the Karperdijk in Uden (GS_07e), which lies over the Peel Boundary Fault, there is a crack of two centimetres, showing that the fault is still active. In the vicinity of faults, cracks in the asphalt are often seen.

Hydrology:
The Sint Annabos (GS_07d) is a moist deciduous forest, rich in alders, ferns, and mosses. It is a wijst area where wijst flora can be seen along the deep ditches through which the seepage water on the high side of the fault flows towards the graben on the west side. The rusty brown colour shows that the water in the seepage ditches is rich in iron. The Revennekes (GS_07b) is a created nature area and lies exactly on the Peel Boundary Fault. The fault line is not directly visible in the landscape but can be recognised by the rusty brown water in the ditch (next to the bike lane). The height difference over the fault can also be seen at the large drop at the two weirs in the deep watercourse.

Deposits & Fossils:
The area west of the fault is characterised by several sand drifts, including the Achter de Berg Nature Reserve (GS_07a) and Bedafse Bergen (GS_07f). In the Middle Ages, drifting sand ridges formed here. The drifting sand ridge, up to 25 metres high, is well maintained.

River & Streams:
Various seepage ditches east of the fault with marsh flora.

3. Geosite Interests

Cultural History
The wijst grounds in this area were discovered through flora and fauna research in connection with the construction of the A50 route through the area. The wijst grounds have been designated as a Geological Monument and the route of the motorway was diverted.

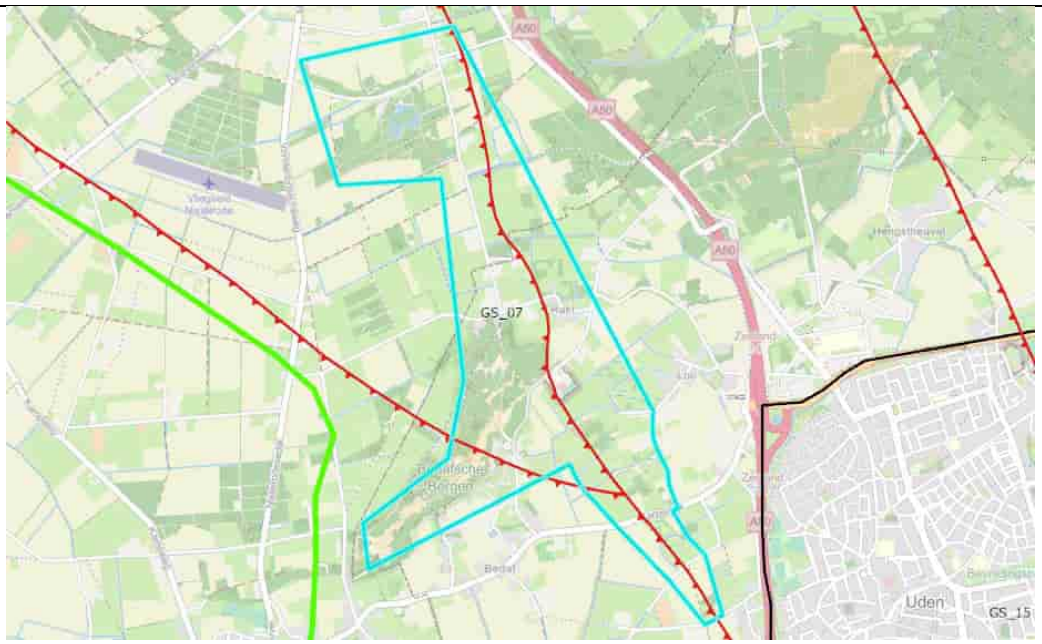
Flora & Fauna:
The Raktse Beemden (GS_07c) form an elongated moist grassland area at the transition from dry to wet, with meadows, hedgerows, and ditches. The rising seepage water makes the area a hotspot for special plants and animals. Beautiful species such as marsh marigold and bistort bloom here. Marsh birds and amphibians such as the moor frog thrive here. In the Revennekes, there are characteristic tree species and moisture-loving vegetation typical of this relatively wet nature area. On the other side of the cycle path is a hedgerow mainly of downy birch, which thrives here. This tree species is characteristic of wijst grounds.

Industrial & Economic:
In the last century, much drifting sand was stabilised with pine planting. The wood was mainly used in coal mining as pit props.

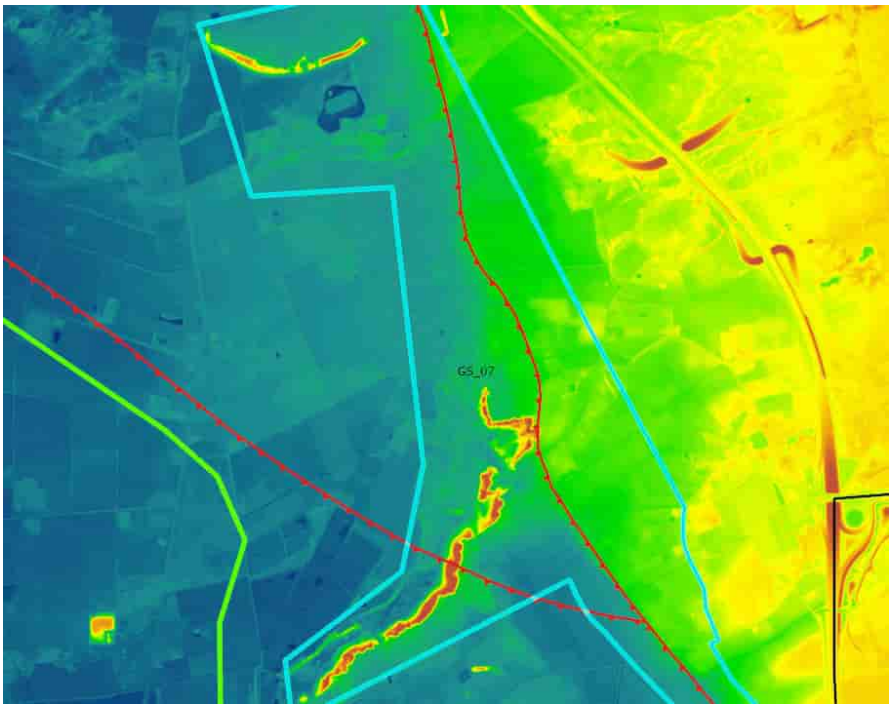
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Map showing the location of GS_07 – Sint Annabos (blue outline) and surroundings along the Peel Boundary Fault (in red)



AHN image of the geosite Sint Annabos showing the height difference over the Peel Boundary Fault. The morphology of the drifting dunes is clearly visible west of the Peel Boundary Fault in the Achter de Berg Nature Reserve (GS_07a, top of the image) and the Bedafse Bergen (GS_07f, bottom of the image)

Wijst water, recognisable by its typical rusty brown colour, flows over the Peel Boundary Fault near Uden (source: "Breuken in het land van Maas en Waal", Van Balen et al., 2022)

Distinct vegetation boundary on the steep edge of the Peel Boundary Fault.(Source: "Ecologische iconen van de Wijst", Ettema, 2010.)

Geosite: GS_08 **Significance: International** **Coordinates (RD): 185730, 382105**	**Name** Hoogdonk (Den Brink)
Municipality	Deurne
Province and country	Noord-Brabant (NL)
Protection status	Natuurmonument
Site management organizations	Xella Nederland
Accessibility	Various roads run around the lake, but the site itself is not accessible.
Relevance for tourism	Walking routes along and around the Den Brink lake
Relevance for education & information	Fossil finds can be viewed at the Klok and Peel Museum in Asten.
Teaching equipment	
Scientific interest	The site is recognized wordwide as a fossil site for the Miocene and Pliocene

Description

1. Location

The Hoogdonk (Den Brink) sand extraction site is located north of the village of Liessel at the end of Hoogdonkseweg, at the intersection of Snoerstebaan/Berktsedijk. The lake is about 1 km long and up to 50 m wide.

2. Landscape formation and description

Origin of the landscape

The Hoogdonk sand extraction site is situated on the Peelhorst, just east of the Peel Boundary Fault. Due to the uplift of the Peelhorst and erosion of younger sediments, Pleistocene, Pliocene, and Miocene sands are relatively close to the surface here. This explains why so many fossils from the late Pliocene and Miocene have been found at this sand extraction site (up to about 30 m deep)..

Geomorphology:

The sand extraction site is bounded on the west by the Peel Boundary Fault, which is marked by a small terrain step. More obvious, however, are the differences in vegetation on either side of the fault. At the north-western boundary of the sand pit along the Berktsedijk, the Peel Boundary Fault can be experienced at the Oude Aa. The height difference is evident from the closely spaced weirs in the Oude Aa.

Hydrology:

The lake is fed by rain and seepage water and, to preserve the fish population, is not in open connection with surrounding water. As Den Brink is mostly deeper than four metres, it can be considered a deep-water type lake. Since September 1968, the lake has been used as a fishing pond by the De Peel Angling Association.

Deposits & Fossils:
Over time, numerous palaeontological finds have been made at the sand extraction site up to 2002. Hoogdonk worked with two museums, the Klok and Peel Museum in Asten and the Oertijdmuseum De Groene Poort in Boxtel. Groups of amateur palaeontologists regularly searched for special finds in the dredged sand together. Shark teeth, whale vertebrae, bird remains, sea urchins, and starfish have been found. Whale remains and many other marine fossils are evidence of a time when this part of the Netherlands was sea (Miocene, Breda Subgroup). Remains of mastodons and other fossils date from a period when the area was land (Pliocene and Pleistocene, Kiezeloolite and Beegden formations, respectively). Occasionally, larger erratic boulders are found in the Pleistocene river deposits. In Liessel, for example, the “Jaap van de Leijsing” and the “Buntse Kei” are on the market square. Seeds of plants and artefacts indicating human presence have also been found, so to some extent, archaeological finds have also been made. Most of the dredged fossils were made available by director Van den Brink to the Klok and Peel Museum in Asten, where the palaeontology department displays a large and beautiful collection of the many fossils. After 2002, the dredging method changed, ending palaeontological research at the sand-lime brick factory. Initially, dredging was done with a floating crane ship. Due to changing environmental requirements, this was done after 2002 with a hired electric suction dredger..

River & Streams:
The Oude Aa stream runs along the north side of the excavation over the Peel Boundary Fault. The Oude Aa is also known as the Vlierdense Aa, Vloeieinds(ch)e (Water)Loop and Raktse Loop and originates in the Deurnese Peel.

3. Geosite Interests

Cultural History
Many residents of the municipality of Deurne, mainly from the Sint-Jozef parish (district) and Liessel, worked in the production at this factory, often in two shifts (the stokers in three shifts) at Den Brink, as the factory was soon popularly called. Den Brink is also the name of the lake created by sand extraction.

Flora & Fauna:
The flora and fauna are extremely varied due to the alternation of wet and dry areas. The area contains flora characteristic of wijst areas, such as Dwarf Hair Grass. Other less common species that prefer base-rich seepage include brown flatsedge, pennyroyal, shortawn fox-tail, and the Cavernous Crystalwort

Industrial & Economic:
Two farmers sold 15 hectares of farmland to Gijberrtus Abtonius (Bert) van den Brink and 20 hectares of peatland to the municipality of Deurne, and in 1954 the Hoogdonk Sand-Lime Brick Factory was established in Liessel. The Peel Boundary Fault lies in front of the factory gate. On the factory site, Miocene (?) sand is at the surface, making it easy to extract. In 2000, a permit was obtained to expand the lake, allowing the factory to continue production until about 2030. Sand extraction was stopped in 2022, but Xella Kalkzandsteen resumed sand extraction for sand-lime brick products in 2024. The permit for excavation runs until 2025; further plans are unknown.

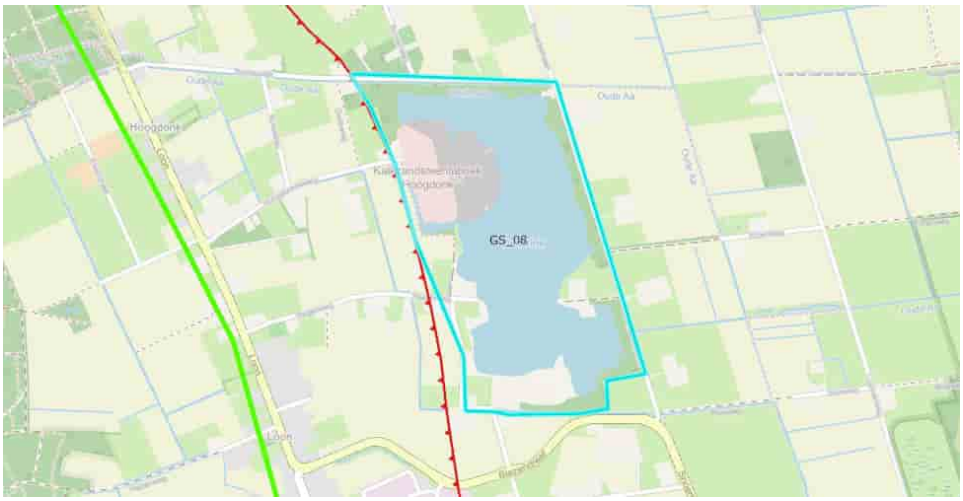
4. Relation with other geosites

The Hoogdonk sand extraction site has no direct relationship with nearby geosites. In De Kuilen (GS_20), forty kilometres north of Liessel, fossils from the Miocene and Pliocene have been found in a sand extraction pit. This location is also on the Peelhorst.

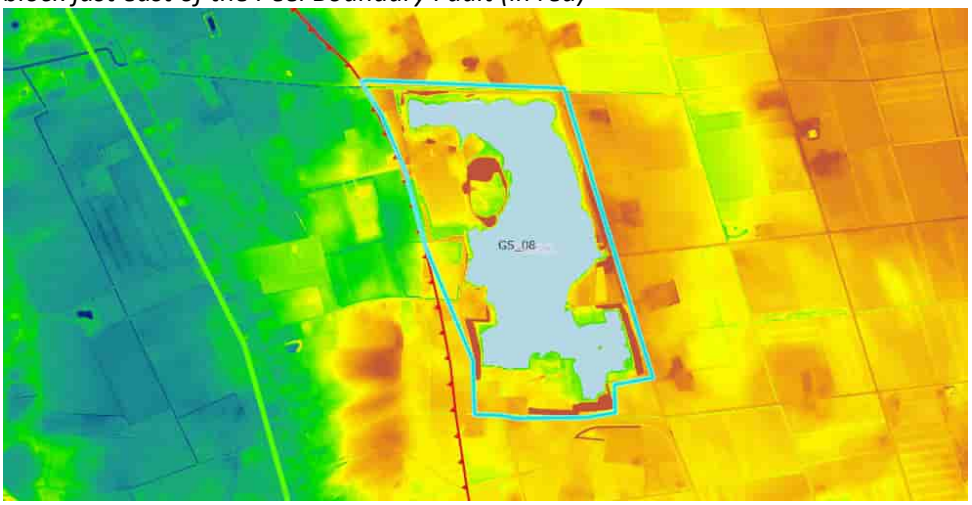
5. Documentation & Resources

- *Peters, A., Lammers, Th.& Mol, D. (1991). Mastodonten=kiezen uit Liessel (Noord-Brabant). Cranium 8 (2), 89-96.*
- *Peters, N., (2009), Brabant tussen walvissen en mastodonten, Fossielen uit Liessel [Asten/Boxtel]*

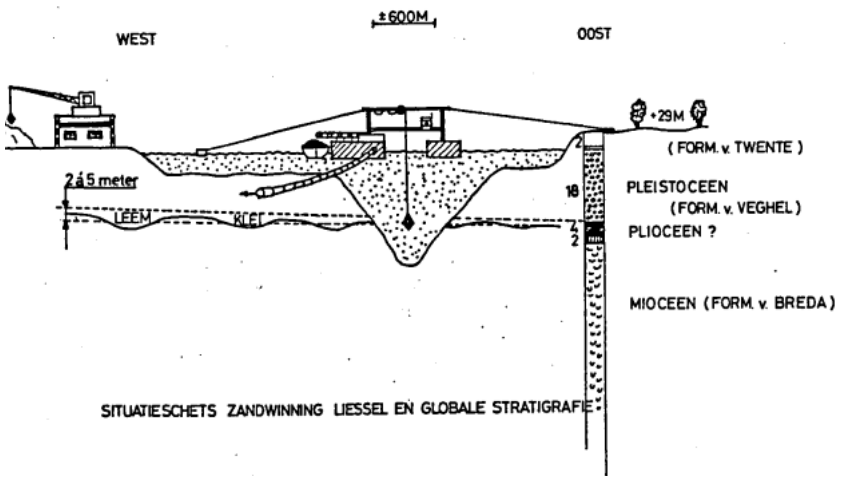
6. Maps, photos and figures



Map showing the location of GS_08 – Hoogdonk-Den Brink (blue outline) on the high fault block just east of the Peel Boundary Fault (in red)



AHN image of the geosite GS_08 – Hoogdonk-Den Brink showing the height difference over the Peel Boundary Fault. The higher area at the bottom of the image lies west of the fault and represents a drifting sand area.



Situation sketch of sand extraction Liessel and general stratigraphy (old names). Source: Peters et al., 1991.

Geosite: GS_09 **Significance: National** **Coordinates (RD): 193927, 362351**	**Name** Leudal
Municipality	Leudal
Province and country	Limburg
Protection status	Natura-2000
Site management organizations	Staatsbosbeheer
Accessibility	Het Leudalmuseum, Roggelse weg
Relevance for tourism	Leudal is a very popular walking area and is part of the Hertogenpad, but there are also many shorter walking routes; these start near the Leudalmuseum. There are various cycle paths as part of the cycling Hroute network.
Relevance for education & information	The Leudalmuseum, located in the Sint Elisabethshof. This museum provides information about the flora and fauna, archaeology, local history, and some history (especially the Second World War) of the area
Teaching equipment	

Description

1. Location

Het Leudal is a nature reserve in the Dutch province of Limburg. It is located between the village centres of Haelen, Roggel, Neer, Nunhem, and Heythuysen in the municipality of Leudal. The total nature reserve covers about 900 hectares, a large part of which is managed as a reserve by Staatsbosbeheer. The area is particularly known for its stream valleys. The geosite consists of an area of 315 hectares designated as a Natura 2000 area.

2. Landscape formation and description

Origin of the landscape

Het Leudal is a relatively high-lying cover sand area on the west bank of the Meuse, with deposits from the last ice age. There are stream valleys, land dunes, and forest ponds. Due to its location in a landscape with Meuse terraces and fairly large height differences, the streams flow quickly, and the stream valleys are strikingly deeply incised into the sand.

Geomorphology:

The stream valleys were formed in the last ice age and have been further eroded over the centuries. Another clearly visible remnant from the distant past are the metre-high sand dunes. In combination with the deep, almost ravine-like stream valleys, they create significant height differences.

Hydrology:

Due to the height differences in Het Leudal, there are large differences in groundwater levels. Together with the differences in soil composition, this creates a great diversity in vegetation. Groundwater steps are found locally in the stream valleys. This is due to peat layers in the subsoil,

which prevent the groundwater from sinking away. Clay layers can cause wet spots locally. There are also several diffuse seepage zones in old meander bends, in the stream valley of the Roggelsebeek on the side of the high hinterland.

Deposits & Fossils:

River & Streams:
The Tungelroyse Beek (locally also called Leubeek) and the Zelsterbeek flow through the area. Between Nunhem and Neer, they merge into the Neerbeek. Just a few hundred meters further, the Haelense Beek joins them, which runs for kilometres just south and east of the reserve. The Leubeek was largely canalised in the past. But at the beginning of the 21st century, an important part of the old stream course with its meanders was restored. Upstream of Het Leudal, various stream sections have been or are being restored, particularly parts of the Tungelroyse Beek and the Roggelse Beek.

3. Geosite Interests

Cultural History
In the middle of the area lies the Sint-Ursulamolen or Leumolen from 1773 (named after Saint Ursula). It now is a water mill and was once used for grain and oil.

Flora & Fauna:
The vegetation in the stream valleys is very varied, especially in the deepest valleys due to the seepage and the associated vegetation. The wet forests in the deep stream valleys belong to relatively special forest types (alder carr, bird cherry-ash forest, hornbeam forest, and birch carr). They mainly contain species that indicate deep seepage, such as large amounts of golden saxifrage, marsh marigold, and water violet. In pools and marshes, further grow snake-root, alder sedge, stiff sedge, bog myrtle thickets, and adder's tongue. In relatively nutrient-poor places in the stream valley, slender primrose, wood anemone, Solomon's seal, and lily of the valley bloom in spring. East of the Elizabeth Monastery are poor grasslands with, among others, spotted orchid. The higher grounds also form a varied nature reserve with forest (consisting of deciduous and coniferous trees), small heathlands, and dry grasslands. There are also fields and meadows.

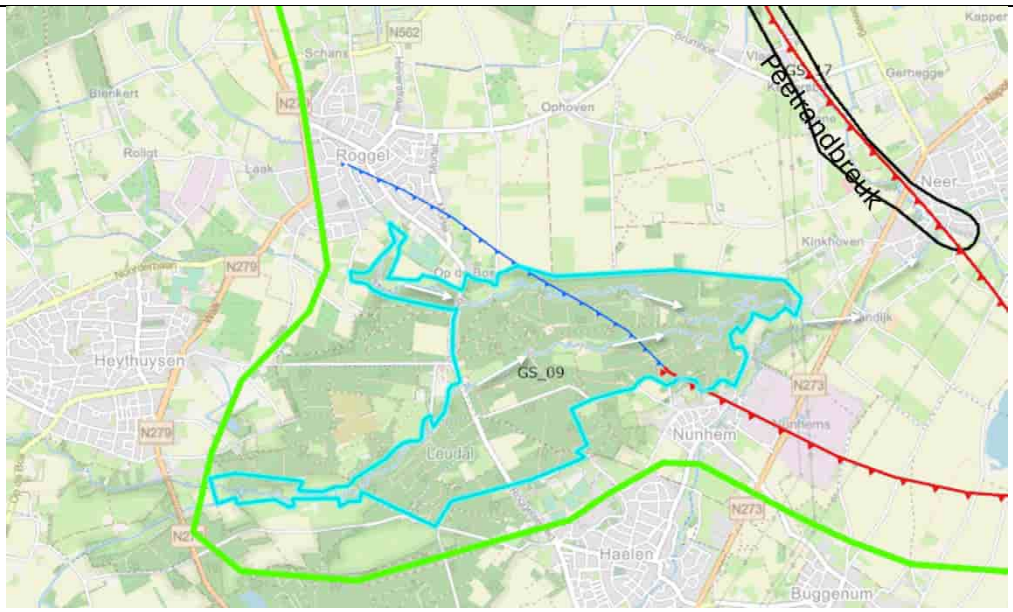
The fauna is very varied. In addition to fox and roe deer, there are badgers and other mustelids; a group of wild boars roams in the area. Beavers were released in 2002. Special bird species include black woodpecker, green woodpecker, middle spotted woodpecker, bullfinch, grey wagtail, sparrowhawk, and hobby. Moreover, kingfishers can be found, which have an ideal habitat in the area with steep sandbanks and fish-rich streams. The phegea moth occurs in the area.

Industrial & Economic:

4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Map showing the location of GS_09 – Leudal (blue outlined) located on the low-lying fault block southwest of the Peel Boundary Fault (in red). The Leubeek and Zelsterbeek (white arrows) drain to the northeast. After the confluence of the streams, they flow further as the Neerbeek towards the Peel Boundary Fault, which they then cross at Neer.

The Leubeek in the nature reserve Het Leudal (source: Wikipedia)

The Sint-Ursulamolen in Het Leudal (source: Wikipedia)

Geosite: GS_10 **Significance: International** **Coordinates (RD): 201809, 367049**	**Name** Maasterrassen
Municipality	Leudel, Beesel en Venlo
Province and country	Limburg
Protection status	Aardkundig waardevol gebied
Site management organizations	
Accessibility	
Relevance for tourism	
Relevance for education & information	
Teaching equipment	

Description

1. Location

The most accentuated Meuse terraces lie roughly between Roermond (Swalmdal) and Tegelen, characterising the area where the River Meuse crosses the Peelhorst..

2. Landscape formation and description

Origin of the landscape

Where the area of the Meuse south of Roermond is a geological subsidence area (Roer Valley Graben), North Limburg (including the Peel Horst, but also the Venlo Graben) is actually being pushed further upwards. Near the village of Neer, the uplift currently amounts to about 2 cm per century (almost half a metre since Roman times, 2 metres since the beginning of the Holocene). This is evidenced by the earthquakes that occasionally occur around the Peel Boundary Fault near Roermond.

The uplift of Northern Limburg automatically meant that the Meuse had to start incising. In warm climate periods, this incision process proceeded relatively quickly, only to partly come to a halt again during ice ages and cold periods. During these glacial periods, the Meuse flowed as a braided river through an almost treeless landscape, carrying much sand and gravel. The old, braided channel relics on the lower terrace date from one of the last cold periods.

Due to climate fluctuations and river course shifts in the upstream catchment, the Meuse has experienced large differences in discharge over time. For example, until about 200,000 years ago (Saalian), the Meuse still drained the water of the Moselle, which, among other things, allowed the large meander bends on the middle terrace of the Schuytwater and Kaldenbroek to form. During glacial periods, sea level was much lower than today, and the North Sea coast lay relatively far away. During warm periods, the coast could advance almost as far as Limburg. The braided Meuse disappeared and the river took on more the character of a more sedate delta river, sometimes with broad meander bends, but sometimes also with its current narrow ‘canyon bed’..

Geomorphology:
The alternation of cold and warmer periods, and thus of incision and widening of the Meuse, ultimately led to the formation of the well-known Meuse terraces, which are visible everywhere in the area like steps. Where the Meuse eroded close to the old middle or high terrace, high steep banks arose directly at the water, such as at Neer, Kessel and at the monastery village of Steijl, where a height difference of 15 to 20 metres between river and middle terrace can be observed.

Hydrology:
Instead of flooding by river water, the dominant process along this river stretch is the emergence of iron-rich groundwater. This is manifested in shallow seepage channels scattered throughout the area at various terrace levels, often far above the Meuse. These channels collect the clear groundwater from older, adjacent areas. Most channel relics are in fact 'fossil channels', no longer directly related to the present Meuse.

Deposits & Fossils:

River & Streams:
Present-day Meuse and numerous side streams

3. Geosite Interests

Cultural History
The old structure of rising river terraces still determines the use and spatial development of the Limburg Meuse valley to this day. Old Meuse villages such as Meerlo, Grubbenvorst and Arcen are still recognisable as historic bastions on the high terrace edges. These were also the logical settlement sites of the first inhabitants of the Netherlands. Right along the Meuse, we find remains from the Stone Age, Bronze Age, Iron Age, Roman period and Middle Ages, directly on top of each other. Because the Meuse has hardly shifted its position for 10,000 years, it has never 'cleared away' this old cultural heritage.

Flora & Fauna:
Due to the action of iron-rich groundwater, the channels and old Meuse arms (potentially) have a unique plant growth with species such as Marsh Marigold, Water Horsetail and even Golden Saxifrage. Where rich alder carr forests grow in the seepage areas, such as in the Old Meuse Arm near Meerlo and the Heuloërbroek near Aijen, we find Nightingale, Pied Flycatcher and sometimes even Golden Oriole. The European Tree Frog, Purple Emperor and Garlic Toad probably originally occurred in large numbers in and around the wet groundwater channels of the Meuse valley.

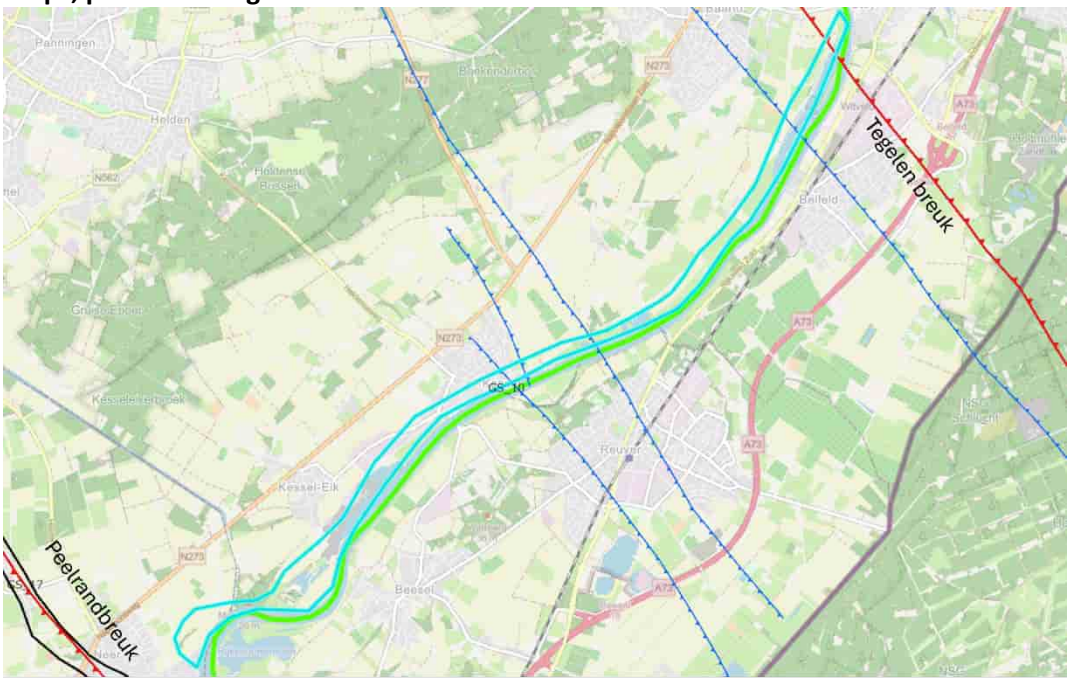
Industrial & Economic:
.

4. Relation with other geosites

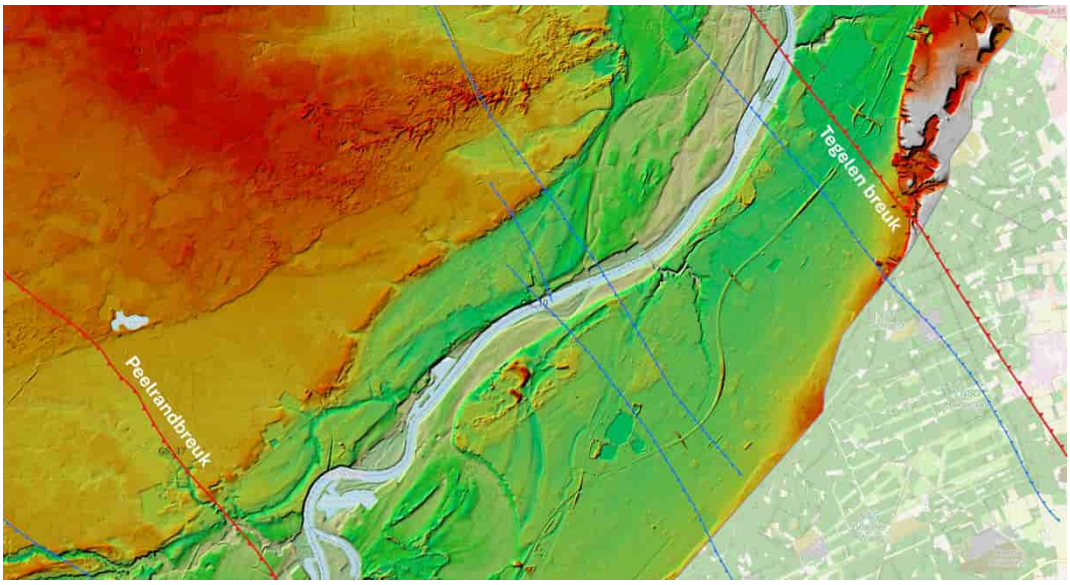
5. Documentation & Resourcess

- *https://www.limburgs-landschap.nl/wp-content/uploads/2021/04/2019_Maaster-rassen_lr.pdf*
- *Woolderink, H.A.G, C. Kasse en R.T. van Balen (2020), De invloed van breuken op de Maas en Roer in het Roerdalslenk-systeem.' in: Grondboor en Hamer 74, 176-182*
- *Woolderink, H. A. G. (2021). Faulty Rivers: The effect of faulting on river morphodynamics and morphology. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam]. Ipskamp.*

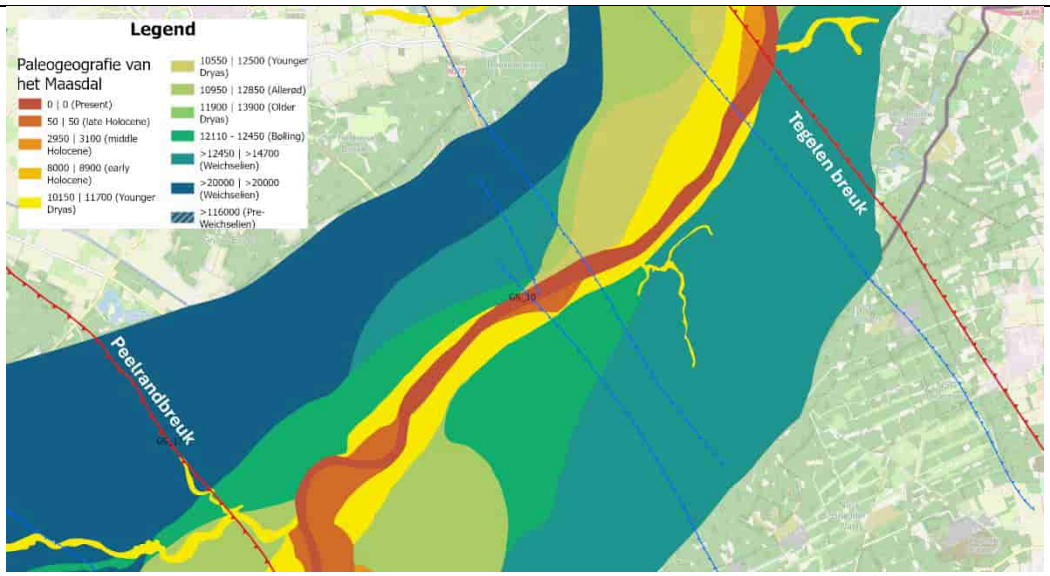
6. Maps, photos and figures



The Meuse crossing (GS_10) represents the area (outlined in blue) where the Meuse has cut through the Peel Horst between the Peel Boundary Fault and Tegelen Fault.



AHN image (shaded relief) of the Meuse crossing shows height differences due to Meuse terraces.



Palaeogeographical reconstruction of the Meuse terraces as observed in the AHN image. (source Woolderink et al., 2020)

Old terrace edges and incising streams as a unique feature of the geomorphology of the Meuse terraces. Source: www.limburgs-landschap.nl

Geosite: GS_11 **Significance: international** **Coordinates (RD): 190423, 381305**	**Name** Deurnse- en Mariapeel
Municipality	Deurne, Horst aan de Maas
Province and country	Noord-Brabant, Limburg (NL)
Protection status	Natura-2000. UNESCO wetlands
Site management organizations	Staatsbosbeheer
Accessibility	Various nature “gateways”
Relevance for tourism	Walking and cycling routes
Relevance for education & information	Guided tours by guides (starting from, among others, nature gateway De Peel)
Teaching equipment	

Description

1. Location

The area covers more than 2,700 hectares and consists of two sub-areas: Deurnsche (Deurnse, Deurnese or Deurnesche) Peel and the Mariapeel. Together with the nearby Groote Peel, they are remnants of what was once an extensive primeval landscape of living raised bog. The reserve is completely surrounded by agricultural land.

2. Landscape formation and description

Origin of the landscape

During the last part of the last ice age, the Peel landscape was sparsely vegetated for a long time. Much cover sand was blown away in places where small rivers cut through sandy sediments from the subsurface. Due to the predominantly south-westerly winds, the upper reaches of the Brabant rivers, which flow northwest, struggled. Entire cover sand ridges were blown straight into the valley, leaving completely or largely cut-off basins. The Limburg rivers were much less affected, as they flowed in the same direction as the drifting cover sand. The Brabant rivers had yet another handicap. The Peel Horst as a whole is tilting, with the north-eastern half subsiding and the south-western half rising. The upper reaches of the Brabant rivers therefore subsided relative to the middle and lower reaches in the Roer Valley Graben, reducing gradient and erosive power. Due to tectonics and the drifting in of cover sand, large, more or less closed basins eventually formed in the Graben of Griendtsveen and in the sanded-up upper reaches of Brabant rivers such as the Soeloop and the Vlier. In all these basins, fen peat began to form during the last part of the ice age. During the Holocene, transitional mires developed on this, and eventually raised bog formed, which also spread outside the original basins and completely or largely overgrew surrounding cover sand ridges. Locally, elongated chains of peat lakes developed between a raised bog and a cover sand ridge or between two approaching raised bogs, such as the Negenmeren near Griendtsveen.
For a long time, these wet peat areas were difficult to access, but eventually they were reclaimed for peat extraction.

Geomorphology:

Hydrology:
The watershed through the area means that the Deurnese Peel and Helenaveen drain to the west and Griendtsveen and Mariapeel to the east. Due to the location of the peat area in a fault zone, buffering of fens just above these faults is possible.

Deposits & Fossils:
Within the aUGGP, the Deurnsche Peel and Mariapeel represent undeveloped areas where remains of peat moss are still present. The entire Natura 2000 area Deurnsche Peel & Mariapeel is a more or less coherent remnant of the largely disappeared raised bog area De Peel, on the watershed between the Brabant stream the Aa in the west and the Limburg Grote Molenbeek in the east. Most of the peat has been excavated in the past, but locally thick layers of residual peat are still present. In some complexes of farm pits, there are vegetations with hummock-forming raised bog species. These Peel raised bogs were largely excavated down to the sandy subsoil. These areas are the southernmost representatives of the flat subatlantic raised bogs, which elsewhere and also in the Peel region have largely disappeared due to excavation, reclamation and peat cutting.

River & Streams:

3. Geosite Interests

Cultural History
For at least seven centuries, but probably much longer, the peat of the Deurnsche Peel and the Mariapeel was gradually excavated from the surrounding Peel villages. The oldest peat pits of the Verheven Peel are the Ronde Kuilen in the Liesselse Peel, on the western edge of the Deurnsche Peel. On the Limburg side, the peat diggers from Horst, Sevenum and Maasbree generally only reached the Verheven Peel in the course of the 19th century, so the peat pits there are somewhat younger. In the Deurnsche Peel, peat was extracted until the 1970s, and the traces of this are still clearly visible

Flora & Fauna:
Due to the different peat extraction histories of the parts of the area, there is a large and fine-scale variation in vegetation and landscape, with gradients towards a slightly more mineral-rich environment. In the oldest peat pits, raised bog growth has been present on a miniature scale for a long time. On the large residual peat units, a relatively large peat thickness is still present, on which, through restoration management, the development of raised bog vegetation is now also taking place in various places.

The faunal value of the affected raised bog mainly concerns the herpetofauna and avifauna. Herpetofauna: Smooth snake, Moor frog. Avifauna: various marsh birds (Bluethroat, Stonechat), Black-necked Grebe, Teal and Black-headed Gull, Bittern, Little Grebe, Water Rail, Spotted Crake, Cormorant and various ducks. A rare breeding bird is the Nightjar. In addition to the large numbers of cranes seen during migration, the Mariapeel is somewhat renowned as a stopover for the rare Black Stork.

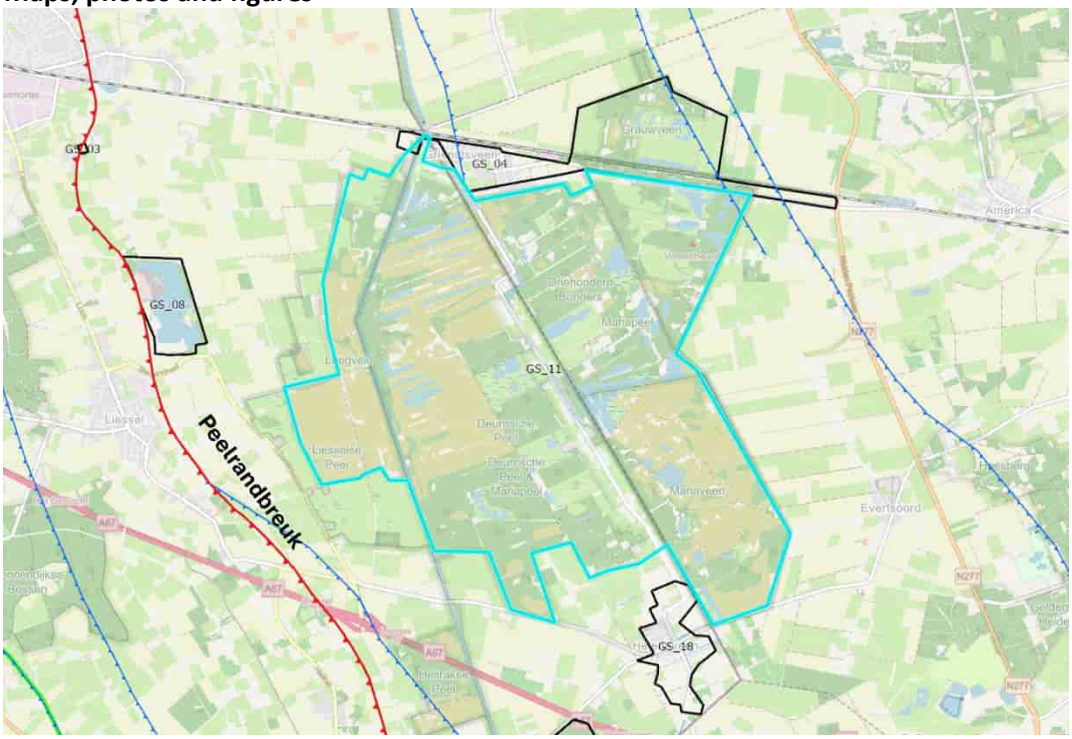
Industrial & Economic:
In the Deurnsche Peel, peat was extracted until the 1970s, and the traces of this are still clearly visible.

4. Relation with other geosites

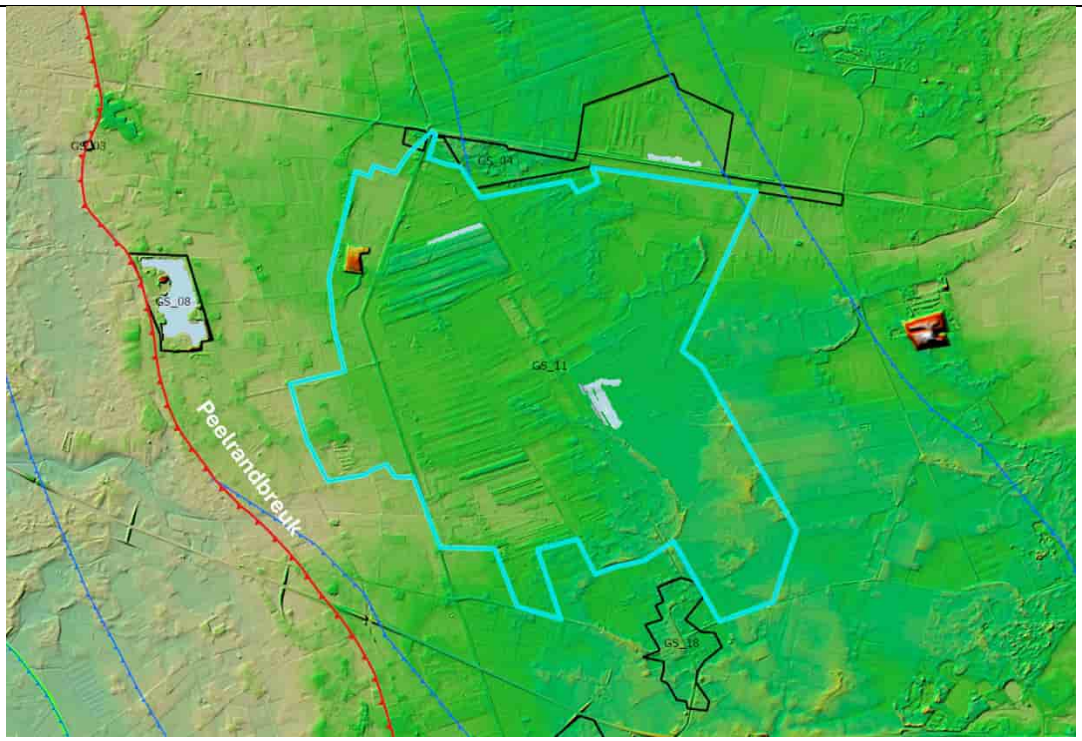
De Bult (GS_30) is also a raised bog area that has remained after reclamation and is part of the same Natura 2000 area, but is located separately. There is also a relationship with the peat reclamation geosites Griendtsveen (GS_04) and Helenaveen (GS_18).

5. Documentation & Resources

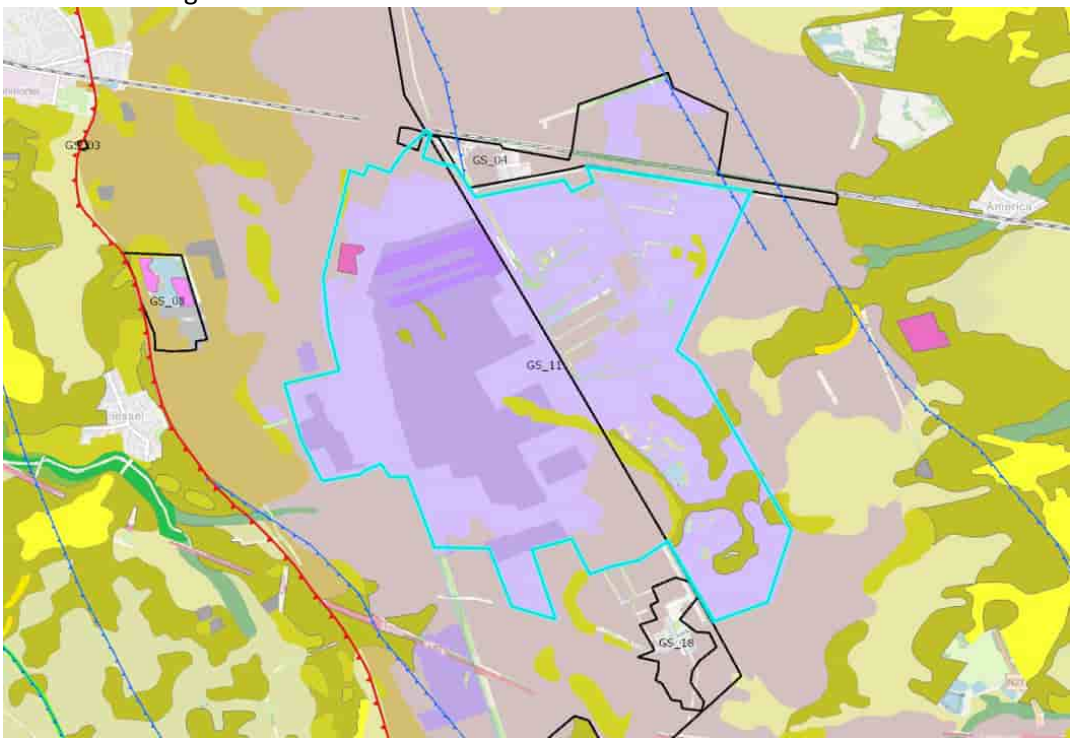
6. Maps, photos and figures



Location of geosite GS_011 – Deurnese and Mariapeel (outlined in blue) situated on the elevated Peel Horst just east of the Peel Boundary Fault.



AHN image (shaded relief) of the Deurnese and Mariapeel (outlined in blue). The image clearly shows the elongated traces of reclamation.



Geomorphological map with the areas where the peat remains are located shown in purple. The watershed here runs almost parallel to the provincial border between Noord Brabant and Limburg (black line), which is also clearly reflected in the opposite flow directions of the stream valleys (in dark green) on either side of the raised bog area.

Geosite: GS_12 **Significance: National** **Coordinates (RD): 176654, 413192**	**Name** Waterzuiverende Wijstboerderij Zeeland
Municipality	Maashorst
Province and country	Noord-Brabant
Protection status	
Site management organizations	Private: Fam. Bongers-Sepp
Accessibility	Langenboomseweg 103, Zeeland
Relevance for tourism	Several walking and cycling routes pass by this location (including the "*Langs de Breuk*) cycle route)
Relevance for education & information	There are plans for a visitor centre in the old manure silo
Teaching equipment	

Description

1. Location

The Bongers-Sepp family are realising their dream at Heihorst in Zeeland: a dairy farm that has transitioned to nature-inclusive, organic farming. Father Piet and daughter Karen have recently dedicated 35 hectares of their land to nature and wijst restoration. As a result, the farm now and in the future contributes to strengthening the landscape, nature, and especially the water system. One of the most important steps has been the planting of around 20,000 trees on these 35 hectares. This is creating a place where people and animals can once again live in harmony.

2. Landscape formation and description

Origin of the landscape

Geomorphology:

Hydrology:

The land has been designed for optimal water retention and purification of water that isn't needed for the crops (which is the majority). There is a 1.5 km long strip of willows; broad strips of nut trees combined with other productive species, and hedges around the fields. For this, the farmers received compensation from the Brabant Green Development Fund

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

Flora & Fauna:

Industrial & Economic:
Alongside space for water and nature, agriculture remains important. Grazing livestock now provides income, as does arable farming with crops such as summer wheat with peas, silage maize, spring barley, and species-rich grassland. The crops are organic, which works well with the planted trees and shrubs that will start to yield produce in a few years' time. There are also plans for a visitor centre in the old manure silo, so that other farmers can get to know the farm and draw inspiration from the transition the family has made.

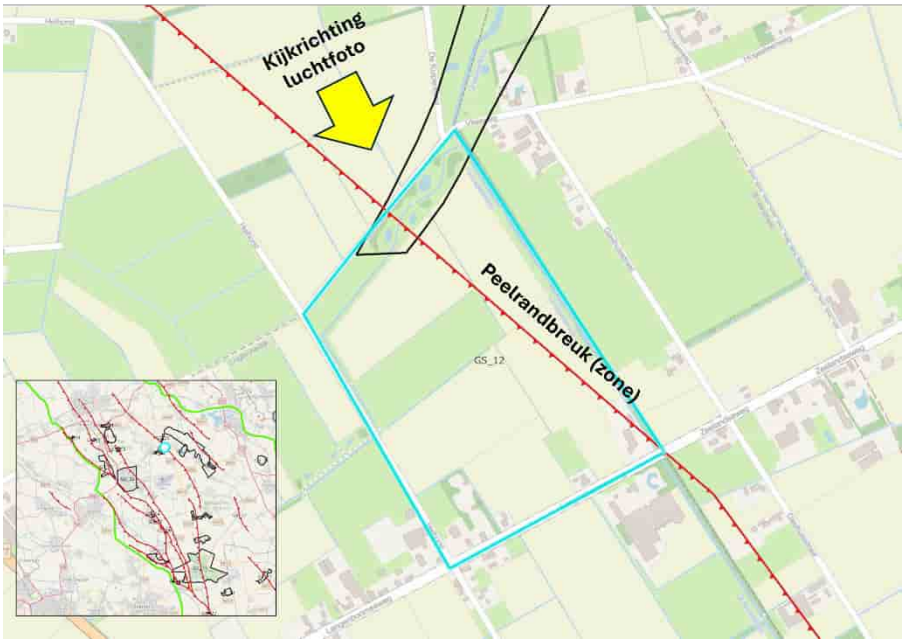
4. Relation with other geosites

GS_35 De Hoge Raam borders this geosite to the north.

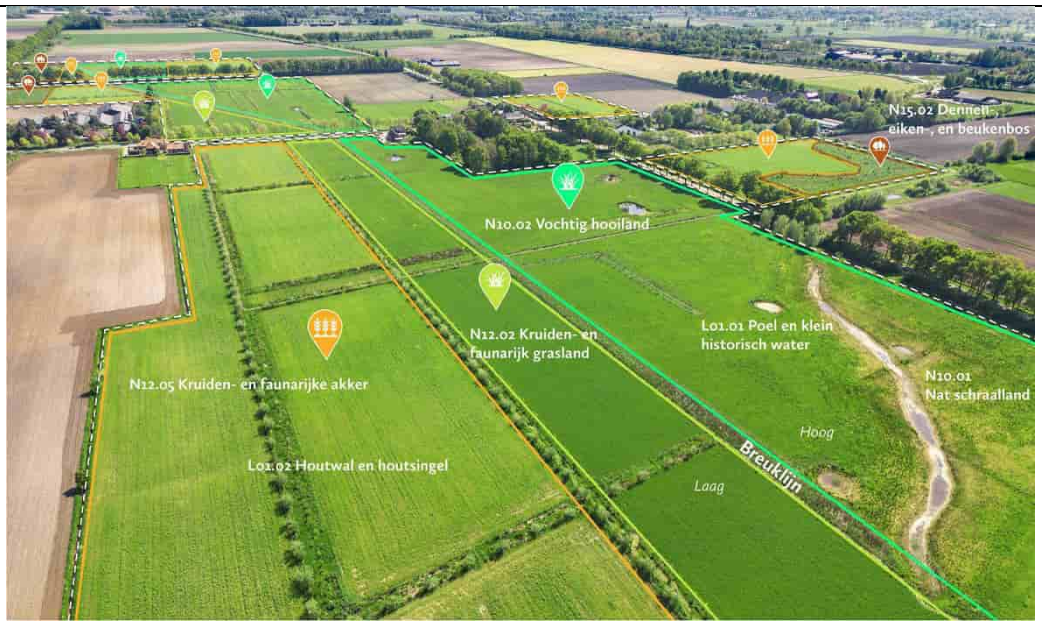
5. Documentation & Resources

Website: https://werkendlandschap.nl/project/waterzuiverende-wijstboerderij

6. Maps, photos and figures



Location of geosite GS_012 – Water-Purifying Wijst Farm Zeeland (outlined in blue), situated around the northernmost fault segment of the Peel Boundary Fault (see inset map for location).



Aerial photograph of the water-purifying wijst farm (view looking east). The Peel Boundary Fault and differences in vegetation and moisture regime are indicated. Source: werkendlandschap.nl

Geosite: GS_13 **Significance: National** **Coordinates (RD): 169700, 412016**	**Name** Slabroek
Municipality	Maashorst
Province and country	Noord-Brabant, The Netherlands
Protection status	Deels Wijstreservaat status
Site management organizations	Staatsbosbeheer
Accessibility	Well connected by a network of walking and cycling paths
Relevance for tourism	A range of activities are organised in this area from the De Maashorst Nature Centre (GS_23). In addition, several local businesses cater to tourists, offering accommodation and selling regional products.
Relevance for education & information	There's an information panel in the area, and extensive information can also be found at the nearby De Maashorst Nature Centre (GS_23).
Teaching equipment	Education team at De Maashorst Nature Centre

Description

1. Location

This small-scale natural and cultural landscape is situated on the Peelhorst, near the hamlet of Slabroek. It comprises a shallow stream valley and adjacent heathland and drifting sand area. In the stream valley lies one of the five Wijst Restoration Projects designated by the province of Noord Brabant.

2. Landscape formation and description

Origin of the landscape

This geosite is located on the Peelhorst. It features a broad, shallow stream valley (Venloop) and, to the south, heathland and drifting sand. The area is intersected by two southeast-northwest trending branches of the Peel Boundary Fault (the Mellebreuk and the Hoevense Fault), which are not visible at ground level but do cause local wijst phenomena in the valley. The valley formed during the last ice age, when rain and meltwater, unable to infiltrate due to permafrost, ran off over the surface, carrying some of the sandy sediment with it. The present-day stream has a much smaller discharge than would be expected for the width of the valley. The heathland is a cultural landscape, created by overgrazing and soil erosion in the Middle Ages. Blowing sand formed elongated drifting sand ridges on either side of the area.

Geomorphology:

This area has hardly been subject to land consolidation, so the original relief has largely been preserved. The shallow stream valley, the cover sand relief and the drifting sand relief are therefore still clearly visible.

Hydrology:

Due to the faults, the wijst phenomenon also occurs here: clean, iron- and mineral-rich, low-acidity groundwater is pushed up to the surface. However, because of large-scale lowering of the

groundwater table, the seepage water now only appears locally at the surface ('wijst'). Efforts are being made to retain water better in the area by constructing small weirs in drainage ditches.
Deposits & Fossils:
Coarse, gravel-rich river sand, deposited by the Rhine and Meuse (Early and Middle Pleistocene; Waalre and Beegden Formations), is overlain by a 1 to 2 metre thick layer of silty (cover) sand, deposited by the wind at the end of the last ice age (Late Pleistocene; Boxtel Formation). Along the flanks of the stream valley are elongated drifting sand dunes (Holocene; Boxtel Formation, Kootwijk Subunit), formed by human activity.

River & Streams:
The narrow Venloop lies in a broad and shallow periglacial valley, making it an example of an 'underfit river'.

3. Geosite Interests
Cultural History
On the Slabroekse Heide there are also more than 100 burial mounds from the Bronze Age and a cemetery from the Iron Age and Roman period. The heath and drifting sand area is also a fine example of a medieval cultural landscape shaped by human intervention (turf cutting, overgrazing).

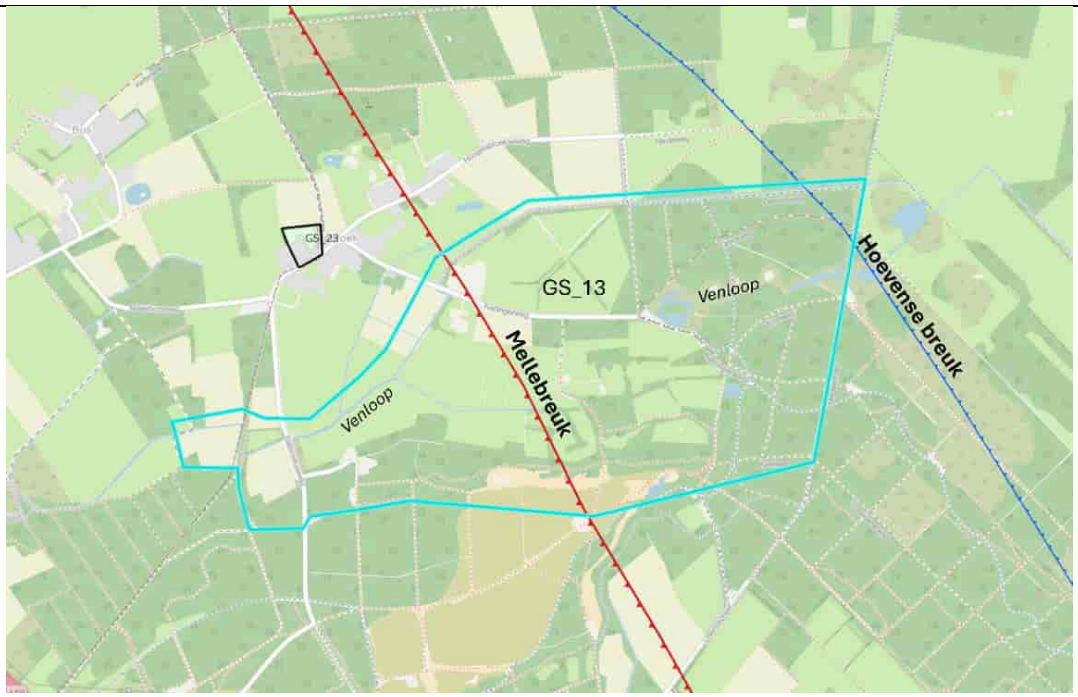
Flora & Fauna:
The restored stream valley of the Venloop is very special, with rare animal and plant species having recently established themselves. The clean, mineral-rich water is now better retained in a broad, meandering stream, rather than being quickly drained away via a narrow, deep, straight ditch. Locally, there are sedge communities and cuckooflower meadows, though these are declining due to drying out. Cuckooflowers serve as a host plant for the orange tip butterfly. Grazing by European bison, Exmoor ponies and tauros cattle keeps the area open and varied. A rare species found in the stream valley is the great crested newt. The banded demoiselle dragonfly is also present, a species that only lives near clean, flowing water.

Industrial & Economic:

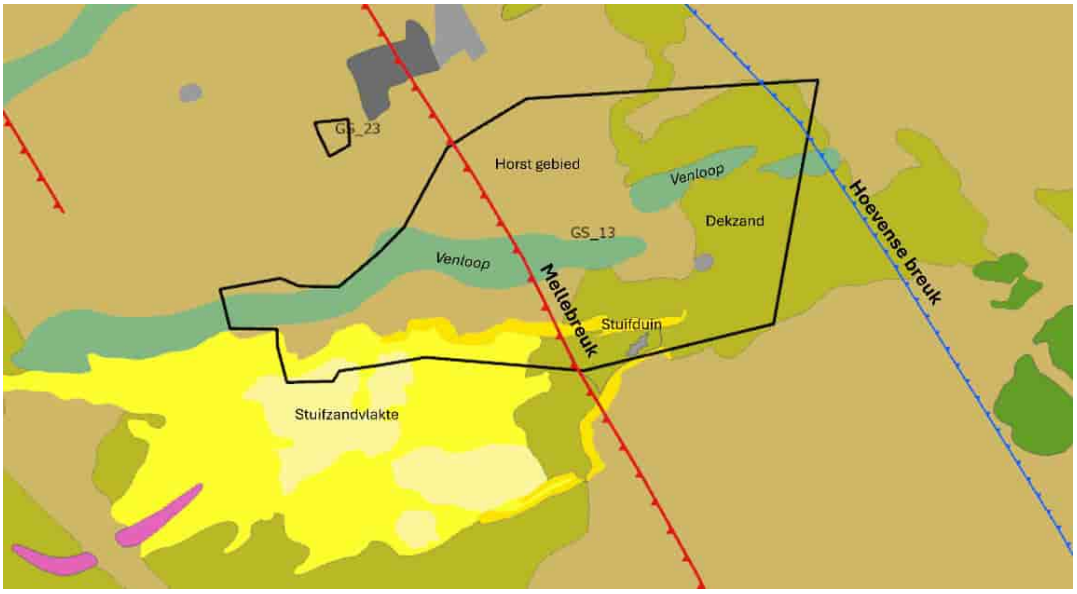
4. Relation with other geosites
The De Maashorst Nature Centre in Slabroek (GS_23) provides extensive information about this area. This area is one of five intended Wijst Restoration Projects designated by the province of Noord Brabant. Others include the wijst area Donzel west of Nistelrode (GS_02), the Wijstbos south of Zeeland (GS_197), the Sint Annabos in Uden (GS_07), and the source of the Esperloop in Gemert (GS_16).

5. Documentation & Resources
- *Monitoring Maashorst Groote Wetering & Venloop Iris van der Laan Nico Ettema 2016 In opdracht van Stg. Natuurorganisaties De Maashorst*

6. Maps, photos and figures



Location of geosite GS_013 – Slabroek. The Mellebreuk and Hoevense Fault are two northern branches of the Peel Boundary Fault.



Morphological characteristics of geosite GS_13 and the relationship with the faults

Stream valley of the Venloop (source: https://arkrewilding.nl/nieuws/2017/opening-slingerende-venloop)

Geosite: GS_14 **Significance: International** **Coordinates (RD): 175790, 395242**	**Name** Gemert - Breuken Beleven
Municipality	Gemert-Bakel
Province and country	Noord-Brabant
Protection status	Various
Site management organizations	Peelnetwerk, Mijn Mooi Brabant, ANWB (?)
Accessibility	Starting point and bike hire at VVV Gemert-Bakel
Relevance for tourism	The manifestations in and around Gemert are part of the "Breuken Beleven" cycle route (for example, the Joffer Grevenbroekpad)
Relevance for education & information	Several points along the route feature information boards
Teaching equipment	

Description

1. Location

The village of Gemert is literally situated on the Peel Boundary Fault zone. As part of the "Experience the Faults" cycle route, several different manifestations of the Peel Boundary Fault zone around Gemert can be visited, including:

GS_14a: Hof van Nazareth: Lourdes made from ironstone blocks
GS_14b: Hopveld Bron:
GS_14c: Hazeldonklaan: Rood in de sloot (Red in the Ditch)
GS_14d: Joffer Grevenbroekpad – Infobord
GS_14e: Broekstraat: a reference to iron-rich ijzerbroek
GS_14f: Daalhorst
GS_14g: Sint Antoniusstraat de Mortel: Wayside cross on ironstone
GS_14h: Lochterweg - de Mortel elevation difference

2. Landscape formation and description

Origin of the landscape

The area around Gemert is characterised by the presence of several branches of the Peel Boundary Fault, namely the Gemert, Gemert-Zuid, Handel and Millheeze faults. The area not only displays morphological and hydrological landscape features, but also tells the story of human interaction, as evidenced by a large number of cultural-historical features.

Where iron-rich seepage water (wijst) emerges, iron oxides can be deposited in coarse-grained sediment near the surface. This cements the sediment, forming iron ore. Either the iron compounds cement the sand on the lower side of the fault, as iron-rich wijst water is transported over the fault due to the slope caused by the fault, or it cements coarse-grained fluvial deposits on the higher side of the fault. Both processes occur, which explains the widespread presence of iron ore. Pieces of iron ore were used in the past as building material and for iron production (since prehistoric times). They are often found in the foundations of churches in the region. Once bricks became affordable, this

tradition faded. Interestingly, iron ore blocks continued to be used in the construction of communal religious structures such as Marian grottos and hills where wayside crosses were placed.

Geomorphology:
GS_14f: Daalhorst: A striking feature of the Daalhorst is the elevation difference of 0.5 metres over a distance of 100 metres, caused by the Gemert-Zuid Fault, a side branch of the Peel Boundary Fault.

Hydrology:
In the immediate vicinity of the Peel Boundary Fault and its side branches, groundwater rises right up to the surface. Because the fault is impermeable, groundwater cannot pass through it. This creates upward pressure, causing water to well up from the subsurface. As a result, a narrow strip of wet and sometimes marshy ground forms along the fault. This phenomenon is known as wijst. The water, which sometimes comes from great depth, is very rich in iron. The iron in the groundwater oxidises when it comes into contact with oxygen. The iron oxide (rust) turns the water a reddish-brown colour. In various places in Gemert, this red water is clearly visible in the roadside ditches. This is also the case in Hazeldonklaan, where the wijst phenomenon at the Gemert-Zuid Fault causes this red water.

Deposits & Fossils:

River & Streams:

3. Geosite Interests
Cultural History
GS_14a Lourdes Grotto Gemert: This Marian grotto is modelled on the grotto in the French pilgrimage site of Lourdes and is made from rough blocks of ironstone or slag (waste from metal smelters). Inside the grotto is a small empty podium and several empty niches, possibly once intended for holy water stoups.

GS_14d: Joffer Grevenbroekpad: The information board describes the history of the Grevenbroekpad and the role of Joffer Grevenbroek in the region. It also provides information about the local flora and fauna.

GS_14g: On Sint Antoniusstraat in de Mortel stands a wayside cross on blocks of ironstone.

Flora & Fauna:

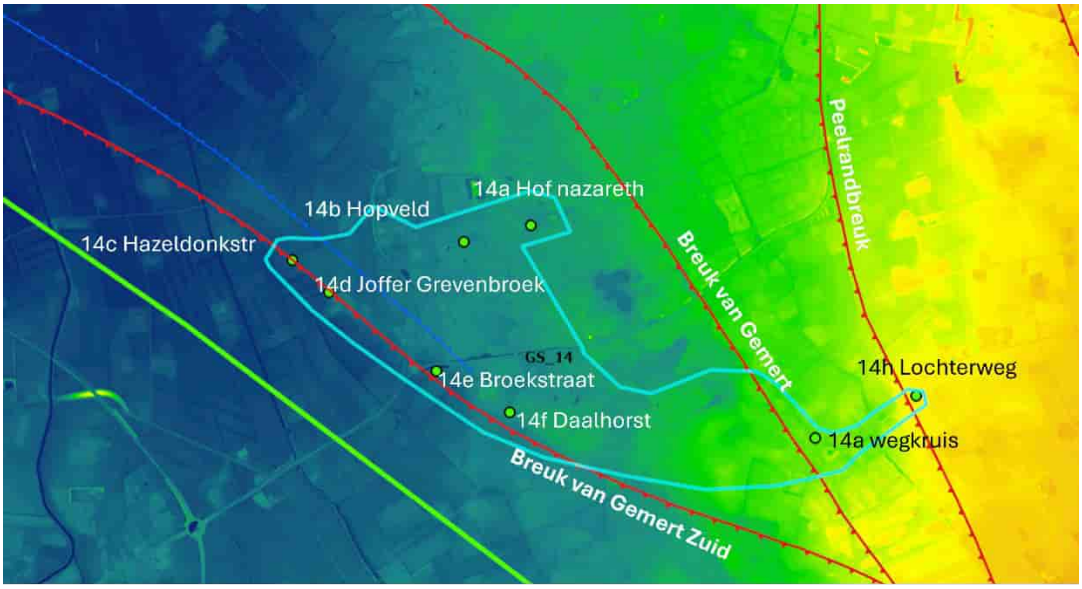
Industrial & Economic:

4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures

Map showing the locations in and around Geosite GS_14 – Gemert



AHN image of geosite GS_14 with indication of the mentioned locations

Lourdes Grotto Gemert

Slope in the Daalhorst (source: www.landvandepeel.nl)

Geosite: GS_15 **Significance: Regional** **Coordinates (RD): 171297, 407764**	**Name** Uden - Stadswijst
Municipality	Maashorst
Province and country	Noord-Brabant
Protection status	
Site management organizations	Municipality of Maashorst
Accessibility	All locations are situated in public parks
Relevance for tourism	All locations can be visited on a circular walk around Uden, possibly combined with sites in the Sint Annabos (GS_07).
Relevance for education & information	Various information boards: Mellepark ("De wijst op Melle")
Teaching equipment	

Description

1. Location

The municipality of Uden is rich in faults belonging to the Peel Boundary Fault zone. Several city parks have been created along the faults in Uden, resulting in a green network running through the urban area, with ecological corridors connecting to the surrounding countryside. The guiding principle in their design was to restore the natural situation, allowing seepage water to flow down the slope into the grasslands below. The following city parks have been established in Uden:
GS_15a – Stadweide
GS_15b – Mellepark (named after the Mellebreuk)
GS_15c – Raampark
GS_15d - Zuiderpark

2. Landscape formation and description

Origin of the landscape

GS_15a: Commissioned by the (former) municipality of Uden, an "Urban Meadow" was created in autumn 2008, located near the Wilhelminalaan/Lippstadtsingel roundabout in Uden. Here, the Peel Boundary Fault was made visible by excavating over 15,000 m^3 of soil and sand. This fault causes a significant difference in groundwater level within the site, which is clearly visible in the ponds and streams that have been dug there. After excavation, the meadow was entirely sown by hand with a special herb mixture. The intention is that in future, the area will be managed with grazing sheep.
GS_15b: Mellepark is a park in the Melle district of Uden. The ribbon-shaped park was laid out in the 1970s and broadly follows the Melle Fault, a side fault of the larger Peel Boundary Fault. The park is characterised by its changes in elevation and numerous water features with rusty-brown water.

Geomorphology:

When the Pleistocene Meuse still flowed here, fine sand was sorted by the current in the riverbed, leaving gravel in pebble banks. In the shelter of these pebble banks, crescent-shaped sand dunes

(barchans) formed. After the last ice age, iron-rich seepage water began to flow through these pebble banks; the barchans trapped the iron-rich water, causing oxidation. This led to the formation of ironstone banks, which, like the compacted fault, push up the seepage water. In the Urban Meadow in Uden, several ironstone banks have been exposed by removing the topsoil.

Hydrology:
To manage high groundwater levels along the high side of faults, many retention basins have been constructed in Uden in the past, recognisable by their brown colour. This also reduced the seepage pressure on the Wijst soils. In addition, swales have been created on industrial estates to disconnect rainwater from the sewer and allow it to infiltrate, helping to prevent drying out and restore seepage pressure in the wijst areas. City parks have been established along the faults in Uden, creating a green network in the urban area with ecological corridors to the countryside. Uden demonstrates that urban wijst along faults within the built-up area is not so much a problem, but rather offers solutions for excessive urban heat; moreover, urban nature provides space for relaxation and helps relieve overcrowded nature reserves. Urban wijst is often characterised by orange ponds and ditches, as well as distinctive flora and fauna.
The water in Mellepark stands out for its rusty-brown colour and is full of iron particles that turn orange-brown when they come into contact with oxygen. In calm, dry weather, the particles settle as a layer on the bottom and the water is clear. But during a rain shower, the water is stirred up, the particles rise, and the water turns brown.

Deposits & Fossils:
Mellepark and the Urban Meadow hide an ancient secret: a former branch of the Meuse once flowed here, leaving behind gravel banks and sand dunes. Gravel and sand together form a permeable subsurface, allowing iron-rich groundwater to rise. In these places, a hard, dense layer of ironstone forms. Few plants grow on the layer itself, but the wet, nutrient-poor soil around it is attractive to rare species. Scattered throughout the parks, you'll find collections of ironstone blocks.

River & Streams:

3. Geosite Interests

Cultural History
Uden is a place where the wijst is less intense and mainly provided benefits, as the fields remained moist in summer. In Uden, large arable complexes lie between the faults, where settlement took place from the Iron Age through to the early Middle Ages. The presence of wijst certainly had a positive influence on settlement in these locations. In some places, later reclamations from the 12th and 13th centuries are located on or right next to a fault. Today, many place names in Uden recall the faults and wijst phenomena: for example, the bus stop at Mellepark is called Wijsthoek, and a residential area east of Mellepark on the high side of the Melle Fault is called "Breukrand".

Flora & Fauna:
Urban nature within Uden's built-up area often has higher biodiversity than the countryside. When the water features in the parks were created, seed banks were exposed, resulting in a wealth of special flora such as White rampion, Reed and Spotted orchid, Star of Bethlehem, Devil's-bit scabious, Marsh violet, Bistort and Great burnet. In the water you'll find Amphibious bistort, Floating club-rush, Bladderwort, Pillwort, Frogbit, Water violet and Whorled water-milfoil. The base-rich seepage allows rich woodland species of Bird cherry–Ash woodland and Oak–Hornbeam woodland to thrive, such as Hazel, Hornbeam, Maple, Small-leaved lime, Large-leaved lime, Bird cherry, Red and Yellow dogwood,

and Yew. Planted woodland bulbs and escaped garden plants are spreading spontaneously, such as Sweet and Pale wood violet, Bluebell, Snowdrop, Dutch crocus and Naples cyclamen. Thanks to the growth of Cuckooflower and Garlic mustard, the Orange tip butterfly is a common day butterfly in parks and gardens around the faults.
Other notable wijst areas with characteristic wijst vegetation in Uden's urban environment include:

- Park Hoeven Uden. Hoeven Fault with Bladderwort, Frogbit and Amphibious bistort in ditches.
- Zoggel Burenstraat Uden. Orang-brown waters.
- Kersenboomgaard Patrijsweg Uden. Ivy-leaved Crowfoot in cleared ditches.
- Landschapspark A50 Uden forms a long strip parallel to the Peel Boundary Fault. In the water features, special wijst flora grows such as Bladderwort, Amphibious bistort, Slender pond-weed, Small pondweed and Great burnet occur.
- Duits lijntje at the Eikelheuvelweg Uden. Behind the ambulance station, a pool with seepage flora and ironstone bank.

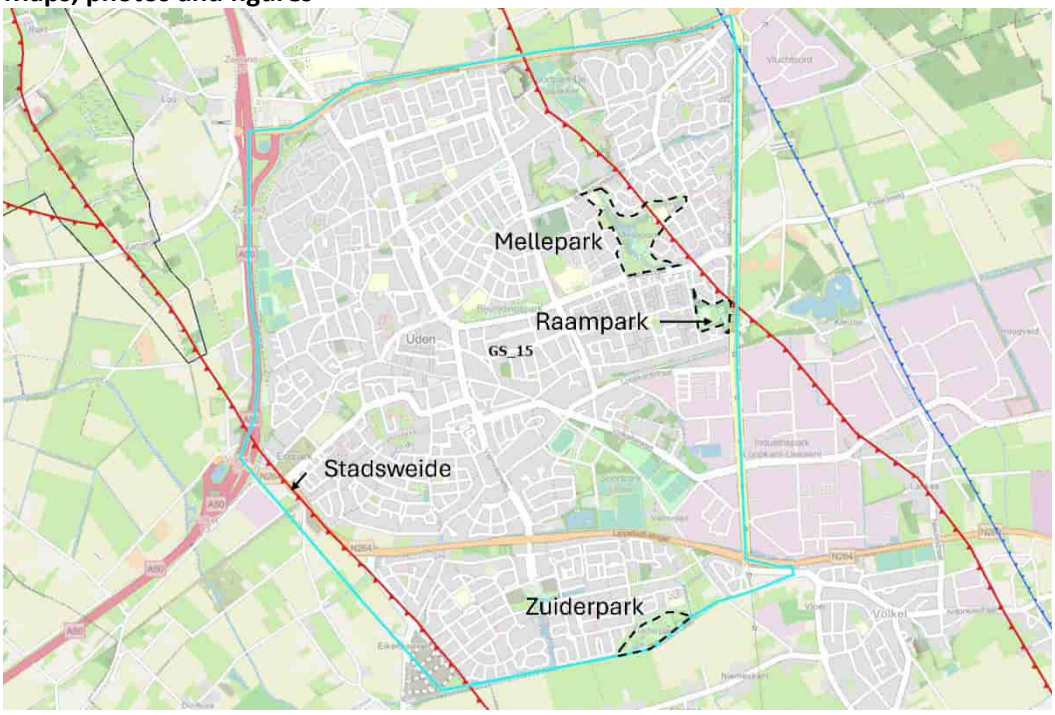
<u>Industrial & Economic:</u>

4. Relation with other geosites

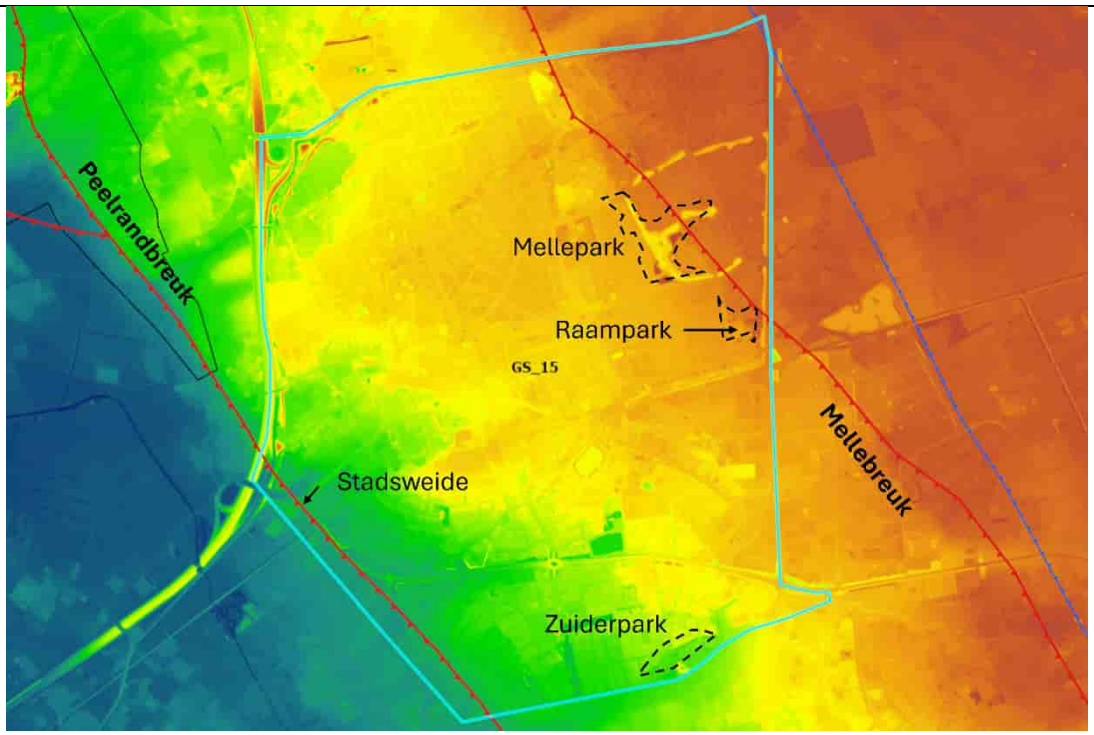
Sint Annabos (GS_07)

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_15 – Uden Urban Wijst and the various city parks where wijst phenomena can be observed.



AHN image of geosite GS_14 shows the differences in elevation related to the faults.

Geosite: GS_16 **Significance: National** **Coordinates (RD): 178952, 391766**	**Name** Geneneind-Esp
Municipality	Gemert-Bakel
Province and country	Noord Brabant
Protection status	
Site management organizations	Stichting Gemert-Bakel Toerisme en Recreatie, Heemkundekring Gemert-Bakel, VVV Gemert-Bakel. Wijstherstel: Waterschap AA & Maas, Gem. Gemert-Bakel, Prov N Brabant, particulier
Accessibility	All points are accessible by bicycle. Cars can park in Bakel around Sint Wilbertsplein.
Relevance for tourism	Geneneind and Esp are part of the "Breuken Beleven" route through the Gemert-Bakel area. The starting point is at Kasteel Gemert.
Relevance for education & information	IVN Gemert-Bakel Nature Education Centre (GS_16b) and information board.
Teaching equipment	
Scientific interest	As part of the Integral Area Programme Bakel-Milheeze North (IGP), extensive geohydrological research has been conducted in the Geneneind area in recent years to increase the opportunities for wijst restoration in this area. Among other things, three rows of piezometers have been placed at different depths, perpendicular to the faults in the subsoil. In this way, the fluctuation in groundwater levels is made clear.

Description

1. Location

Geneneind is a hamlet in the rural area north of Bakel.

2. Landscape formation and description

Origin of the landscape

The Peel Boundary Fault runs through the Geneneind area. The horst is characterized by wijst phenomena. Groundwater rises strongly here, but due to human modifications of the soil, both the wijst grounds and the height differences are less visible. Various parties are therefore working to restore the wijst grounds. Because the groundwater emerging before the faults can be centuries old, the water is very clean, low in calcium, and characterized by low(er) concentrations of nutrients such as nitrates and phosphates. Where the groundwater comes into contact with oxygen (in the outside air), oxidation occurs, followed by complex chemical processes in which, among other things, iron, nickel, phosphate, and nitrate can be bound and precipitated. Oily films on these watercourses indicate the presence of iron bacteria.

Geomorphology:

On the Geneneindse Heide near Bakel, the Peel Boundary Fault can be recognized with some difficulty by a terrain step and by the vegetation.

Hydrology:
Groundwater jump of almost 2 m over the Peel Boundary Fault. Hydrologically considered, the incoming wijst water at the Peel Boundary Fault is a collection of various separate water flows, each with its own travel time (age) and composition. Geohydrological measures that intervene in the water management situation of wijst areas will generally take "a longer period" to have an effect. This is a direct result of the fact that the wijst water is on the way for at least several years, but often decades and for some part even centuries before it emerges near underground faults. This also applies to the Geneneind area. The Esperloop wijst restoration project aims to restore the hydrological situation and sets the following goals: upgrading the Esperloop to an Ecological Connection Zone (EVZ); stream restoration; creating a robust and resilient water system (sufficient water and future-proof); improving the ecological potential; enabling fish migration; stream restoration of the Esperloop and creating added value for wijst restoration.

Deposits & Fossils:

River & Streams:
At Geneneind in Bakel, the Esperloop (GS_16c) runs through the restored wijst area on the Peel Boundary Fault. The Esperloop flows further to the Grotelsche Heide. The Esperloop is a meandering stream fed by wijst water. The water of the Esperloop is very clean but contains a lot of iron. The Esperloop splits at Milheeze in the Stippelberg area from the Snelle Loop and is largely unchanneled. As such, it is one of the rare examples of a more or less intact 'heath brook'. This narrow stream meanders through the Grotelsche Forest to rejoin the Snelle Loop near the hamlet of Grotel, south of De Mortel.

3. Geosite Interests

Cultural History
Geneneind used to belong to the very old hamlet of 'Esp'. The cadastral map shows that various farms and small buildings formed a fairly large settlement. There is still one real old long-gable farm standing in the street, which is the farm at No. 18, built in 1846. The map shows a stream, which is the Esperloop, which still lies in the same place today. In 2015, the course of this stream was restored. At Geneneind, there are even still steep edges and a so-called hollow road (in combination with "bulging fields"), the only one still preserved in Noord-Brabant. The Espse Hoeve (Esp 3; GS_16a) is a moated farm from the 15th century. The moats, which have been partially restored, are filled with rising wijst water. The rest of the site has the protected status of 'archaeological monument'. The rising groundwater in the streams along the arable land was important for the farmers. The relatively warm water ensured that the frost stayed in the ground for a shorter time, allowing the farmer to use the land for up to two months longer.

Flora & Fauna:
Both locally on the banks of the Esperloop and at the bottom of the steep banks, there are stream valley plants such as marsh marigolds and black sedge, which do not occur further in the Grotelsche Forest (an old heath field) and are relatively rare in the area. A rare situation, which can possibly be explained by phosphate fixation caused by the high iron content. The rare common dragonfly also benefits from the pure water. The stream also flows along some floristically interesting grasslands.

Industrial & Economic:

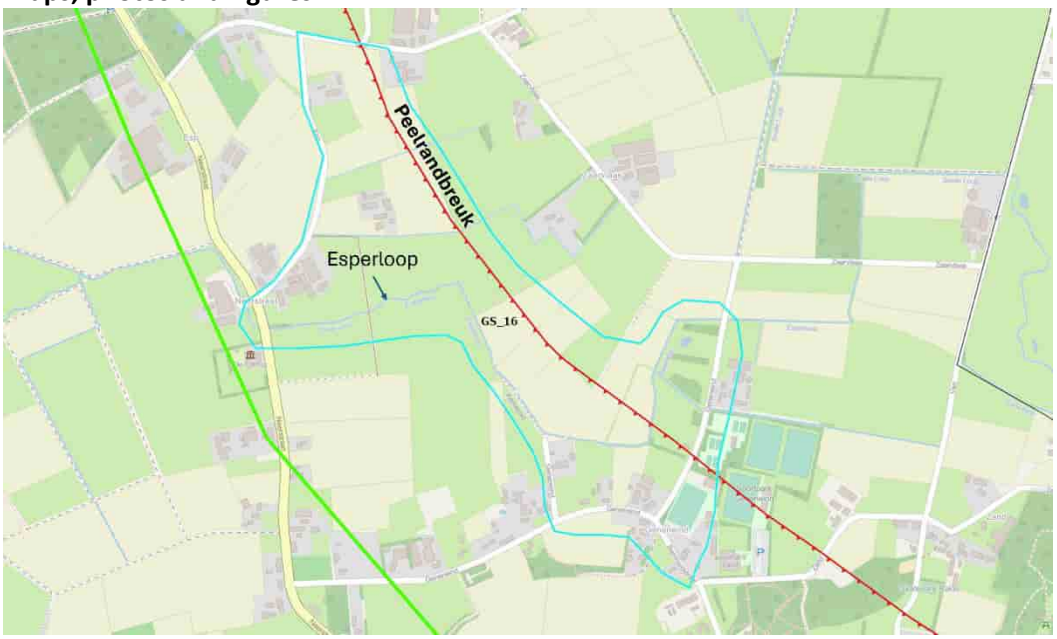
4. Relation with other geosites

Geneneind is a beautiful wijst area along the Peel Boundary Fault, comparable to Sint Annabos (GS_07) but located further south.

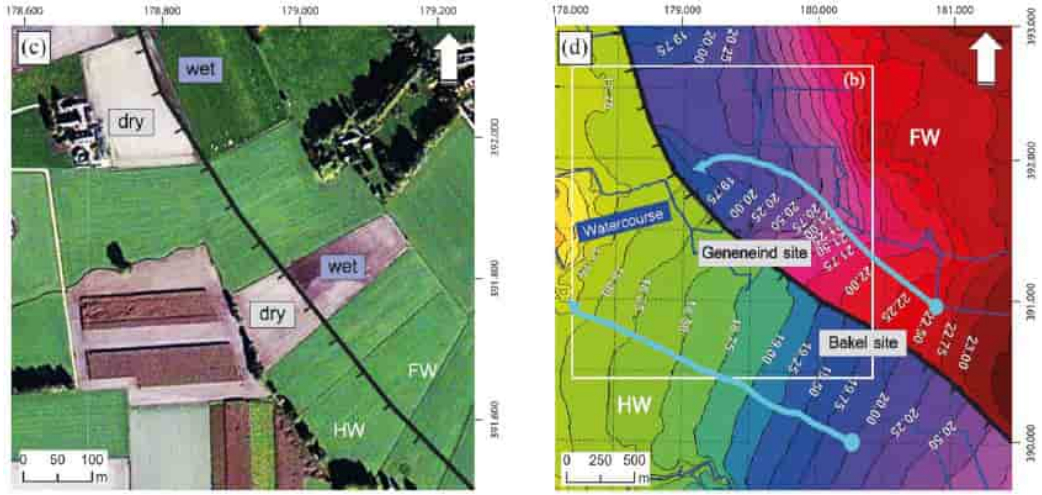
5. Documentation & Resources

- *Lapperre, R. E. (2025). Fault-Zone Hydrogeology in Unconsolidated Sediments: Cross-Fault Groundwater Levels, Fault Sealing, and Permeability Distribution in the Roer Valley Rift System. [PhD-Thesis, Vrije Universiteit Amsterdam].* https://doi.org/10.5463/thesis.1223

6. Maps, photos and figures



Location of GS_16 indicated with a light blue line



Left: crop marks and soil moisture contrasts on a satellite image indicating the exact location of the fault at Geneneind, between the wet foot wall (FW) and the drier hanging wall (HW) agricultural plots. Right: overview of the regional isohypses pattern (groundwater-level contours)

on 1 April 2016 (m NAP), with the fault modelled as an (almost) impermeable boundary, and corresponding groundwater flow path (blue arrows) on both sides of the fault using the regional groundwater model GRAM2.0 from Water Authority Aa en Maas. (from Lapperre, 2025)

”

“Bulging fields” near Geneneind

Geosite: GS_17 **Significance: National** **Coordinates (RD): 195969, 364656**	**Name** Neer
Municipality	Leudal
Province and country	Limburg
Protection status	
Site management organizations	
Accessibility	rom Neer, head west via Keizersloop towards Keizersbos
Relevance for tourism	Walking area
Relevance for education & information	Informationpanel at De Kwir
Teaching equipment	
Scientific interest	Along the Reverskamp was one of the five research locations (KNMI, 2000). The trench is no longer visible. Results were published in Netherlands Journal of Geosciences / Geologie en Mijnbouw 81 (1): 39–60 (2002).

Description

1. Location

The Peel Boundary Fault crosses the River Meuse near the village of Neer. Along the Peel Boundary Fault near Neer, several different manifestations of the fault zone and its relationship with streams can be observed, namely:
GS_17a: Terreintrede Peel Boundary Fault
GS_17b: Seepage site Keizersbos
GS_17c: Research trench at Raverskamp
GS_17d: De Kwir
GS_17e: Het Sprunske

2. Landscape formation and description

Origin of the landscape

In the southern part of the Peel Horst, where the Meuse Valley cuts through the horst, the relief and hydrology are far more complex than elsewhere along the Peel Boundary Fault. Here, not only the Peel Horst shapes the relief, but also the river terraces in the Meuse Valley. These terraces sometimes have metre-high scarps and old river channels, which now often host streams. Streams may also originate at the foot of the Peel Boundary Fault, where they are fed by groundwater seepage and rainwater.

Geomorphology:

West of Neer, between Vlaas and Schooldijk (GS_17a), the Peel Boundary Fault is slightly visible in

the topography but clearly recognizable in the AHN (elevation model). The fault can also be located using cropmarks (caused by differences in vegetation due to wet versus dry soils). This height difference mainly resulted from several strong earthquakes around 12,000 BC, as shown by research at the trench near Neer-Raverskamp. The fault offsets a Meuse terrace from the Late Pleniglacial (abandoned by the Meuse around 18,000 BC), as indicated by the height difference between the Peel Block and the Roer Valley Graben. This difference is absent in younger Meuse terrace deposits. Based on OSL dating, Van den Berg et al. (2002) concluded that two relatively large faulting events occurred within a short time span (less than 3,000 years) between the Last Glacial Maximum (c. 15,800 years ago) and the onset of the Younger Dryas (c. 13,000 years ago), while only one very minor displacement occurred during the Younger Dryas and the Holocene.

Hydrology:
In the Meuse Valley, places with iron-rich seepage are locally called “Sprunk”. It is not always clear whether such seepage is caused by the Peel Boundary Fault or by elevation differences associated with river terraces. The seepage in the area of De Kwir (GS_17d) occurs exactly where the Keizer stream intersects the Peel Boundary Fault. Behind St Martinus Church in Neer (GS_17e), seepage water also used to emerge, but this phenomenon is no longer visible due to artificial drainage. On the Ferraris Map (1771–1778), it is still clearly shown that the seepage fed a north-flowing watercourse (now known as the Wijnbeek).

Deposits & Fossils:

River & Streams:
The Keizersloop (or simply Keizer) originates at the foot of the Peel Horst and is partly fed by groundwater from the fault. The Keizer roughly follows the base of the Peel Horst and has cut deeply through cover sand ridges and the relief of the Meuse river terraces. The deepest incision is visible at De Kwir (GS_17d). The Keizer is fed by rainwater from the Roer Valley Graben, which meets the Peel Horst here, and by groundwater from the Peel Boundary Fault. The Keizerbos monastery was originally surrounded by moats, remnants of which are still visible. These were probably dug later, but the location of Keizerbos undoubtedly relates to the continuous water supply. The Keizer touches the north-eastern corner of the monastery grounds, where seepage water still occasionally surfaces. The Keizer joins the Neerbeek in Neer, which ultimately flows into the Meuse. The Neerbeek itself is formed by the confluence of the Leubeek (GS_09) and the Haelense Beek north of Nunhem.

3. Geosite Interests

Cultural History
Although the origins of the village of Neer date back to the early Middle Ages, the area upstream along the Keizer remained forested until after the year 1000 and was only reclaimed in the High Middle Ages (1000–1250). At the Keizer(sloop), the outlying farm Cherserburch is mentioned in 1185. On the same site, Norbertine monks later (1230–1246) founded the Keizerbos monastery, of which only a few buildings remain.
The Friedesse watermill on the Neerbeek is an undershot mill, now functioning as a corn mill. The original mill was built in 1343, but the current mill house and miller’s house date from 1717. The mill belonged to the Abbey of Thorn. After years of disuse and decay, it became operational again following restoration in 2000–2002. The mill was designated a national monument in 1973.

Flora & Fauna:

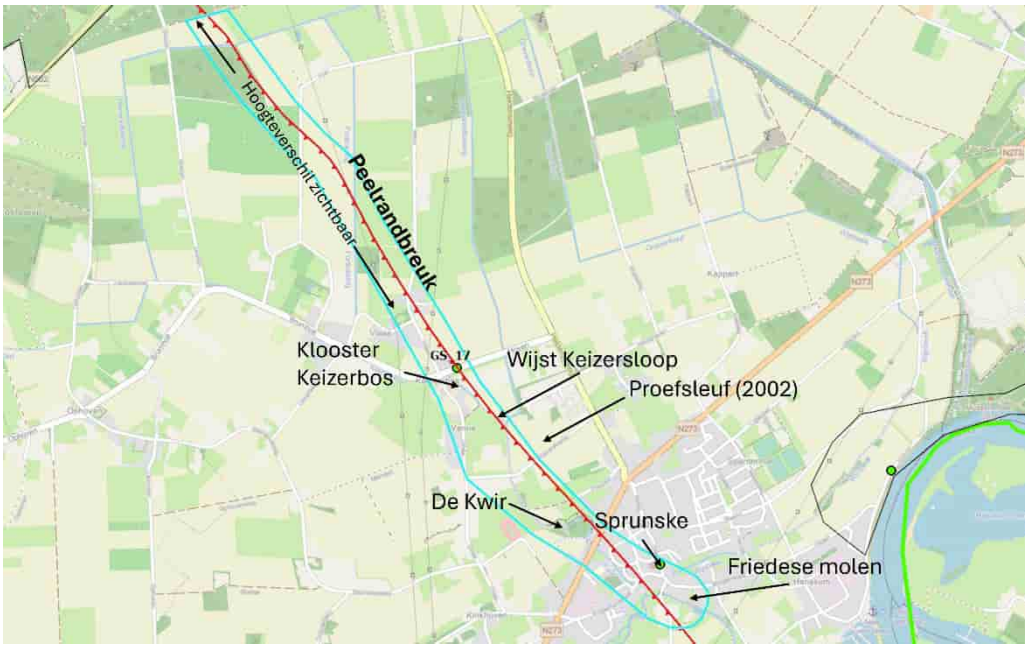
Industrial & Economic:

4. Relation with other geosites

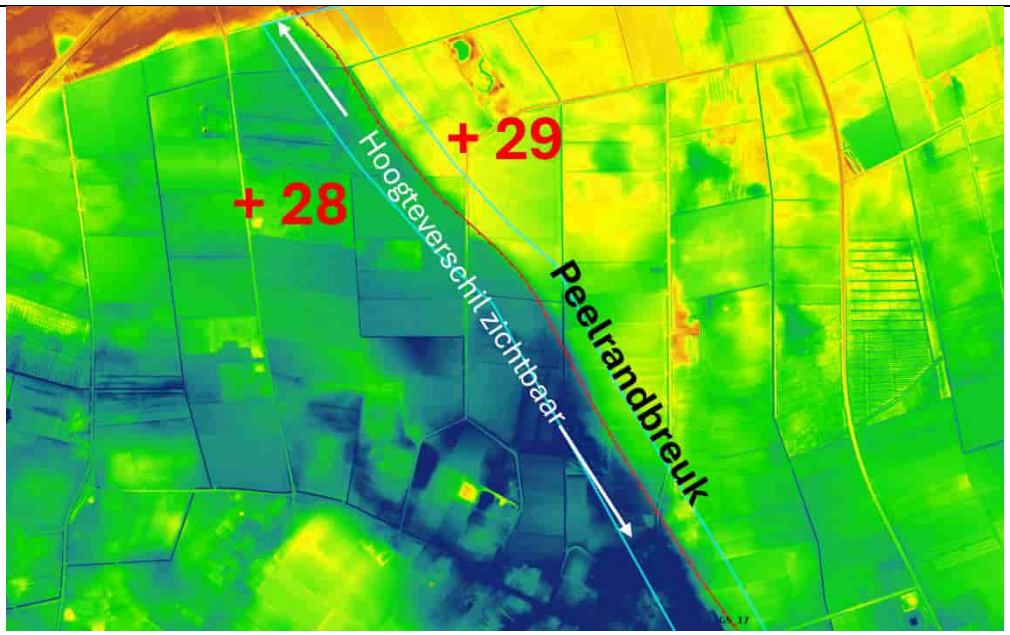
5. Documentation & Resources

- *Berg, M. van den, K. Vanneste, B. Dost, A. Lokhorst, M. van Eijk and K. Verbeeck (2002), 'Paleoseismic investigations along the Peel Boundary Fault: geological setting, site selection and trenching results', in: Netherlands Journal of Geosciences; Geologie en Mijnbouw 81*

6. Maps, photos and figures



Location of GS_17 and the various manifestations along the Peel Boundary Fault.



AHN imagery shows a visible height difference (1 m) in the northern part of the geosite.

Geosite: GS_18 **Significance: National** **Coordinates (RD): 192070, 377851**	**Name** Helenaveen
Municipality	Deurne
Province and country	Noord-Brabant
Protection status	Protected village view (*Beschermd dorpsgezicht*)
Site management organizations	
Accessibility	Soemeersingel 127, 5759 RD Helenaveen
Relevance for tourism	Part of the Geopad Verheven Peel cycle route
Relevance for education & information	Information board between Helenaveen and Sevenum about the history of coal drilling in the Peel
Teaching equipment	

Description

1. Location

Helenaveen is a peat colony situated at the easternmost point of the Deurne Peel and is one of the most easterly villages in the province of Noord-Brabant. Helenaveen was the first peat colony, founded by peat contractor Jan van de Griendt (and named after his wife Helena). It is a protected village view, partly due to its numerous canals and side channels (wijken) and the Koningshoeven, farms built after the peat extraction period.

2. Landscape formation and description

Origin of the landscape

During the latter part of the last Ice Age, the Peel landscape was sparsely vegetated for a long time. Due to tectonic activity and the drifting of cover sands, large, almost closed basins eventually formed in the Griendtsveen Graben and in the blocked upper reaches of Brabant streams. In these basins, fen peat began to develop during the final stage of the Ice Age. During the Holocene, these fens evolved into transitional mires and eventually into raised bogs, which expanded beyond the original basins and largely covered the surrounding sand ridges. For a long time, these wet peatlands were difficult to access, but they were eventually reclaimed for peat exploitation. Helenaveen is an example of large-scale industrial peat cutting.

Geomorphology:

Hydrology:

Parallel to the Helenavaart canal, a dyke was built 200 metres away, containing an impermeable barrier to create a high and stable water level behind it, ideal for raised bog restoration. Along the Helenavaart, emphasis was placed on the peat-colonial cultural landscape with its Koningshoeven and three-pronged canal system. Remarkably, this spatial planning process involved exemplary

cooperation between authorities, recreation entrepreneurs, and nature and agricultural organisations.

Deposits & Fossils:
The Van de Griendt brothers commissioned engineers from the Water Authority to conduct various studies on the feasibility of canal construction. Based on boreholes, profiles were constructed showing four soil layers: Subsoil, 'Black peat' or *klot*, 'Pale peat' or *vale moer*, topsoil.
The black peat was sometimes classified as 'heavy', 'light klot', or 'less good'. Due to the undulating subsoil, peat thickness varied greatly. For the first 30 years, peat cutting focused on black peat, as pale peat (grey peat) was unsuitable as fuel. Peat litter, made from grey peat, had not yet been invented.

River & Streams:
The Helenavaart was the lifeline of the company 'Maatschappij Helenaveen'. Typical of this peat colony is that from the main canal, side canals (wijken) were dug at 600-metre intervals, with two cross-canals branching from the main canal, creating a three-pronged system. This allowed more space for buildings and reduced the number of bridges needed. This system is still visible in several places along the canal. This distinctive peat-colonial structure earned Helenaveen its designation as a protected village view in 1998.

3. Geosite Interests

Cultural History
Peat cutting required thousands of labourers, recruited not only locally but also from afar (even from Prussia). Many came from the north-east of the Netherlands, where peat extraction was declining. Helenaveen became a thriving village with a mixed population, evidenced by the presence of both a Catholic and a Protestant church. Offices and various industrial buildings were also established, including a beautifully restored former peat litter factory.

Flora & Fauna:

Industrial & Economic:
To exploit his purchased section of the Peel, Jan van de Griendt, a manufacturer from 's-Hertogenbosch, founded the peat company Maatschappij Helenaveen, named after his second wife, Helena Panis. The company quickly grew into a huge enterprise, a highly profitable multinational selling peat (or peat litter) across much of Europe.
In 1903, the State Mineral Exploration Service (ROD) was established to search for coal outside South Limburg. After studying the subsurface of neighbouring North Rhine-Westphalia and the relief of Brabant and Limburg, ROD director Van Waterschoot van der Gracht concluded that the Peel was a tectonically elevated, fault-bounded area. The first coal drilling took place in Helenaveen in 1906 and struck coal at a workable depth of 914 metres. This success was followed by more successful drillings in the Peel. Due to economic uncertainty after the First World War, exploitation did not proceed. During the 1930s crisis, there were unsuccessful calls to develop Peel coal mines as a means of combating unemployment.
After the Second World War, rising energy demand led to the establishment of the Peel Commission. Seismic surveys and new drillings confirmed earlier ROD estimates. In 1963, the Peel Commission concluded that there were sufficient coal reserves to exploit two mines (Peel Mines I and II). Construction of the State Mine Beatrix began in 1954 but was halted in 1962, mainly due to

the discovery of the Groningen gas field in 1959. The monument on Helenaveenseweg – opposite Toverland amusement park – commemorates the fact that between 1913 and 1915, the State Mines drilled for coal at the site of the current monument.

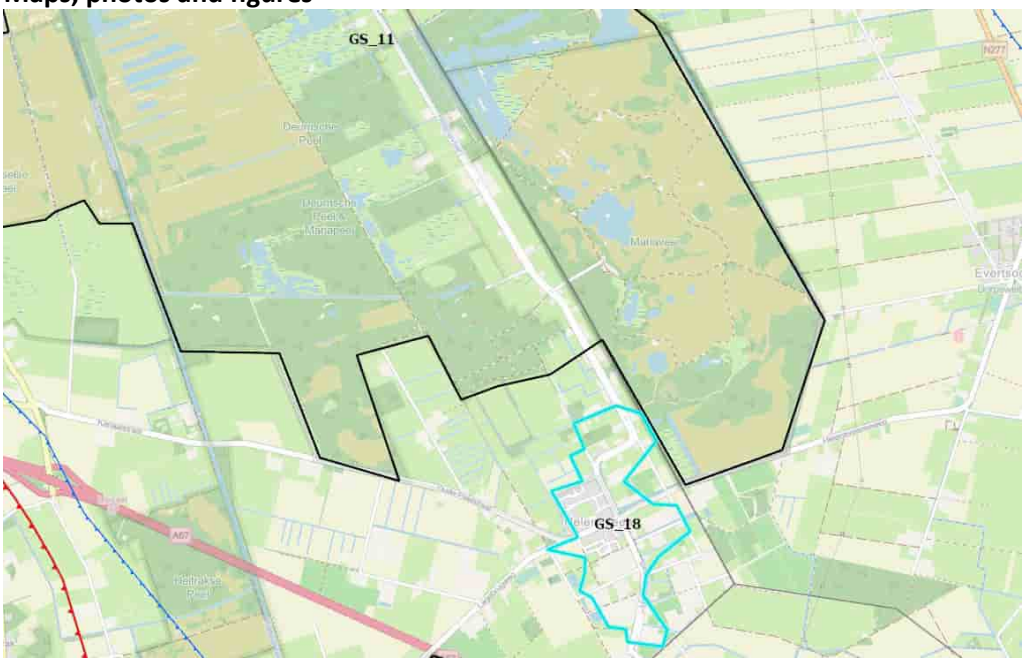
4. Relation with other geosites

Griendtsveen (GS_04) is the other peat colony on the northern side of the Deurne Peel.

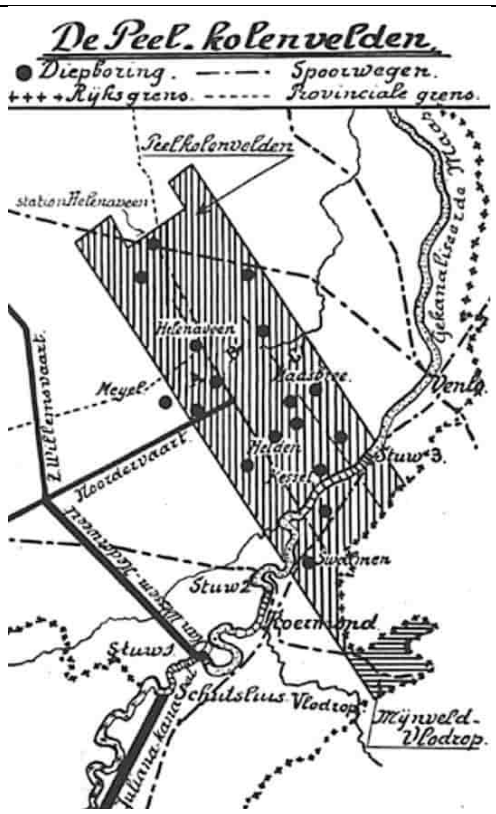
5. Documentation & Resources

- Theo van de Mortel - Boortorens in de Peel (https://natuurtijdschrif-ten.nl/pub/1021589)
- André Vervuurt: Helenaveen van Boven tot Koningslaan 1900-1925

6. Maps, photos and figures



Location of GS_18 Helenaveen indicated with a light blue line.



Map showing the extent of the coalfield discovered at Helenaveen in 1906.

Geosite: GS_19 (a,b) **Significance: Regional** **Coordinates (RD): 176158, 411902**	**Name** Wijstbos Zeeland
Municipality	Maashorst
Province and country	Noord-Brabant, the Netherlands
Protection status	Aardkundig monument
Site management organizations	Land van Cuijk
Accessibility	Accessible from the junction of Langenboomseweg and Veldzuring.
Relevance for tourism	Part of the cycle route "Langs de breuk (Along the Fault) through the municipalities of Maashorst and Bernheze.
Relevance for education & information	Walking trail and information panels
Teaching equipment	

Description

1. Location

The Wijstbos in Zeeland is one of five Wijst Restoration Projects designated by the province of Noord-Brabant. The area lies to the south-east of Zeeland and has been redeveloped in phases. It consists of a woodland section with balsam poplars and black alder (GS_19a) and several grasslands near the hamlet of Graspeel (GS_19b), featuring old pollarded willows and alder/ash scrub.

2. Landscape formation and description

Origin of the landscape

This geosite is located on the eastern side of the Peel Horst, on a slightly lower fault block. It is therefore the only one of the five Wijst Restoration Projects that drains eastwards towards the Meuse Valley. Older Rhine and Meuse deposits are overlain by a layer of cover sand and intersected by several south-east to north-west trending fault lines, which have displaced the subsurface deposits stepwise.

Geomorphology:

The Wijstbos lies on a slightly lower fault block of the Peel Horst. However, the landscape has been heavily re-parcelled, leaving little trace of the original relief with its cover sand ridges and shallow stream valleys. Just east of the Wijstbos, a terrace step of approximately 0.5 m is visible.

Hydrology:

Deep ploughing has disrupted the area's original water regime, causing desiccation.

Deposits & Fossils:

Coarse, gravelly river sand deposited by the Meuse (Middle Pleistocene; Beegden Formation) is overlain by a 1–2 m thick layer of silty cover sand deposited by wind at the end of the last Ice Age (Late Pleistocene; Boxtel Formation). Locally, this sand was reworked by wind during the Holocene induced by human activity.

River & Streams:
This geosite lies on the eastern side of the Peel Horst, on a lower fault block. It is therefore the only Wijst Restoration Project that drains eastwards towards the Meuse Valley. Drainage occurs via straightened ditches.

3. Geosite Interests

Cultural History
The area contains ancient field complexes that have been in use since the Iron Age. Their location is partly determined by the orientation of the fault lines and the resulting hydrological conditions.

Flora & Fauna:
As part of the Graspeel land consolidation, the edges of poplar woods were cleared and the banks of watercourses were made shallower. Several ponds were also created. The ditches host one of the largest populations of bistort in Brabant. The area is home to the little owl and many other breeding birds such as blackcap, icterine warbler and nightingale. In winter, siskins, redpolls, goldfinches, fieldfares and redwings forage here.

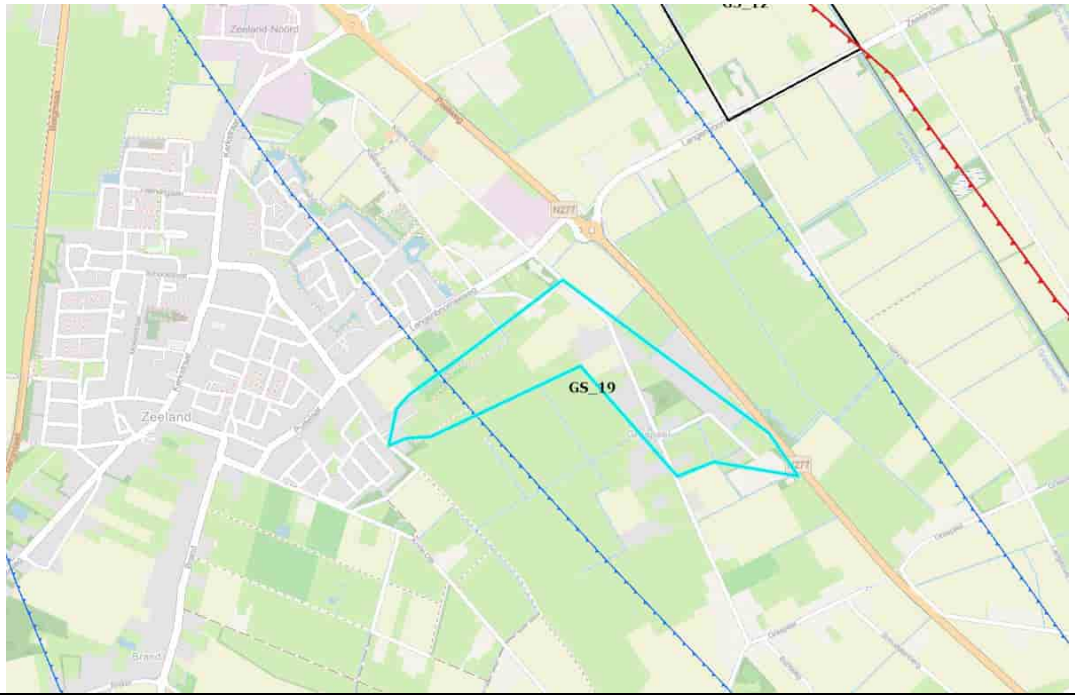
Industrial & Economic:

4. Relation with other geosites

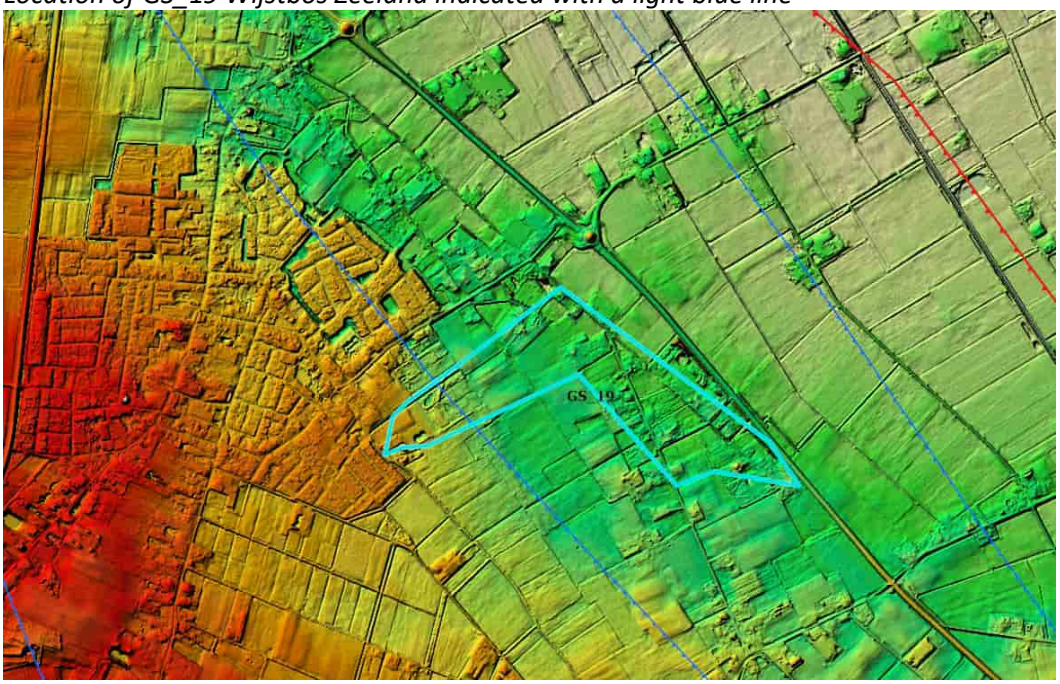
This area is one of five designated Wijst Restoration Projects in the province of North Brabant. Others include the wijst area of Donzel west of Nistelrode (GS_25), the Venloop valley near Slabroek (GS_13), the Sint Annabos in Uden (GS_07), and the source of the Esperloop in Gemert (GS_16).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_19 Wijstbos Zeeland indicated with a light blue line



AHN (shaded relief) image of the GS_19 site

Information panel at the entrance to the Wijstbos near Zeeland

Geosite: GS_20 **Significance: International** **Coordinates (RD): 179989, 412109**	**Name** De Kuilen, Langenboom
Municipality	Land van Cuijk
Province and country	Noord-Brabant (NL)
Protection status	Natuurmonument
Site management organizations	Natuurmomumenten, private owners
Accessibility	The area is easily accessible from Fazantenweg. Parking is available.
Relevance for tourism	De Kuilen ceased sand extraction in 2012 and now features one of the cleanest sandy beaches in the Netherlands. There is a beach pavilion, a playground, and numerous cycling and walking paths in the adjacent nature reserve. Natuurmonumenten has established a circular walking route around the lake and the adjoining Langenboomse Woods.
Relevance for education & information	Fossil finds can be viewed at the De Kuilen visitor centre in Mill, which also provides information about the surrounding nature reserve.
Teaching equipment	

Description

1. Location

De Kuilen lies east of the village of Langenboom, on the crest of the Peel Horst.

2. Landscape formation and description

Origin of the landscape

De Kuilen at Langenboom consists of lakes formed by the extraction of “green sand”. Langenboom is situated on the crest of the Peel Horst. Here, green sands from Miocene and Pliocene formations occur less than one metre below the surface, whereas elsewhere in the Netherlands they lie at much greater depths.

Geomorphology:

Hydrology:

Green sand contains glauconite, which releases iron into groundwater. Oxidation of this iron gives the seepage water a brown colour. Although De Kuilen lies between two faults, iron-rich seepage from point sources is present. The water is exceptionally clear.

Deposits & Fossils:

De Kuilen is renowned for fossil shells from the Pliocene, which can still occasionally be found along the lake shores, but it is especially famous for the wide variety of fossils excavated here in the past. Langenboom is recognised in Europe as one of the most productive sites for Miocene and Pliocene fossils – it even ranks first for fossil birds. Palaeontological finds include the ungulate Chalicotherium,

four new auk species, and the short-snouted dolphin (Protophocaena minima). At Langenboom, the dredged sand, including fossils, was deposited on land, allowing amateur geologists and palaeontologists to collect specimens on a large scale.

River & Streams:

3. Geosite Interests

Cultural History

Flora & Fauna:

The flora and fauna are highly diverse due to the alternation of wet and dry habitats. The area supports plant species typical of wijst areas, such as needle spike-rush (Eleocharis acicularis). Other less common species that thrive on base-rich seepage include brown sedge, pennyroyal, foxtail, and the rare water moss Fontinalis antipyretica..

Industrial & Economic:

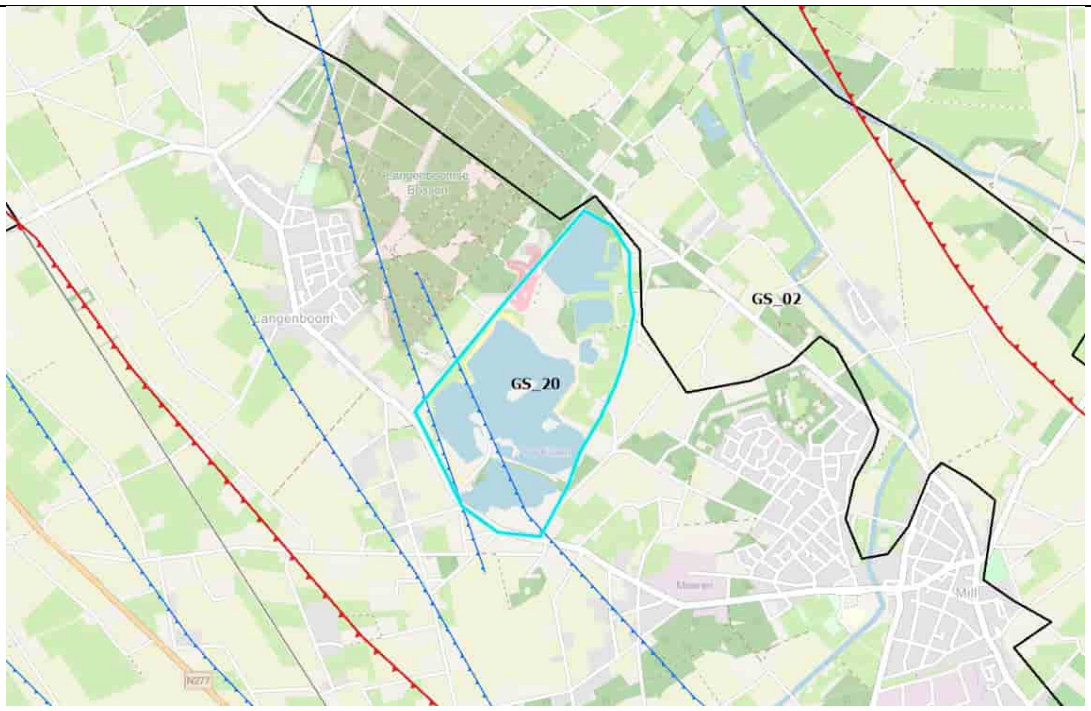
De Kuilen originated from the extraction of green sand from Miocene and Pliocene formations. For road construction, glauconite-bearing sand is an excellent material; glauconite grains are angular and interlock firmly, a property that makes the green sands of Langenboom highly suitable for building motorway embankments.

4. Relation with other geosites

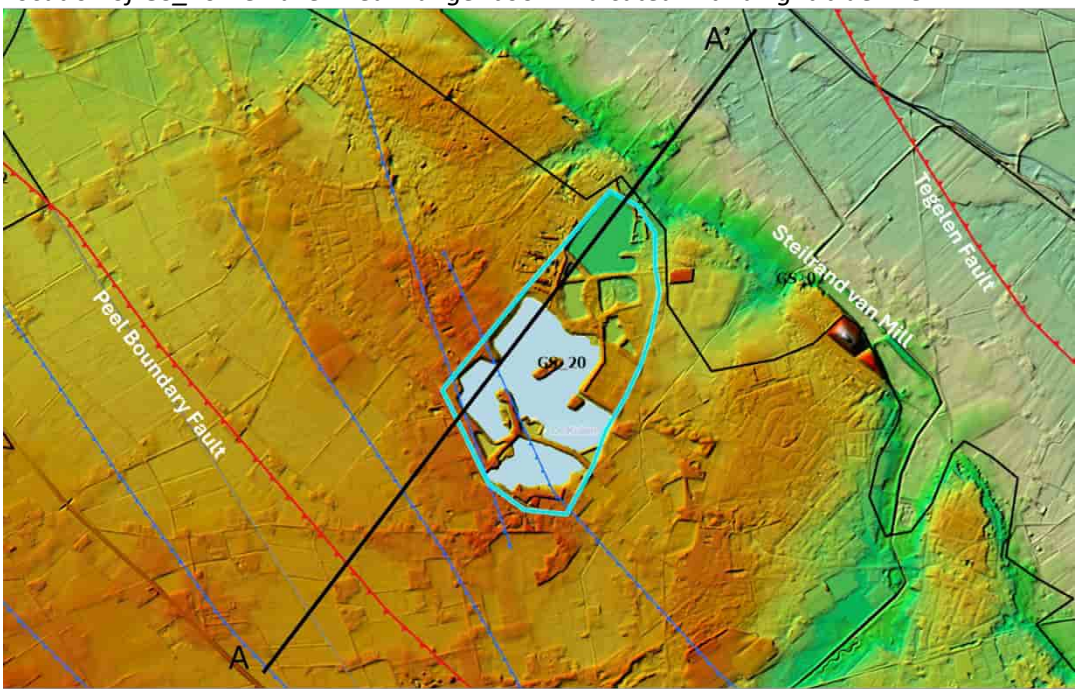
De Kuilen has no direct relationship with nearby geosites. In Liessel, forty kilometres south of Langenboom, a sand pit (GS_08) has yielded Miocene and Pliocene fossils. This site also lies on the Peel Horst.

5. Documentation & Resources

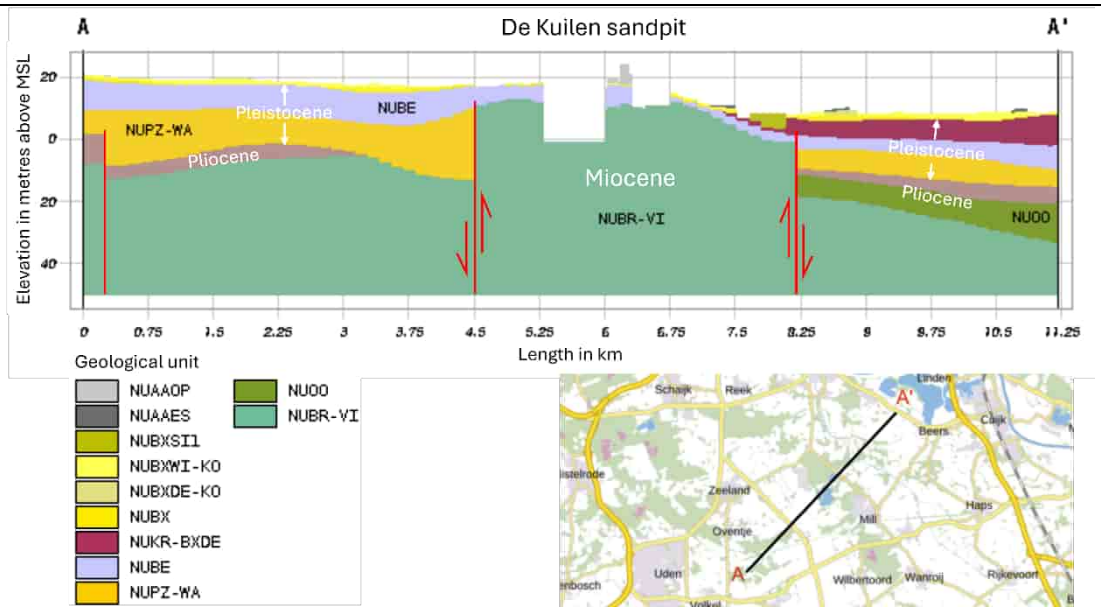
6. Maps, photos and figures



Location of GS_20 De Kuilen near Langenboom indicated with a light blue line



AHN image of GS_20 De Kuilen; A–A' shows the profile line



South-east to north-west cross-section through the GeoTOP subsurface model (v1.6.1) at the De Kuilen sand extraction site, located on an elevated fault block of the Peel Horst where Miocene deposits lie closer to the surface (see inset map for location)

Finds from the local history society "Felix Walter" – Langenboom.

Geosite: GS_21 (a, b, c) **Significance: National** **Coordinates (RD): 184471, 409842**	**Name** Sint Hubert
Municipality	Land van Cuijk
Province and country	Noord-Brabant
Protection status	Aardkundig Waarveol Gebied (Peel Boundary Fault System)
Site management organizations	GS_21a: Land van Cuijk GS_21b: Heemschut Sint Huybert GS_21c: Het Duitse lijntje
Accessibility	All sites (GS_21a,b,c) are easily accessible and located along public roads.
Relevance for tourism	This geosite forms part of several walking and cycling routes around Sint Hubert and Mill.
Relevance for education & information	Informationpanel at Broekstenen Huuske Informationpanel about Het Duitse Lijntje at the Scheiwalweg crossing with the old railway line
Teaching equipment	

Description

1. Location

This geosite comprises three locations in and around the village of Sint Hubert: the church square (GS_21a), the IJzerbroekseweg (GS_21b), and the German railway line (Het Duitse Lijntje, GS_21c), situated about 1 km from the village centre. These sites illustrate the history of iron ore extraction.

2. Landscape formation and description

Origin of the landscape

Sint Hubert lies west of the Tegelen Fault on a high fault block, as evidenced by wijst phenomena and iron ore deposits in the relatively coarse-grained old Meuse deposits (Beegden Formation). However, it is located east of the morphological scarp of Mill.

Geomorphology:

The geosite lies east of the Mill scarp (see also GS_02), which was formed by river erosion during the last two Ice Ages in the Middle and Late Pleistocene. The morphology of this geosite shows an atypical relationship between tectonic activity and river processes, as the greatest elevation difference (the scarp) does not coincide with the fault.

Hydrology:

Occurrence of iron ore (bog iron) formed by precipitation of iron oxides from iron-rich seepage (wijst) on the elevated block along the Tegelen Fault.

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

On the square in front of Sintt Hubert's Church (GS_21a) stands the 1994 sculpture 'De Broeksteenwerker' by Marian van Puyvelde, commemorating iron ore extraction in Het IJzerbroek. In this area, between Sint Hubert and Haps, bog iron was mined between about 1825 and 1860 using pickaxes. Blocks of iron ore found locally are displayed near the sculpture. These so-called "broekstenen" are conglomerates of iron oxide, sand, clay, and gravel.

In the church of Sint Hubert, blocks of iron ore are clearly visible in the masonry. On IJzerbroekweg once stood the "Broekstenen Huuske" (1825), built from iron ore blocks. The house disappeared around 1950; the information board tells the story of the subsurface and the house (GS_21b). The iron ore blocks were quarried locally to reclaim farmland. The hard iron ore layer prevented rainwater from draining downwards and groundwater from rising. Crops suffered from waterlogging in wet weather and drought in dry periods. Special pickaxes were used to break the ore, and large pieces were removed for practical use. The red clay was brought to the surface and, mixed with peat sods, formed the new topsoil. For water management, a ditch was dug and fitted with sluices to regulate water levels.

Het Duitse Lijntje (The German railway) was opened in 1873 by the North Brabant–German Railway Company (NBDS). It connected the seaports of Vlissingen, Antwerp, and Rotterdam with the German hinterland and was part of the fastest route between London, Berlin, and St Petersburg. During the First World War, the line was heavily used for domestic workers and refugees entering the Netherlands. In the Second World War, it played a major role: on 10 May 1940, German troops invaded the Netherlands via this line at 5 a.m. Near Zeeland, soldiers disembarked after breaking through the Peel-Raam defensive line. At the end of the war, the Allies used the railway to invade Germany. Passenger services ceased in 1950, and freight services ended in 2004. Most of the track was removed in 1973, but traces remain in the landscape.

The section between Scheiwalweg and Achterdijk near Sint Hubert is elevated because the area was once frequently flooded. The embankment is still visible. Both Scheiwalweg (GS_21c) and Achterdijk had signalman's cottages. Two have been preserved in nearby Mill. Mill station has been converted into a youth centre (De Wissel). A few metres of track, a loading quay, and an artwork symbolizing the railway remain. At the former station site in Haps, an original signal post still stands.

Flora & Fauna:

The old railway line now serves as a wildlife corridor. Species include badgers, foxes, buzzards, kestrels, roe deer, and various amphibians. The tree stands and ponds along the route make the area attractive for nature enthusiasts.

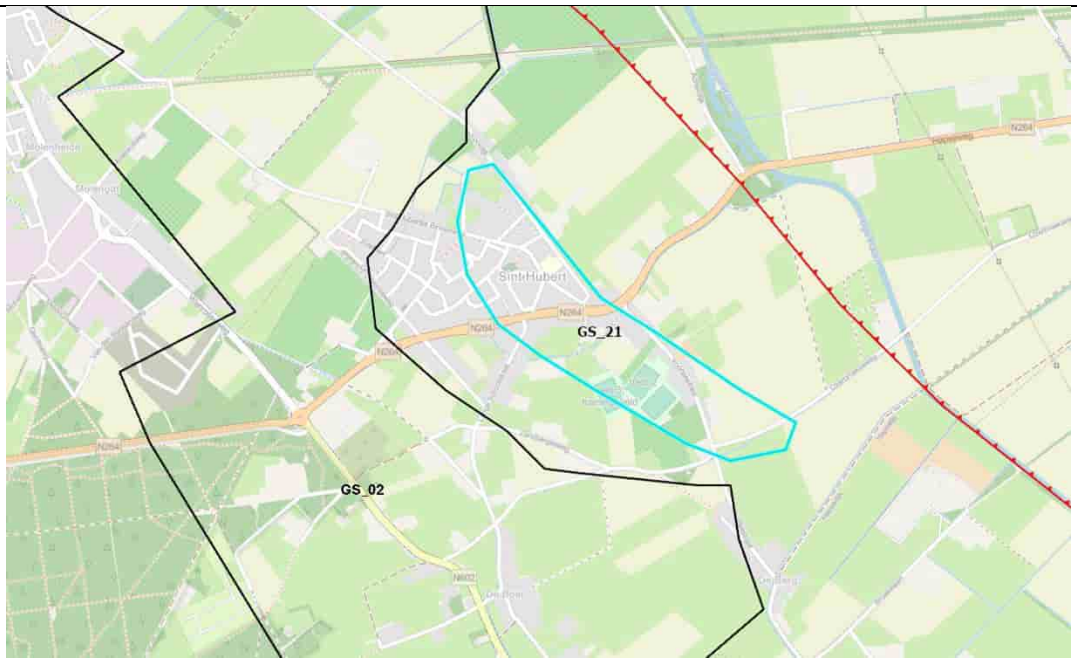
Industrial & Economic:

4. Relation with other geosites

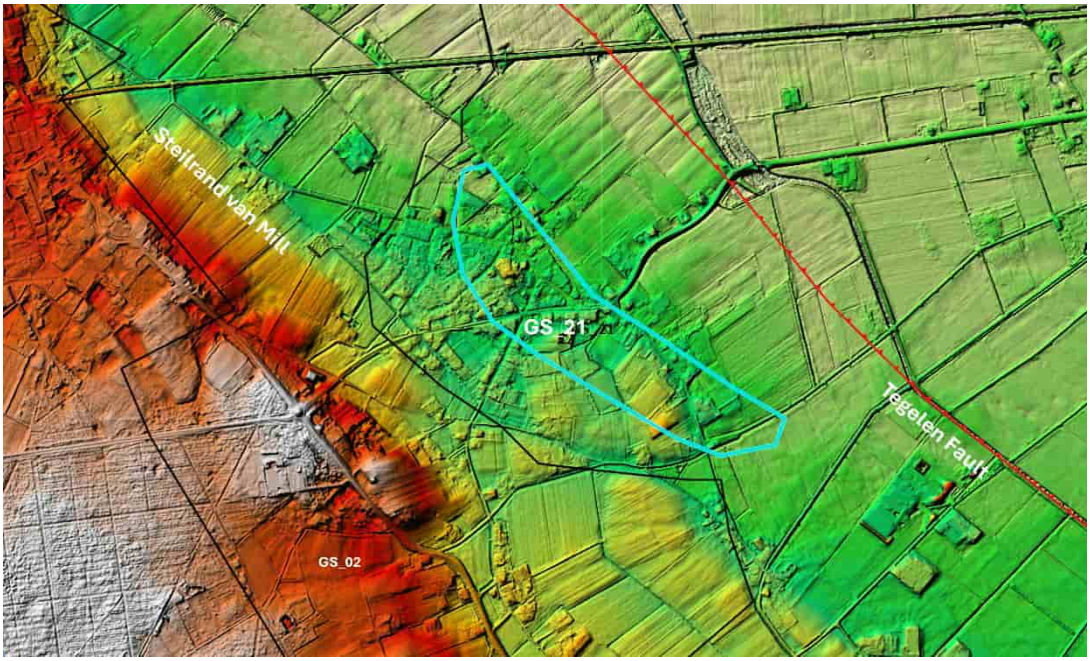
Alongside the sites in Mellepark and Stadsweide in Uden (GS_15), this geosite illustrates the historical importance of iron as a valuable raw material, dating back to the Iron Age. The site lies at the base of the Mill steilrand (escarpment, GS_02).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_21 Sint Hubert indicated with a light blue line



AHN image of GS_21 Sint Hubert

Sculpture De Broeksteenwerker (GS_21a) and the Broekstenen Huuske (GS_21b)

Informationpanel "Het Duitse Lijntje" at Scheiwalweg in Sint Hubert (GS_21c)

Geosite: GS_22 **Significance: National** **Coordinates (RD): 184072, 386789**	**Name** Kasteel Deurne-Heiakker
Municipality	Deurne
Province and country	Noord-Brabant
Protection status	National Monument (*Rijksmonument*)
Site management organizations	Municipality of Deurne
Accessibility	The ruins of the Great Castle are located in a public park and are freely accessible to walkers and visitors.
Relevance for tourism	The site is part of several walking routes, such as the Deurne Castle Route. Guided tours can be booked via VVV Deurne.
Relevance for education & information	De Ossenbeemd, adjacent to the castle garden, is the leading nature and environmental centre in the Geopark area, offering by far the most information about the Peel Fault.
Teaching equipment	

Description

1. Location

The Great Castle Groot Kasteel) is located at Haageind 37, Deurne. There is also a Small Castle and a watermill. The Peel Boundary Fault runs through Vlierpark in Deurne, just north of the castles and watermill.

2. Landscape formation and description

Origin of the landscape

The moat around the Great Castle is fed by groundwater supplied via the Vlier stream. The most suitable location for a watermill on a stream is on or just downstream of the point where the stream crosses a fault. The Haageind site, just south of the Peel Boundary Fault, is an excellent example of a reclamation from the 12th and 13th centuries. The choice of location for the watermill and castles was influenced by the fault of the Peel Boundary Fault Zone Faults: strong seepage along the faults ensured a relatively constant water supply, while the height difference between horst and graben provided additional fall for water power.

Geomorphology:

The height difference at the castle itself is not dramatic, but north and south of the site the terrace step along the Peel Boundary Fault becomes more evident. On Kulertseweg, at the southern edge of Heiakker (about 1 km south of the castle), a clear terrace step can be seen in the road.

Hydrology:

Groundwater rises through seepage just north of the impermeable Peel Fault. The groundwater cannot flow further into a lower area and therefore emerges at the surface, feeding the Vlier stream.

Deposits & Fossils:

Kulertseweg is one of the few places along the Peel Fault where exposed Pleistocene Meuse sediments can be seen.

River & Streams:
The Vlier is a drainage stream of the Peel, originating near the Deurne Canal and flowing into the Kaweise Loop near the hamlet of Molenhof. The stream flows northwest from the Peel Horst and reaches the Deurne basin near the ring road. The section east of the current ring road was probably entirely dug before the 19th century to serve as a new upper course. The Vlier powers the watermill at Haageind, which has been there since the 14th century, and also supplies water to the moats of the Great Castle (Groot Kasteel) and the Small Castle (Kleine Kasteel), both built in the 14th century on either side of Haageind. The meandering of the stream has been preserved near the castle garden, though largely lost elsewhere. Further downstream, the Vlier also powered the watermill on Kerkeindseweg until it was destroyed by fire in the 17th century. Today, the Vlier is a canalized stream connected to the Deurne Canal just south of Griendtsveen.

3. Geosite Interests

Cultural History
The Great Castle (Groot Kasteel) in Deurne, located in the Vlier valley, was built in the 14th century. At that time, it was rarely inhabited; only from the 16th century did it become the residence of the Lordship of Deurne. Before the Great Castle was built, the watermill and the Small Castle at Haageind already existed. The nearby Peel Fault guaranteed a steady water supply for the watermill and moats, fed by the Vlier stream. This is the only surviving watermill along the Peel Boundary Fault. Unfortunately, the moat could not prevent the Great Castle from being shelled at the end of the Second World War during the liberation of Deurne (24 September 1944), as German SS soldiers were hiding inside. The resulting fire destroyed most of the castle, leaving only part of the outer walls standing.
The Peel Boundary Fault runs through Vlierpark in Deurne. In autumn 1993, Italian artist Roberto Ruggiu created an artwork on the Fault, which must remain undeveloped due to its geological conditions. The artwork consists of two interconnected elements stretching over about one kilometre: five wells and a double row of trees with differently coloured blossoms.

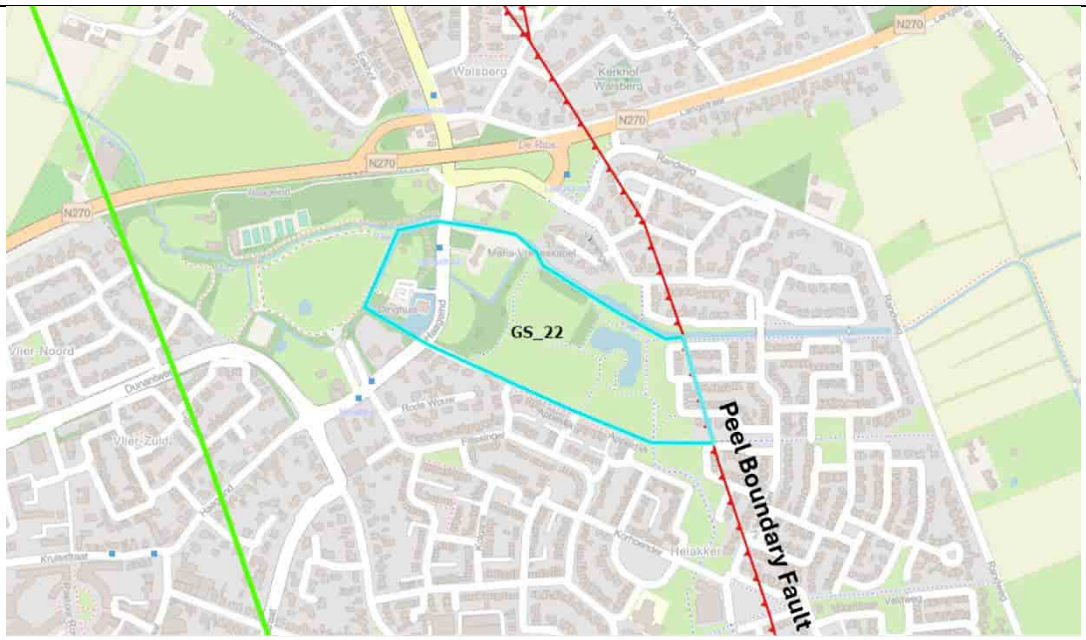
Flora & Fauna:

Industrial & Economic:

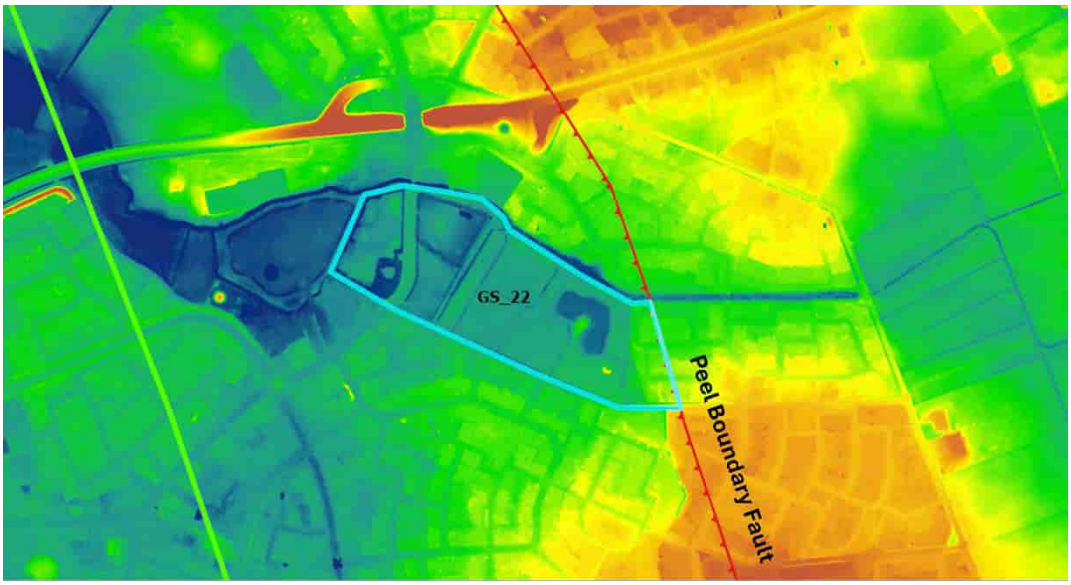
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_22 Deurne Castle – Heiakker indicated with a light blue line



AHN image of GS_22 Deurne Castle – Heiakker

Double row of apple trees marking the Peel Fault in Vlierpark (source: www.landvandepeel.nl)

Geosite: GS_23 **Significance: Regional** **Coordinates (RD): 169828, 412393**	**Name** Natuurcentrum De Maashorst
Municipality	Bernheze
Province and country	Noord-Brabant, The Netherlands
Protection status	National Monument (*Rijksmonument*)
Site management organizations	Staatsbosbeheer
Accessibility	Easily accessible, including for people with reduced mobility.
Relevance for tourism	Starting and information point for nature-oriented activities in De Maashorst. Excursions are organized, and catering facilities are available.
Relevance for education & information	Information hub for nature-oriented activities in De Maashorst. An education team provides lessons on nature, sustainability, and water management.
Teaching equipment	Equipment is available for hire for expeditions in the surrounding area, particularly aimed at children and families.

Description

1. Location

Natuurcentrum De Maashorst is located in the hamlet of Slabroek, on the boundary between the municipalities of Bernheze and Maashorst.

2. Landscape formation and description

Origin of the landscape

The Nature Centre is situated in a historic natural and cultural landscape. The area was shaped by river activity (Meuse and Rhine), periglacial processes (periglacial valley formation, cover sand deposition), and significant fault activity. From the Bronze Age onwards, humans utilised this natural variation, creating cultural elements such as heathlands.

Geomorphology:

Hydrology:

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

The Nature Centre is housed in a historic farmhouse in the hamlet of Slabroek, which forms part of a small-scale historic cultural landscape.

Flora & Fauna:

The Nature Centre provides extensive information about the flora and fauna of the surrounding area.

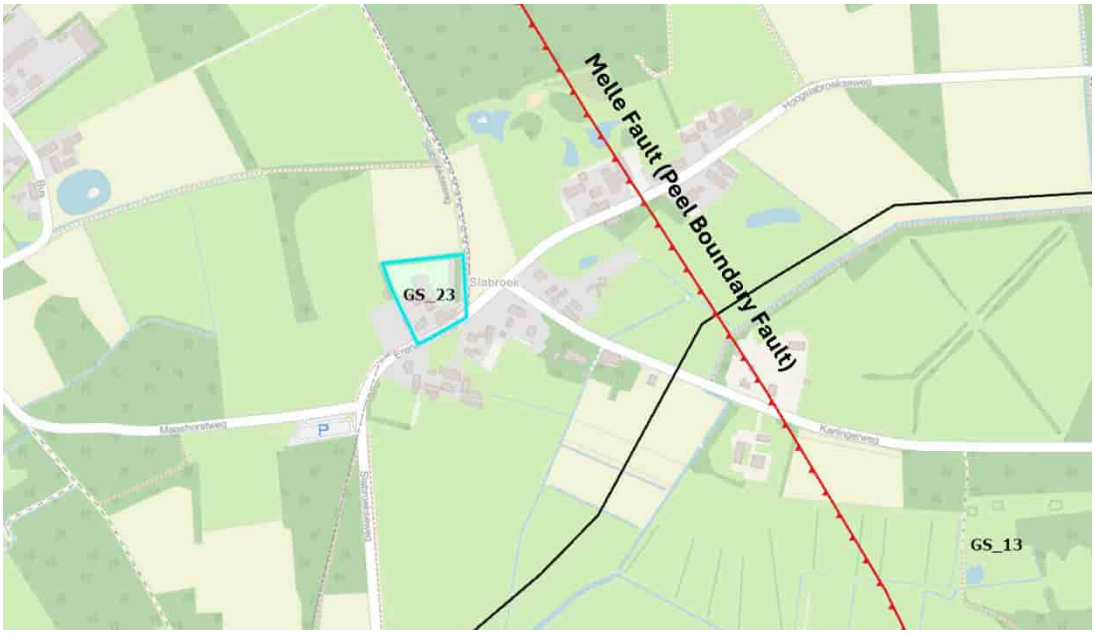
Industrial & Economic:

4. Relation with other geosites

The Nature Centre offers comprehensive information about De Maashorst, particularly the area around Slabroek (GS_13).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_23 Natuurcentrum De Maashorst indicated with a light blue line

Natuurcentrum De Maashorst (www.natuurcentrumdemaashorst.nl)

Geosite: GS_24 **Significance: International** **Coordinates (RD): 175262, 402267**	**Name** Plan de Burgt (under development)
Municipality	Boekel
Province and country	Noord-Brabant
Protection status	
Site management organizations	Municipality of Boekel
Accessibility	
Relevance for tourism	The geosite is part of the walking route Ommetje Peel Boundary Fault Boekel (set out by the Boekel Local History Society).
Relevance for education & information	The residential area is being developed as a Peel Boundary Fault Park, but without signage. It is intended to subtly draw visitors' attention to the natural phenomena.
Teaching equipment	
Scientific interest	On 22 May 2025, mechanical test drillings (up to 8 m deep) were carried out on the De Burgt Phase 2 site in Boekel to determine the exact position of the Peel Boundary Fault(s).

Description

1. Location

On the northern side of Boekel, the De Burgt residential area is being developed. A fault of the Peel Boundary Fault Zone runs directly through this neighbourhood. The term Wijstwonen ("Wijst Living") expresses this unique living environment. The name refers to the "Hoge Burgh", a group of plots situated around the Peel Boundary Fault.

2. Landscape formation and description

Origin of the landscape:

The De Burgt area was formed by the activity of one of the three fault segments of the Peel Bounbdary Fault Zone. The variation in wijst phenomena, ironstone layers, terrace steps, groundwater springs, and vegetation differences clearly demonstrates that the fault runs through the developing residential area.

Geomorphology:

The planning area exhibits a very large height difference due to the presence of the Peel Boundary Fault Zone. The eastern part of the area lies significantly higher than the western part. The elevated Peel Horst is also a relatively wet area.

Hydrology:

The Peel Boundary Fault marks the transition between the Peel Horst and the lower Roer Valley Graben. Groundwater flows from high to low, but at the fault plane, this flow is impeded by impermeable layers, causing the water to rise and emerge as seepage at the surface. This makes the

higher ground wet while the lower ground remains dry. This special form of seepage is called wijst. De Burgt lies on top of the Peel Boundary Fault with two subsidiary faults along which wijst phenomena occur. The plan includes above-ground drainage of rainwater under gravity to infiltration zones, where it will have time to return as wijst water to the faults.

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

De Burgt represents a new step in cultural-historical development by making wijst visible, accentuating height differences, and carefully interpreting the contrasts between horst and graben with specific vegetation.

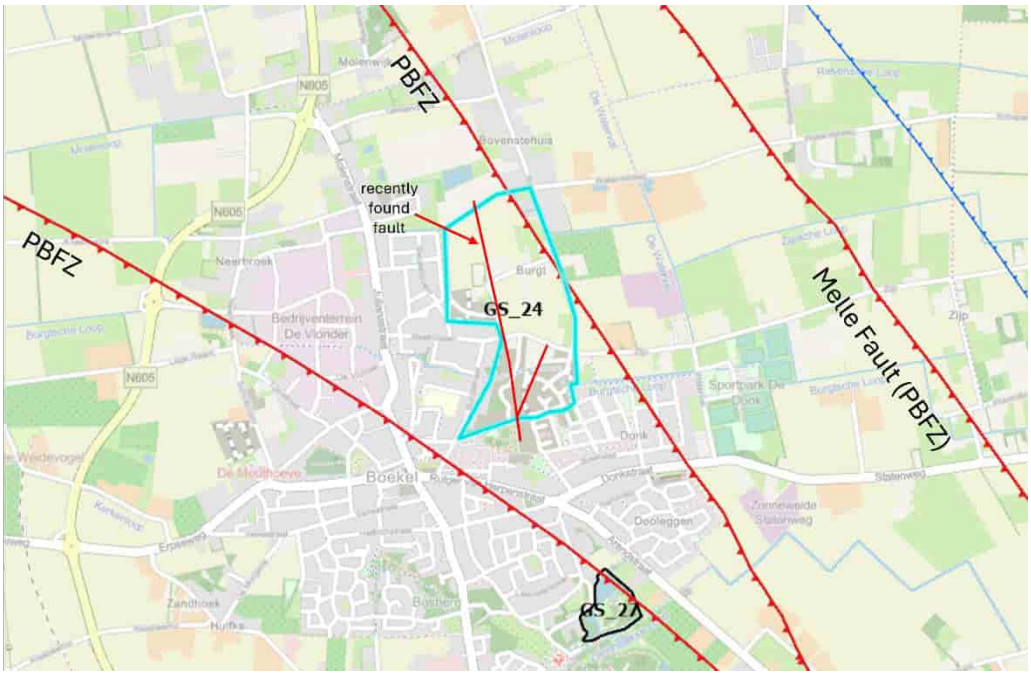
Flora & Fauna:

Industrial & Economic:

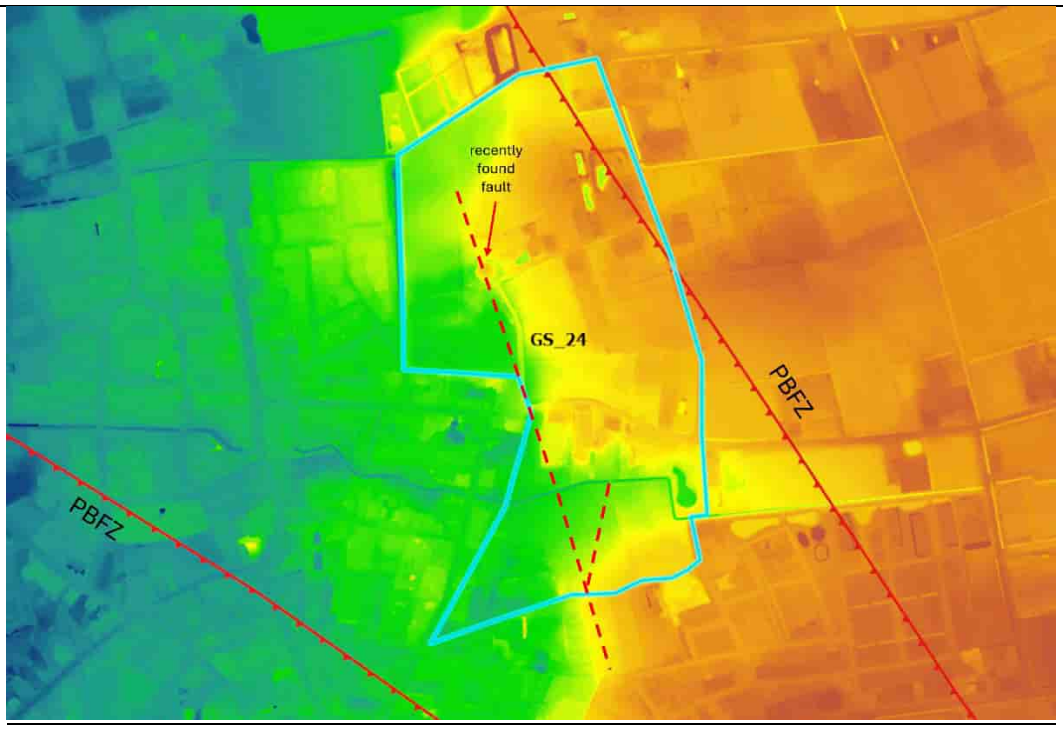
4. Relation with other geosites

5. Documentation & Resources

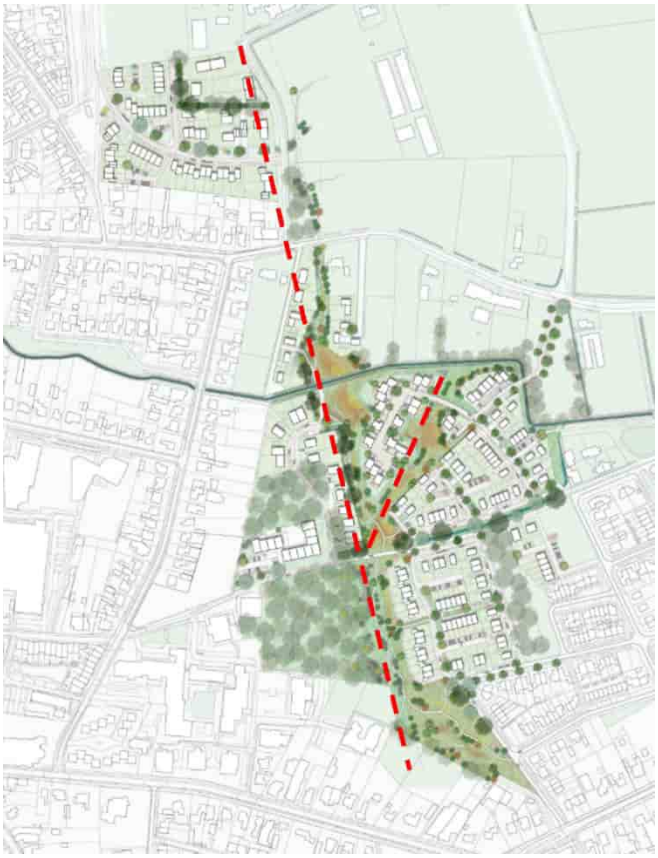
6. Maps, photos and figures



Location of GS_24 De Burgt indicated with a light blue line. The fault identified by the investigation runs through the planned residential area.



AHN image of GS_24. The newly discovered fault segment shows a clear morphological expression here



Urban and landscape design of Plan De Burgt, in which the faults occupy a prominent position (source: https://nieuwblauw.nl/project/de-burgt-fase-1b).

Geosite: GS_25 **Significance: National** **Coordinates (RD): 165970, 413829**	**Name** Donzel
Municipality	Bernheze
Province and country	Noord-Brabant, The Netherlands
Protection status	Designated as Wijst Reserve
Site management organizations	Staatsbosbeheer
Accessibility	Not accessible, but visible from the public road (Donzel and Donzelse Steeg).
Relevance for tourism	
Relevance for education & information	Viewing frame at Donzel to indicate the location of the fault.
Teaching equipment	

Description

1. Location

This area is one of the five Wijst Restoration Projects designated by the province of North Brabant. After 2015, nine plots on the high side of the Peel Boundary Fault were purchased and redeveloped as a wijst reserve. In this former agricultural area, wijst values still need to develop further.

2. Landscape formation and description

Origin of the landscape

This geosite is located on the high side (footwall) of the Peel Boundary Fault, in an area that lies relatively higher than its surroundings due to fault movements. The fault line is clearly visible in the northern part of the area (a terrace step of about 1 m). Its position can also be inferred from a sudden change in vegetation and seepage phenomena in the ditches.

Geomorphology:

This plateau-like area was re-parcelled in the past, which largely erased the original cover sand morphology. In addition, the nutrient-rich topsoil was removed to a depth of about 30 cm to impoverish the soil and bring seepage closer to the surface..

Hydrology:

During land consolidation, deep drainage ditches were dug to drain the wet area. Recently, small weirs have been installed in these ditches to retain water on the high side of the fault. Seepage (wijst) is mainly recognisable by the rusty-brown water emerging here.

Deposits & Fossils:

Coarse, gravelly river sand deposited by the Meuse (Middle Pleistocene; Beegden Formation) is overlain by a 1–1.5 m thick layer of silty cover sand deposited by wind at the end of the last Ice Age (Late Pleistocene; Boxtel Formation).

River & Streams:
There is no natural drainage.

3. Geosite Interests
Cultural History

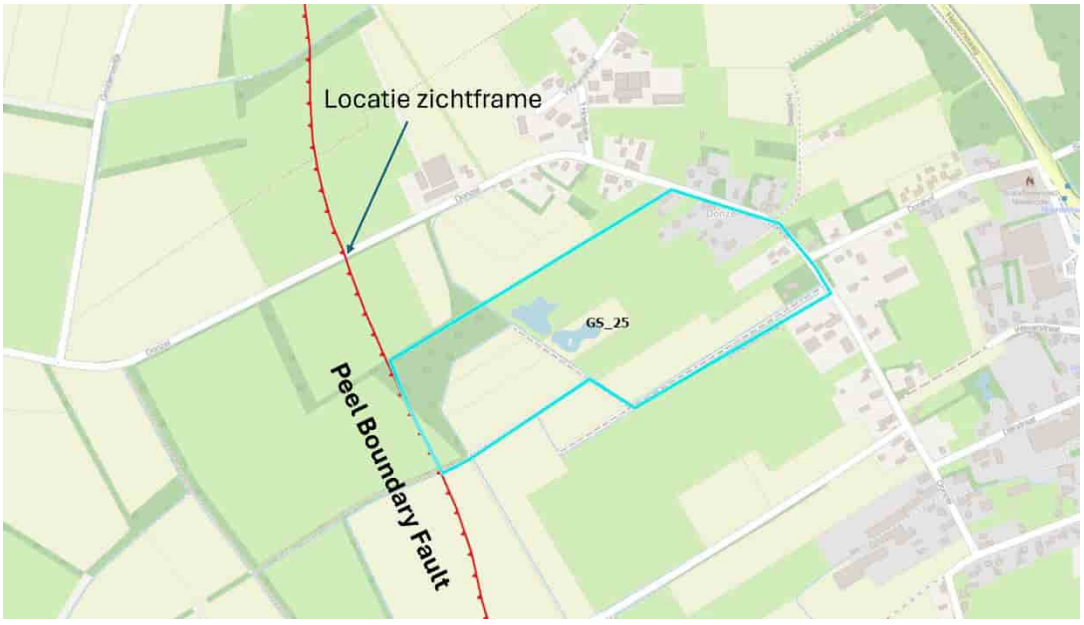
Flora & Fauna:
In de sloten en struweelranden staan wijsticonen zoals Klimopwaterranonkel, Moerasspirea, IJle zegge, Gewone vogelkers en Grote muur.
In the ditches and shrub edges grow wijst indicator species such as ivy-leaved crowfoot, meadowsweet, remote sedge, bird cherry, and greater stitchwort.

Industrial & Economic:

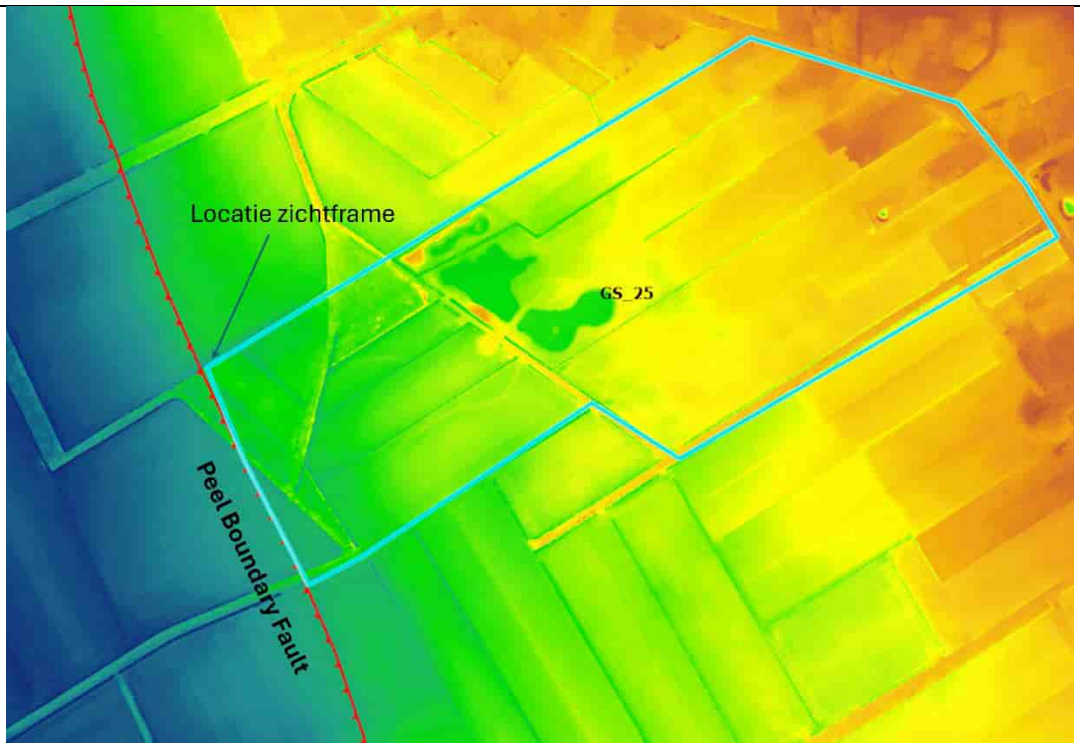
4. Relation with other geosites
This area is one of the five designated Wijst Restoration Projects in the province of Noord Brabant. Others include the Venloop valley near Slabroek (GS_13), the Wijstbos south of Zeeland (GS_19), the Sint Annabos in Uden (GS_07), and the source of the Esperloop in Gemert (GS_14).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_25 Donzel indicated with a light blue outline



AHN image of GS_25 Donzel. The height difference across the Peel Boundary Fault is about 1 m

Viewing frame at Donzel showing the location of the Peel Boundary Fault (photo: Thea Huijsmans).

Geosite: GS_26 **Significance: Regional** **Coordinates (RD): 177072, 399738**	**Name** De Specht-Putakker
Municipality	Boekel
Province and country	Noord-Brabant
Protection status	Natuurnetwerk Nederland (NNN)
Site management organizations	De Specht-Handel
Accessibility	De Specht is easily accessible by car and bicycle.
Relevance for tourism	This geosite is part of the Breuken Beleven cycle route. The area features several themed walking trails, including the Specht Route, which explains the functioning of the Peel Boundary Fault.
Relevance for education & information	Natuurcentrum De Specht is a nature education centre (open by appointment) offering outdoor excursions, courses, and guided tours. The 'Breukenpad'(Fault Path) provides information about wijst phenomena. Viewing frame "De Elzen" is located near the Putakker.
Teaching equipment	?
Scientific interest	

Description

1. Location

The Specht nature reserve is situated in the village of Handel, in a wooded area where many characteristic natural values remain intact.

2. Landscape formation and description

Origin of the landscape

The area around De Specht was formed by the activity of three fault segments of the Peel Boundary Fault. Wijst phenomena, terrace steps, groundwater springs, and vegetation differences make this evident. The nature reserve was established in the early 1990s and enhanced by sowing a native herb mixture of about thirty flower species. The Breukenpad starting at Natuurcentrum De Specht clearly reveals the various manifestations of the faults.

Geomorphology:

Around Natuurcentrum De Specht, the height differences caused by movement along the Peel Boundary Fault and the Handel Fault are clearly visible. This height difference is highlighted by the viewing frame at the Putakker.

Hydrology:

Natuurcentrum De Specht lies on top of the Peel Boundary Fault with two subsidiary faults along which wijst phenomena occur. These are explained along the 'Breukenpad'. At the Putakker viewing frame, pools with different groundwater levels can be seen on either side of the Peel Boundary Fault. Due to seepage, the higher ground has a higher groundwater level than the lower ground, caused by

the impermeable nature of the fault.

Deposits & Fossils:
Coarse, gravelly river sand deposited by the River Meuse (Middle Pleistocene; Beegden Formation) is overlain by a 1–2 m thick layer of silty cover sand deposited by wind at the end of the last Ice Age (Late Pleistocene; Boxtel Formation). Locally, this sand was reworked by wind during the Holocene induced by human activity.

River & Streams:
The Landmeerse Loop flows through the nature reserve, crossing the faults. Within the reserve, several hundred metres of the stream remain unchannelled. Because the area suffers from drought, small dams have been installed in the Landmeerse Loop.

3. Geosite Interests
Cultural History

Flora & Fauna:
The great diversity of landscapes within De Specht results in a wide variety of flowering plants. Different species thrive in the woodland compared to the pond edges or the sunlit flower meadows. Twenty-five years after its creation, the area now hosts more than 200 species, including wild marjoram, wild teasel, burdock, garden burnet, and marsh orchid.
The section of the Landmeerse Loop within the reserve is unchanneled for several hundred metres and is bordered by willow thickets. Reed growth along the fault is characteristic. In the marshy area and along the stream banks, many wijst indicator species occur, such as field rush, cuckooflower, ragged robin, marsh thistle, marsh orchid, greater bird's-foot trefoil, valerian, alder, bird cherry, guelder rose, and hop.
The Putakker viewing frame illustrates the differences in vegetation between plants growing on the wet horst and those on the dry graben.

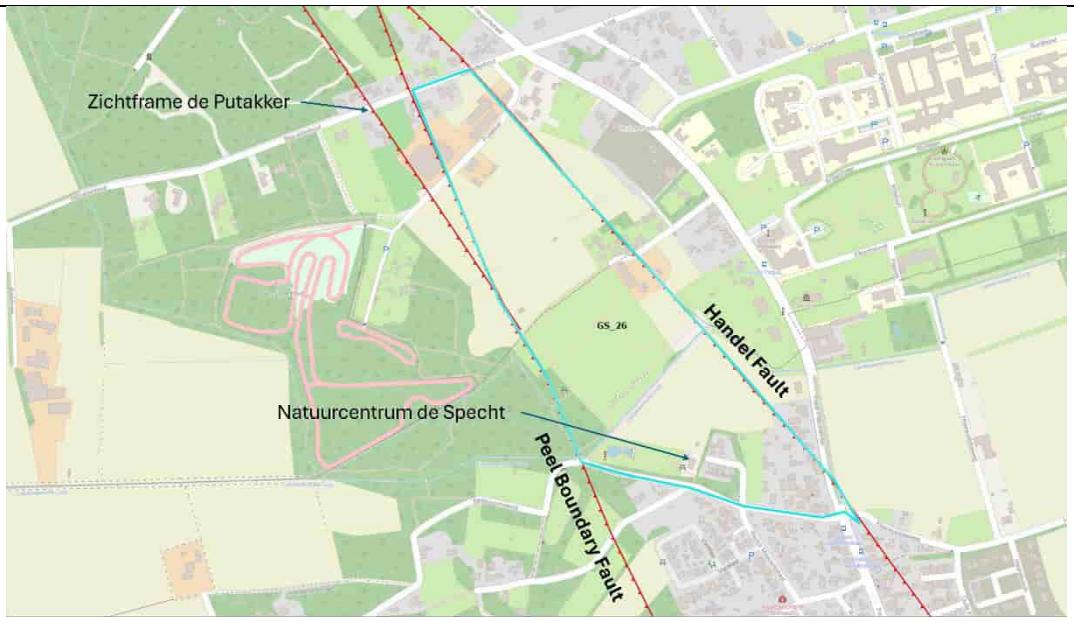
The diversity of habitats around Natuurcentrum De Specht supports a rich fauna as well. Numerous rare insects can be observed. Kingfishers, icterine warblers, whitethroats, and sparrowhawks are frequently seen, while frogs, toads, and newts are abundant. The bat bunker shelters a large bat population. Visitors may also encounter squirrels, roe deer, rabbits, hares, mice, and, with luck, a fox or polecat.

Industrial & Economic:

4. Relation with other geosites
De Perekker (GS_27) in Boekel

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_26 De Specht–Putakker indicated with a light blue outline

Breuken Beleven route; Natuurcentrum De Specht is at point 3 (source: peelhorstenmaasvallei.nl)

Viewing frame at the Putakker (see map for location; source: peelhorstenmaasvallei.nl)

Geosite: GS_27 **Significance: Regional** **Coordinates (RD): 175645, 401071**	**Name** De Perekker
Municipality	Boekel
Province and country	Noord-Brabant
Protection status	?
Site management organizations	Stichting D'n Eik Boekel
Accessibility	he De Perekker nature trail is easily accessible by car and bicycle via Mezenlaan in Boekel.
Relevance for tourism	The geosite is part of the walking route 'Ommetje Peelrandbreuk Boekel' (developed by the Boekel Local History Society).
Relevance for education & information	This nature centre and park features a bee hall, insect wall, frog pond, ponds with waterfall, bat cellar, and sand martin wall, as well as an interpretive nature trail where the wijst phenomenon and the Peel Boundary Fault are visible.
Teaching equipment	
Scientific interest	

Description

1. Location

lose to the centre of Boekel lies the nature park De Perekker, a unique area of woodland, water, and sand drifts. Within this area runs a subsidiary fault of the Peel Boundary Fault, associated with wijst phenomena.

2. Landscape formation and description

Origin of the landscape

The De Perekker nature reserve is intersected by the Peel Boundary Fault. Wijst phenomena, terrace steps, groundwater springs, and vegetation differences make this evident. The reserve was established in the early 1990s and enhanced by sowing a native herb mixture of about thirty flower species. The fault trail starting at Natuurcentrum De Specht clearly reveals the various manifestations of the faults.

Geomorphology:

Around the nature centre, the height differences caused by movement along the Peel Boundary Fault and the Handel Fault are clearly visible. The terrace step in the watercourse along the Perekker path also indicates the position of the fault.

Hydrology:

The Perekker area east of the fault has a higher groundwater level due to seepage, caused by the impermeable nature of the fault. Seepage water flows over the fault into the lower Perekker area, where it feeds the ponds. The wijst water is artificially impounded in a large skating pond within the reserve. The weir, located on the fault, clearly shows the difference in water level above and below

the fault.

Deposits & Fossils:

River & Streams:
The Landmeerse Loop flows through the nature reserve, crossing the faults. Within the reserve, several hundred metres of the stream remain unchannelled. Because the area suffers from drought, small dams have been installed in the Landmeerse Loop.

3. Geosite Interests

Cultural History
The 'Ommetje Peelrandbreuk Boekel route links the centre of Boekel with the historic Huize Padua, passing characteristic locations that have shaped both the past and the lives of local residents. Points of interest along the route include clay pits where bricks were made, centuries-old farms along the fault line, an ancient ridge-and-furrow field complex, and the Klein Rondeel, notable for its lower ground level due to sand extraction.

Flora & Fauna:
In the watercourse along the Perekker path grow several wijst indicator species such as field rush, horsetail, marsh thistle, and floating sweet-grass. On the banks grow cow parsley, bulbous buttercup, and sorrel, which no longer thrive on the drier ground further away. Along the path, alders suffer from drought, while around the fault, species typical of bird cherry–ash woodland replace the alder carr, including bird cherry, guelder rose, hazel, and ash. Hornbeam even self-seeds here. The small reserve is surrounded by encroaching urban development. The Dooleggen housing estate, situated above the Peel Boundary Fault, is bordered by ditches containing orange-brown seepage water.

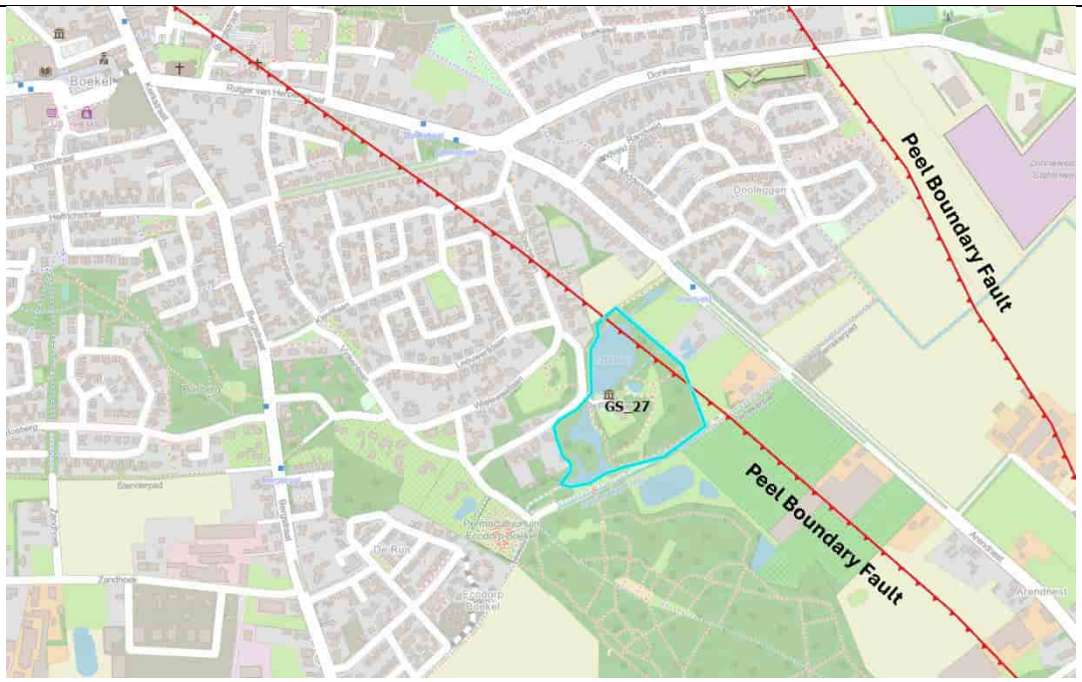
Industrial & Economic:

4. Relation with other geosites

On 22 May 2025, mechanical test drillings (up to 8 m deep) were carried out at the De Burgt site on the northern edge of Boekel (GS_24) to determine the exact position of the Peel Boundary Fault. This concerns a branch located further north than the one at De Perekker (see map).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_27 De Perekker indicated with a light blue outline

Geosite: GS_28 **Significance: Regional** **Coordinates (RD): 188930, 373879**	**Name** Willibrordusput Meijel
Municipality	Deurne, Peel en Maas
Province and country	Noord-Brabant, Limburg
Protection status	The well and the boundary stone are designated as National Monuments (Rijksmonument).
Site management organizations	
Accessibility	Hof, 5768 RX Meijel
Relevance for tourism	De Wegh van Meijl op Seven in Someren is a 21 km route full of legends, marked by basalt columns and starting at the Saint Willibrordus Well.
Relevance for education & information	Informationpanel
Teaching equipment	

Description

1. Location

The Saint Willibrordus (or Wilbers) Well is located in the Limburg village of Meijel, precisely on the border between the provinces of North Brabant and Limburg. Next to the well stands a boundary stone dating from 1761.

2. Landscape formation and description

Origin of the landscape

According to tradition, Saint Willibrord (the Apostle of the Netherlands), who was active in the eighth century in what is now Noord Brabant as a missionary, is said to have dug this well. That a well could be dug at this relatively high elevation (35 metres) was due to the presence of the Peel Boundary Fault. It is possible that Willibrord travelled from Deurne along this route to Echternach, noticed the wijst water, and decided to dig a well here.

Geomorphology:

The location of the Saint Willibrordus Well is relatively high, but the Peel Boundary Fault lies about 300 m further north. Due to cover sand deposits, the terrace step at the fault is no longer visible. The terrace step just south of the well is attributable to an aeolian landform.

Hydrology:

Here, the hydrological situation appears reversed: the wet areas lie below the Peel Boundary Fault, and the dry areas above. This is explained by the presence of cover sand deposits over the Peel Boundary Fault, which almost eliminated the fault-related height difference. The clay and loamy sand at the base of the cover sand prevent water from draining easily. The near absence of wijst phenomena with iron-rich seepage is also atypical.

Deposits & Fossils:

Cover sand ridge

River & Streams:

3. Geosite Interests

Cultural History

The Willibrordus Well lies along a passage through the Peel. The nearby road through the Peel is said to have been used by Saint Willibrord, travelling from Utrecht via his estates in Bakel and Deurne on his way to his monastery in Echternach. Here, according to legend, he and his companions could rest, preach, and baptise people. A large oak tree stood by the well on the height, serving as a landmark for boundary demarcation as early as before 1300. This oak remained a reference point until the 19th century. In 1352, the well, clearly visible on this high point, was used as an orientation marker. About 150 metres away lay the boundary between Brabant and the Land of Weert. In 1452, the area was referred to as Luttel Meijdel, where Meijdel denotes a height amid marshy land. Users from both sides had boundary disputes here. In 1549, a boundary stone was placed to mark the border between municipalities such as Someren and Nederweert, which often clashed. The actual boundary still lay 150 metres further on. On 12 May 1761, a new boundary stone was erected, now marking the border between the Dutch Republic and Austrian Upper Guelders. One side bears the Dutch lion, the other the Austrian double-headed eagle.
The water of the well was considered medicinal, making it a place of pilgrimage. In 1742, it was believed to protect against marsh fever. However, the well was poorly maintained and, after 1800, fell into such disrepair that nothing remained visible. Under the parish priest's leadership, the well was rediscovered and re-excavated on 6 July 1899. A round structure was built over it, which still exists. On 8 October 1899, a procession went to the well, which was then re-consecrated. It became a pilgrimage site, and the water, now regarded as an excellent remedy for eye diseases, was taken home in bottles.
The well was damaged during the Second World War but restored in 1953. A bust of Willibrord was placed, though it was not weather-resistant and eventually moved to the church. In 1979, the well was purchased by the municipality of Meijel, and a new bust was installed.

Flora & Fauna:

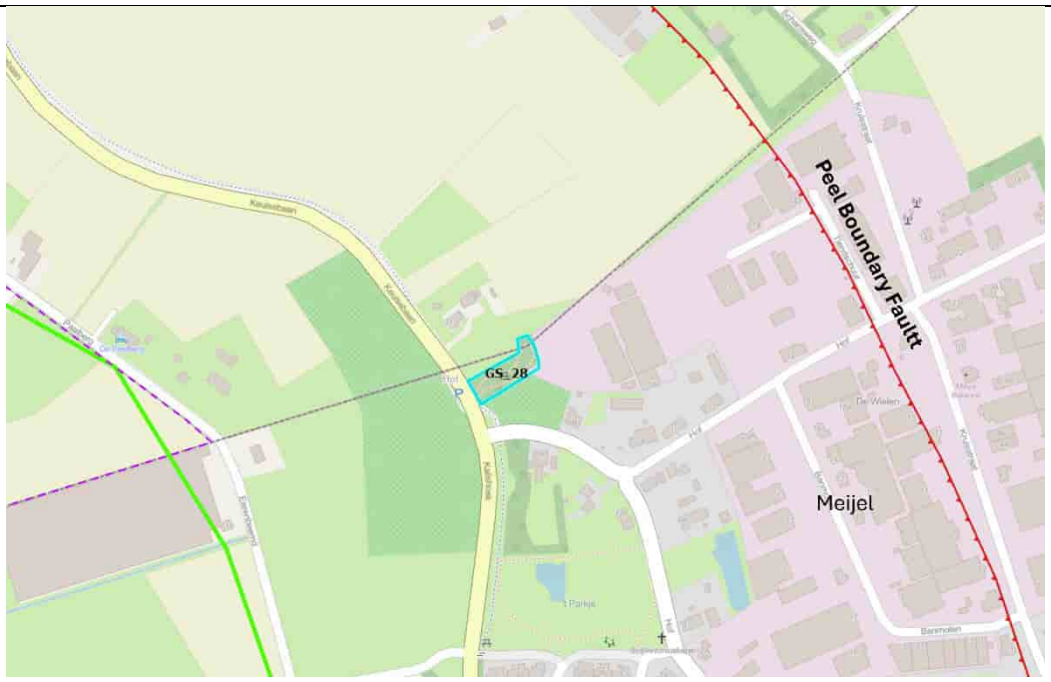
Industrial & Economic:

4. Relation with other geosites

The geological setting is comparable to Geosite GS_40 Waterbloem.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_28 Willibrordus Well, Meijel, indicated with a light blue outline

AHN image around GS_28 showing that the terrace step does not coincide with the Peel Boundary Fault but with the edge of a cover sand ridge

The Willibrordus (or Wilbers) Well and the boundary stone

Geosite: GS_29 **Significance: Regional** **Coordinates (RD): 206579, 387302**	**Name** Schuitwater
Municipality	Horst aan de Maas
Province and country	Limburg
Protection status	Aardkundige waarde, Natuurnetwerk Nederland (NNN)
Site management organizations	Staatsbosbeheer
Accessibility	Accessible from the car park between Broekhuizen and Horst/Melderslo.
Relevance for tourism	Staatsbosbeheer has established the N-95 walking route here. This 9.3 km walk starts at the car park along the Horsterweg. The route and information about flora, fauna, and nature management are displayed on information panels. Several routes of the 'Stempel van de Maas' (later integrated into the KnopenLopen network of Horst aan de Maas) also pass through this nature reserve. Some marshy sections are crossed by boardwalks. The Pieterpad long-distance trail also runs through the area.
Relevance for education & information	Informationpanel "Schuitwater – Stempel van de Maas"; IVN organizes educational walks.
Teaching equipment	
Scientific interest	Woolderink et al., 2018

Description

1. Location

Schuitwater is a 313-hectare nature reserve in northern Limburg. It lies between the villages of Swolgen, Broekhuizenvorst, and Broekhuizen, and west of Lottum. The area consists of remnants of an abandoned Meuse meander between Broekhuizen in the north and Lottum in the south. The total length of the old river arm is about 7 km, whereas the present Meuse course over this stretch is only 3 km long. The area lies within the Venlo Block.

2. Landscape formation and description

Origin of the landscape

During the Allerød period (10,950–11,900 years ago), the River Meuse flowed here, cutting a large meander through the landscape and forming the middle terrace. The Meuse later broke through the meander and shifted its course during the Younger Dryas. During this cold phase, the meandering river changed into a braided system with a wide riverbed that cut across the old channel (see Woolderink et al., 2018).

Geomorphology:

It is a wooded and water-rich area, surrounded by higher sandy soils with pine trees, sand dunes, heathland, and birch woods.

Hydrology:

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

Flora & Fauna:

Few nature reserves offer as much variety in such a small area as Schuitwater: heathlands, dry and wet grasslands, and water bodies. The diversity of the landscape is linked to numerous elevation differences. The low-lying core of the reserve consists of old channels abandoned by the Meuse, flanked by high, dry sandy soils.

Industrial & Economic:

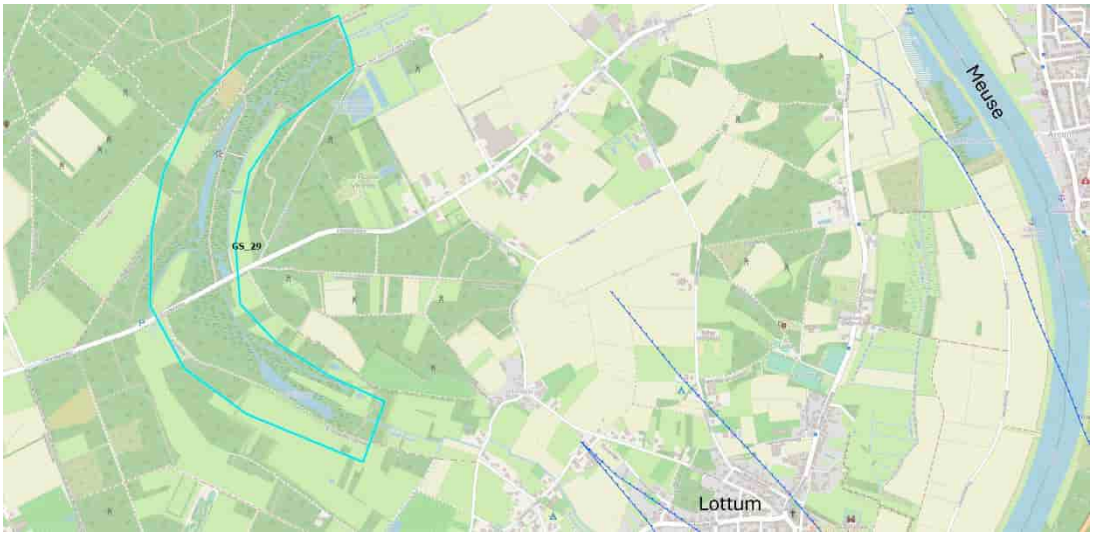
The Schuitwater reserve is a remnant of several former Meuse channels. These gradually silted up, and fen peat formed on the bottom. From the 18th century, peat was dredged from the Schuitwater channels and transported in flat-bottomed boats. After peat extraction ceased, the silting-up process resumed.

4. Relation with other geosites

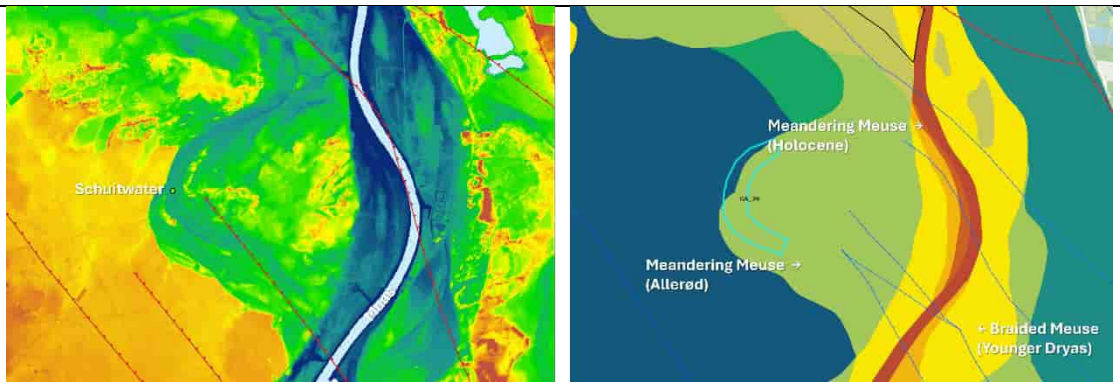
Geosite GS_36 – De Vilt shows an abandoned Meuse meander of the same age.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_29 Schuitwater indicated with a light blue outline



Left: AHN image of GS_29 Schuitwater. Right: Palaeogeography of the Meuse Valley (Woolderink et al., 2018) showing the abandoned Allerød Meuse meander at Schuitwater.

Geosite: GS_30 **Significance: Regional** **Coordinates (RD): 186902, 390007**	**Name** De Bult
Municipality	Deurne
Province and country	Noord-Brabant (NL)
Protection status	Natura-2000
Site management organizations	Staatsbosbeheer
Accessibility	
Relevance for tourism	It is now prohibited to give peat-cutting demonstrations here. These are still provided on a peat field located on a Staatsbosbeheer plot at the Toon Kortooms Park (GS_04).
Relevance for education & information	
Teaching equipment	

Description

1. Location

The wetland nature reserve De Bult covers 120 hectares in the far north-east of Deurne, behind the Craijenhut, on the border between the provinces of North Brabant and Limburg. Although it does not directly adjoin it, the site is part of the Natura 2000 area Deurnsche Peel & Mariapeel, but lies outside its core zone. The reserve is completely surrounded by farmland. To the east flows the Defensiekanaal, and to the north of De Bult begins the Kaweise Loop.

2. Landscape formation and description

Origin of the landscape

Like the entire Natura 2000 area Deurnsche Peel & Mariapeel, De Bult is a raised bog area that remains after historical reclamation. It is an isolated remnant of the Deurne Peel. The name “De Bult” derives from the raised bog hummocks characteristic of the area. These peat bogs were largely excavated down to the sandy subsoil. These areas are the southernmost representatives of the flat sub-Atlantic raised bogs, which elsewhere—and also in the Peel region—have largely disappeared due to excavation, reclamation, and peat cutting.

Geomorphology:

Hydrology:

To the east of the area flows the Defensiekanaal, and to the north begins the Kaweise Loop. Although De Bult is designated as a wetland nature pearl, the area is threatened by the planned reopening of the nearby De Peel Air Base, which has led to protests from Werkgroep Behoud de Peel (WBdP). To keep this higher-lying area wetter, the water management system needs significant adjustment.

Deposits & Fossils:

Within the aUGGP, De Bult represents an undeveloped area where remnants of sphagnum moss are still present. It forms part of a more or less continuous remnant of the largely vanished raised bog landscape of the Peel, located on the watershed between the Brabant river Aa in the west and the Limburg Grote Molenbeek in the east. Most of the peat was removed in the past, but locally thick layers of residual peat remain. In some complexes of peat pits, vegetation with hummock-forming raised bog species occurs.

River & Streams:
In this area, watercourses have been made shallower, boundary ditches filled in, and weirs and controlled drainage installed to preserve and, where possible, restore remnants of raised bog, birch woodland, and dry and wet heathland, while also considering agriculture, residents, and cultural history.

3. Geosite Interests

Cultural History
Archaeological finds, in the form of flint knives, scrapers, and points, indicate very early human presence.

Flora & Fauna:
De Bult is a remnant of the former extensive raised bog marshes. Characteristic species such as small cranberry, bog rosemary, and hare's-tail cottongrass still grow mainly in and along peat pits. The aim is for De Bult to consist largely of regenerating and partly active raised bog in the future, with birch carr and birch-oak woodland mainly in the marginal zones. In some places, original vegetation is recovering thanks to improved water management, and sphagnum mosses, cotton grass, and sundew are reappearing.
Due to the varied history of peat cutting in different parts of the area, there is a high degree of fine-scale variation in vegetation and landscape, with gradients towards slightly more mineral-rich conditions. In the oldest peat pits, miniature raised bog growth has been occurring for a long time. On the larger residual peat units, relatively thick peat layers remain, and restoration management has already led to the development of raised bog vegetation in several places.
Important animal species in the area include the badger and the smooth snake.

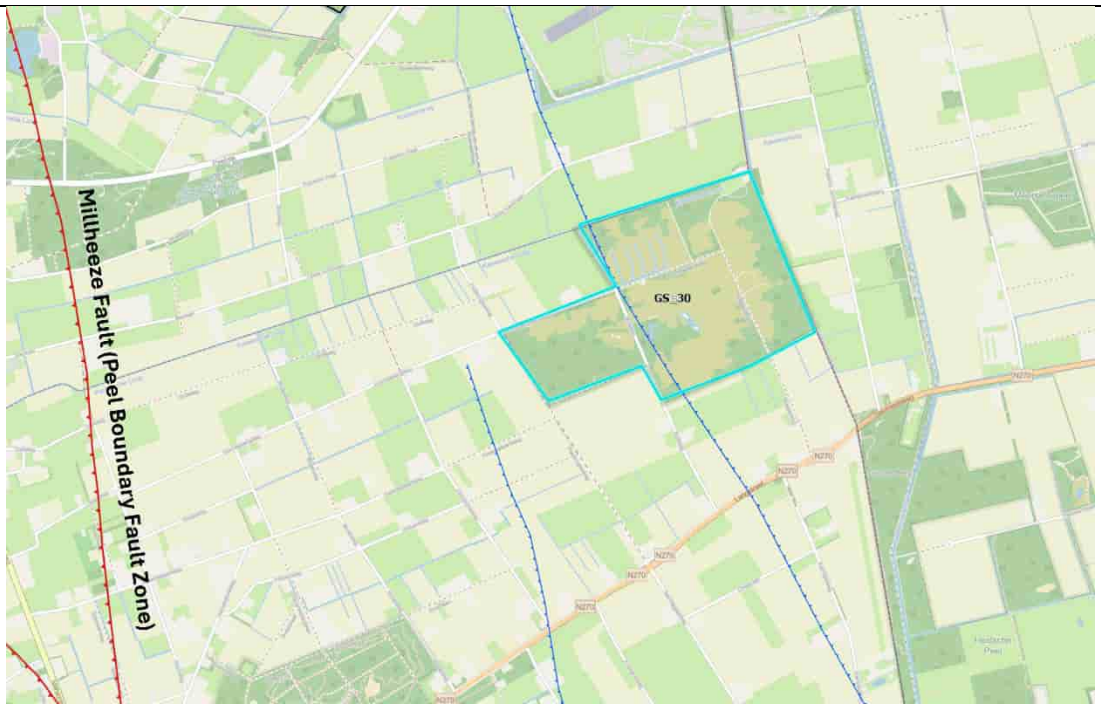
Industrial & Economic:

4. Relation with other geosites

Like the entire Natura 2000 area Deurnsche Peel & Mariapeel (GS_11), De Bult is a raised bog area that remains after reclamation. One kilometre to the north lies De Peel Air Base, which still contains important natural values such as heathlands, and two kilometres further north lies the Stippelberg estate (GS_33), also with some heathland. About half a kilometre to the south-east is the Peel remnant Heidsche Peel.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_30 De Bult indicated with a light blue outline

De Bult still provides a good impression of what the vast and open Peel must once have looked like

Geosite: GS_31 **Significance: Regional** **Coordinates (RD): 192726, 392546**	**Name** Loobeekdal
Municipality	Venray
Province and country	Limburg
Protection status	The area is part of the Dutch National Nature Network (NNN) and falls under the European Water Framework Directive (WFD), the Water Act (Waterwet), and the Water Management Plan (Waterbeheerplan).
Site management organizations	Staatsbosbeheer, Waterschap Peel en Maasvallei, Stichting Loobeekdal
Accessibility	
Relevance for tourism	There are several walking routes through the nature reserve starting from Merselo. It is a wetland area with unpaved paths.
Relevance for education & information	Stichting Loobeekdal organises guided walks covering history, culture, nature, and landscape. A sheepfold combined with an information centre is under development.
Teaching equipment	

Description

1. Location

The Loobeek flows south of Merselo (Haag–Weverslo) through a redesigned section of the Loobeek Valley. Here, geology (Tegelen Fault and Peel Horst), nature, culture, and history converge within a few hundred metres. The Weverslose Schans lies in the Loobeek Valley.

2. Landscape formation and description

Origin of the landscape

The Loobeek crosses the Tegelen Fault Zone south of Merselo. The Tegelen Fault here forms a so-called “relay” zone where the southern fault segment steps over to a more northerly segment. The Loobeek also crosses the northern segment west of Venray. Originally a tributary of the River Meuse, the Loobeek rises in the Peel. In the 20th century, the stream was adapted for agricultural drainage.

Geomorphology:

The Tegelen Fault lies on the southern side of the valley; the left bank has been raised by wind-blown sand.

Hydrology:

The Loobeek Valley is a mixed-water area where rainwater combines with groundwater. This groundwater is iron-rich, as evidenced by various wijst phenomena.

Deposits & Fossils:

River & Streams:

Today, the stream originates northwest of Ysselsteyn as an inlet from the Peelkanaal (Defensie Kanaal) and flows northeast, initially through large-scale agricultural reclamation. South of Merselo, the landscape becomes more small-scale. Here lies the Loobeek Valley nature reserve with the Weverslose Schans. In this section, the stream follows a more natural course. The valley has been redesigned in recent years (completed in 2015) to allow nature to recover. North of Merselo, however, lies an area where land consolidation in the 1960s and 1970s resulted in heavy canalisation of the stream and large-scale alteration of the valley landscape. Ultimately, the Loobeek joins the Afleidingskanaal between Venray and Smakt and continues under that name towards the Meuse. At this point, effluent from the Venray wastewater treatment plant is also discharged.

3. Geosite Interests

Cultural History

During the final phase of the Second World War, when Allied forces advanced after the Battle of Overloon to push from Overloon to Venray, they had to cross the Loobeek with tanks. At that time, the stream had swollen to a width of six metres. The Germans had laid mines in the river. The crossing took place on 16 October 1944 and involved heavy losses, after which the Loobeek was nicknamed “Blood Brook”.

The Weverslose Schans was a farmers’ redoubt located south of Merselo and north of Weverslo in the Loobeek Valley. The exact year of construction is unknown. It was used by local inhabitants as a refuge during times of war and roaming bands of looters. Around 1925, the old Weverslose Schans was levelled during the reclamation of the Peel. Not far from the original site, the redoubt was reconstructed in 2022 by Stichting Loobeek. The fortification consists of an earthen wall with a pentagonal plan, corner bastions, and a watchtower. Around it lies a water-filled moat fed by the Loobeek. The Weverslose Schans lies exactly on the southern branch of the Tegelen Fault.

Sheep have always been important to the inhabitants of the Peel region, providing wool for clothing and, above all, manure to enrich the poor sandy soils. The new Weverslose sheepfold being built in Merselo will serve a dual purpose: occasionally housing sheep and functioning as an information centre focusing on nature, landscape, and the history of the sheep companies, the fulling mill, and the redoubt.

The wool from sheep grazing in the Peel was partly traded, spun, woven, and processed into felt. Felt was produced in a fulling mill, where wool was pounded for hours by water-powered wooden hammers, creating felt for clothing. The reconstructed fulling mill in Merselo is powered by water from the Loobeek and is located at the point of greatest fall.

Flora & Fauna:

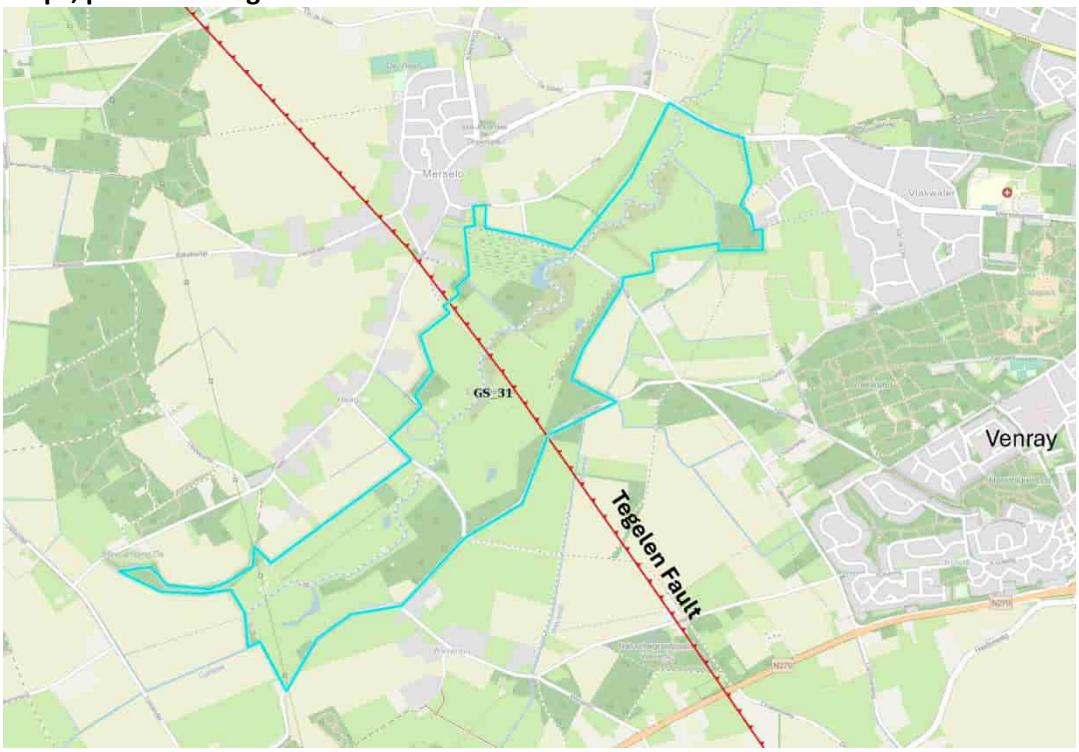
The site showcases flora and fauna and, together with the Weverslose Schans and fulling mill, illustrates how past inhabitants utilised the geological setting. The area is an excellent example of how nature conservation and ecological development can go hand in hand. The Loobeek Valley contains wet grasslands and groves with alder and willow. On drier parts, birch and coniferous trees grow. The valley harbours several rare plants that contribute to biodiversity, including various orchids (such as the broad-leaved helleborine), marsh marigold, and marsh violet. The area is home to birds such as the kingfisher and grey wagtail, mammals like roe deer and foxes, and provides habitat for amphibians and reptiles, including the common toad and grass snake.

Industrial & Economic:

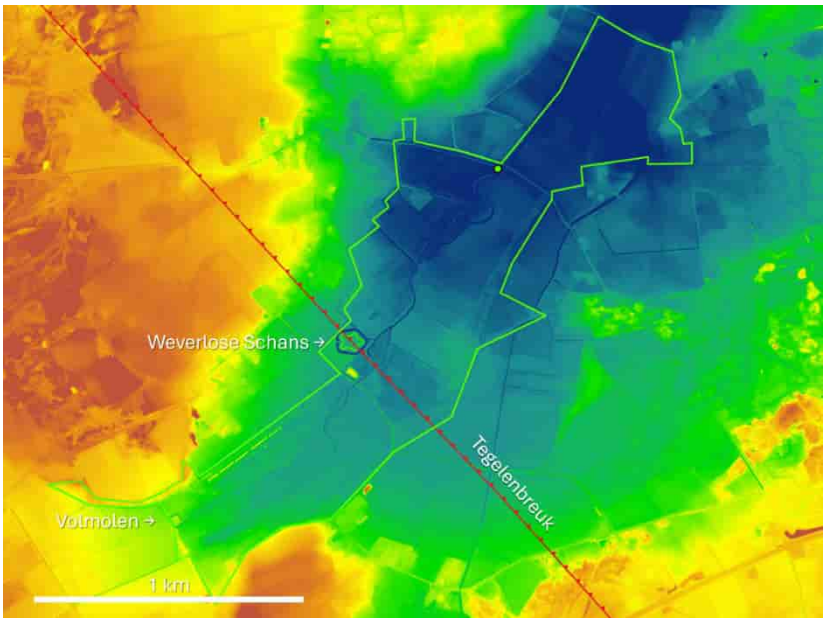
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_31 Loobeek indicated with a light blue outline



AHN image of the Loobeek Valley (green outline) with the Tegelen Fault, Weverslose Schans, and fulling mill

The Loobeek (foto: www.waterschaplimburg.nl)

Geosite: GS_32 **Significance: National** **Coordinates (RD): 205555, 392170**	**Name** Maaspark Noord-Limburg
Municipality	Horst aan de Maas, Venray
Province and country	Limburg
Protection status	Gebiedsontwikkeling Ooijen-Wanssum
Site management organizations	stichting Maaspark Noord-Limburg
Accessibility	Maaspark Ooijen-Wanssum is freely accessible throughout the year. Facilities for people with reduced mobility are also available. The park boasts an extensive network of paths and roads, yet it also invites visitors to explore off the beaten track. The area has no fewer than 68 entrances, including seven distinctively designed 'escarpment gates' (steilrandpoorten).
Relevance for tourism	Pedestrians and cyclists can experience the area to the fullest. There are 13 kilometres of cycle paths and 30 kilometres of walking trails. The park has its own cycling route and several circular walks in and around the villages.
Relevance for education & information	
Teaching equipment	A special teaching package, The Water World between Ooijen and Wanssum, has been developed for primary school children. Educational canoe trips are also available.
Scientific interest	Reconstruction of former Meuse river courses by Woolderink et al., 2018

Description

1. Location

The Groote Molenbeek is an old branch of the River Meuse, approximately 32 kilometres long, flowing through Maaspark Noord-Limburg. It meanders through the landscape towards Wanssum, where it joins the Meuse. With 540 hectares, the Maaspark is the largest contiguous area of Meuse nature in North Limburg. The original Meuse terrace landscape is central here, and the influence of water is evident everywhere. The ten-thousand-year-old river courses of the Meuse are still recognizable and now form a domain of water in many forms. The park contains a wide variety of landscapes.

2. Landscape formation and description

Origin of the landscape

About 10,000 years ago, during the last cold period (Ice Age), the Meuse flowed through the area as a braided river. It cut into older Meuse deposits of the middle terrace, creating the lowest terrace, about 2 to 3 metres above the current river. The river valley was very wide, with multiple channels and islands in between. This braided pattern gave the lowest terrace a varied relief. After the last Ice Age, the Meuse began to meander again and assumed roughly its present single course. The channel

between Ooijen and Wanssum was abandoned, but the lowest terrace still floods relatively quickly.

Geomorphology:
Cover sands and drifting dunes also formed during the last cold period, covering large parts of the middle terrace. That cold period briefly turned much of the Netherlands into a polar desert. Severe drought, lack of vegetation, and stormy westerly winds caused major sand drifts. Thick layers of cover sand reached the Meuse from the west, and high river dunes blew up from the riverbed. The two terraces, combined with the drifting sand, define the current landscape of the old Meuse branch. The higher grounds in the planning area belong to the middle terrace. These higher grounds have been cut through again by a network of channels forming part of the lowest terrace. A section of the higher middle terrace became isolated between the Meuse and the old branch. River dunes also blew up from this branch, explaining the presence of Meuse dunes on the western bank between Ooijen and Blitterswijc

Hydrology:
This section of the Meuse as serves as a floodplain during extreme water levels to prevent greater disasters downstream in the low-lying parts of the Netherlands. From this perspective, the North Limburg Meuse valley is considered a retention area. This makes Maaspark Noord-Limburg different from other nature reserves, as it was designed to protect against high water levels of the Meuse. When water levels rise, the high-water channels fill first, and if the water continues to rise, the entire area floods—a spectacular sight. During the high water of July 2021, Maaspark Ooijen-Wanssum was severely tested immediately after completion. The design proved highly effective in accommodating high Meuse water levels and reducing water levels downstream.

Deposits & Fossils:

River & Streams:
Closer inspection reveals that the channel pattern of the old Meuse branch is more extensive and irregular than it first appears. The higher grounds between Ooijen and Blitterswijck and the area between Broekhuizenvorst, Ooijen, and Legert are intersected by several historic channels. Many current streams follow these depressions, such as the Smallenbroek, Wolterskamp, and Boddebroek.

3. Geosite Interests
Cultural History
This area was shaped by the Meuse and by human activity. Originally, there were few settlements, and habitation was limited to the higher ridges between the channels.
Castle Ooijen dates back to before 1433, though the current buildings are from the 17th century and later. It lies in a freely accessible new nature reserve, after the old Meuse branch was restored at the end of 2020. The castle remained inhabited until 1981 and has been listed as a monument since 1968. Since 1989, the once-derelict castle has been owned by the Ooijen Castle Foundation, which restored it. The restoration was completed in 2003. Over the years, the moats were partly filled in and relocated, so the castle is now only partially moated.

Flora & Fauna:
Maaspark Ooijen-Wanssum allows natural processes and diverse flora and fauna to thrive. Beavers, badgers, and foxes are already frequent visitors. Grazing animals maintain the open landscape, ensuring water has enough space during floods. The area supports geese, herons, and even ospreys and kingfishers. The vegetation includes various grasses, willows, and plants such as yellow rattle

and devil's-bit scabious. In the early years, waders like the little ringed plover can also be seen along the still-bare channel banks.

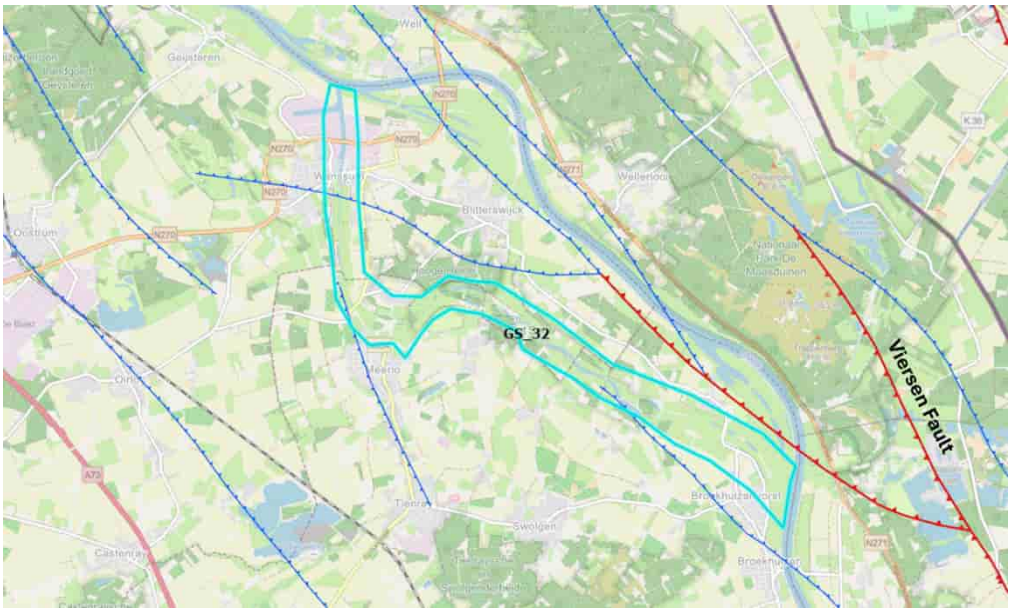
Industrial & Economic:

4. Relation with other geosites

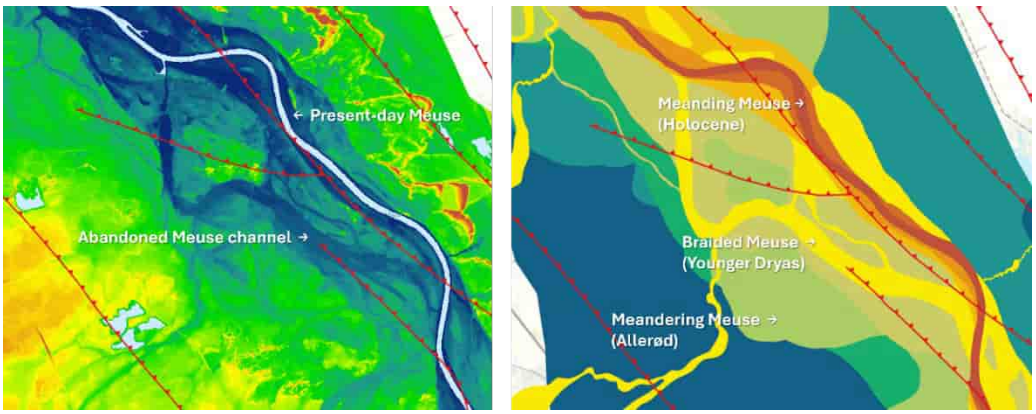
Old Meuse Meander Schuitwater (GS_29). The Groote Molenbeek also flows through De Elsbeemden (GS_42).

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_31 Loobeek indicated with a light blue outline



Left: AHN image of the old Meuse branch Ooijen-Wanssum. Right: Reconstruction of old Meuse courses (Woolderink et al., 2018). Green – meandering Meuse before the last Ice Age; Yellow – braided Meuse during the last Ice Age; Orange – meandering Meuse after the last Ice Age

Geosite: GS_33 **Significance: International** **Coordinates (RD): 182640, 393777**	**Name** Stippelberg (Klotterpeel, de Rips)
Municipality	Gemert-Bakel
Province and country	Noord-Brabant
Protection status	Natuurmonument
Site management organizations	Gem. Boekel (opdrachtgever)
Accessibility	Via the Bosmuseum, near the Beestenveld car park
Relevance for tourism	At the edge of the Stippelberg nature reserve lies Natuurpoort Nederheide, an excellent starting point for walks. The Bosmuseum in De Rips also offers various starting points for walks in the woodland area..
Relevance for education & information	At the Bosmuseum in De Rips, the rich history of the Peel village is presented through information panels and visual material. There is an archaeological monument, Stone Age, on the Stippelberg, and an information panel near the Tjongerculture finds on the Stippelberg, Oude Bakelsedijk.
Teaching equipment	
Scientific interest	Archaeological research on a heathland site at “De Stippelberg”. KWR research into the desiccation of the Stippelberg.

Description

1. Location

The Stippelberg lies on the Peel Horst and is intersected by the Milheeze Fault (a branch of the Peel Boundary Fault). The Stippelberg is the largest forested area in the province of Brabant; only the Veluwe is larger in the Netherlands. On the Peel Horst there are two wet areas: the Klotterpeel and De Rips. In the southern part of the Stippelberg is a small wijst area just east of the fault.

2. Landscape formation and description

Origin of the landscape

Stippelberg and the reclamation village of De Rips are characterised by a striking feature: the fault line running through the area. This is the Milheeze Fault, a branch of the Peel Boundary Fault. The fault line causes major differences in groundwater conditions, resulting in varied vegetation. The cover sand layer deposited during the last Ice Age on the Peel Boundary Fault is about two metres thick, but in the middle of the horst it is only a few decimetres thick, and in wind-eroded depressions it is sometimes absent, exposing Meuse sediments recognisable by coarse sand with pebbles. Where seepage water reached the surface, drifting sand was stabilised, forming elevations.

Geomorphology:

The Stippelberg owes its name to the many small drifting sand dunes in the landscape. Because the drifting sand was trapped, the depression beneath the fault was not completely filled, creating

slopes. Differences in subsidence rates along the fault may also have caused these slopes. The result is a sand dune ridge bisected by the fault.

Hydrology:

The Klotterpeel is a large shallow fen situated above the Milheeze Fault. Beestenveld lies on the northern side of the Stippelberg. The Koorden Canal, which runs through it, is reportedly not intersected by the Milheeze Fault according to Witteveen and Bos. However, halfway along the Koorden Canal there is a weir, and a water-bearing ditch runs across the fields towards the Middenpeelweg. A strip of reeds grows along the verge of the Middenpeelweg. It is assumed that the Milheeze Fault crosses near the Beestenveld weir towards the Middenpeelweg.

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

Most of the current forest area of the Stippelberg is a well-preserved example of a production forest dating from the late 19th and early 20th centuries, with typical grid parceling, avenue planting, and drifting sand dunes stabilized by conifers. Important historic heath paths, aligned with the church towers of surrounding villages, cross the area. From the northern corner of the forest, a zigzag line runs southwards: a precursor of the Peel-Raam Line (a defensive structure), a rare example of an intact anti-tank ditch from 1939.

The Klotterpeel was originally a small peat-cutting area, and traces of peat extraction remain. The reclamation village of De Rips lies on the north-eastern edge of the Stippelberg and was created through organized reclamation of heath and peatlands in the 19th and 20th centuries. A forest museum illustrates this history. Nearby are other reclamation villages such as Elsendorp and Vredepeel.

Human habitation in the De Rips area goes back much further, as artefacts from the Tjonger Culture have been found here. The Tjonger people lived about 13,000 years ago during the Stone Age. They made tools and arrowheads resembling pocket knives. In the Netherlands, they are also called Tjonger people because the first finds were made near the River Tjonger in Friesland. They lived at the end of the last Ice Age, in a warmer period, though not as warm as today. The landscape changed from tundra with sparse vegetation to open woodland with heath and grassland. These people lived by hunting, fishing, and gathering plant foods and small animals. Remarkably, they often returned to camp here, probably because they could set up camp high and dry halfway up a cover sand ridge.

The first excavation took place in the 1950s by Dr Bohmers of the University of Groningen. The State Service later investigated the area, and amateur archaeologists also made many finds. Thousands of flint artefacts have been found, such as points, scrapers, burins, blades, and drills used as personal tools. This site has been an Archaeological National Monument since 1971 and remains one of the most important Stone Age sites in the Netherlands and north-western Europe. The site is 100 to 150 metres wide and no less than two kilometres long.

Flora & Fauna:

The Klotterpeel hosts a large population of moor frogs, which mainly occur in nutrient-poor, slightly acidic waters. However, seepage indicators such as many-stalked spike-rush, winter purslane, pillwort, arious-leaved water-starwort, and shoreweed show that it is a buffered fen.

Above the weir in the Koorden Canal grow species typical of base-rich soils (hard fern and male

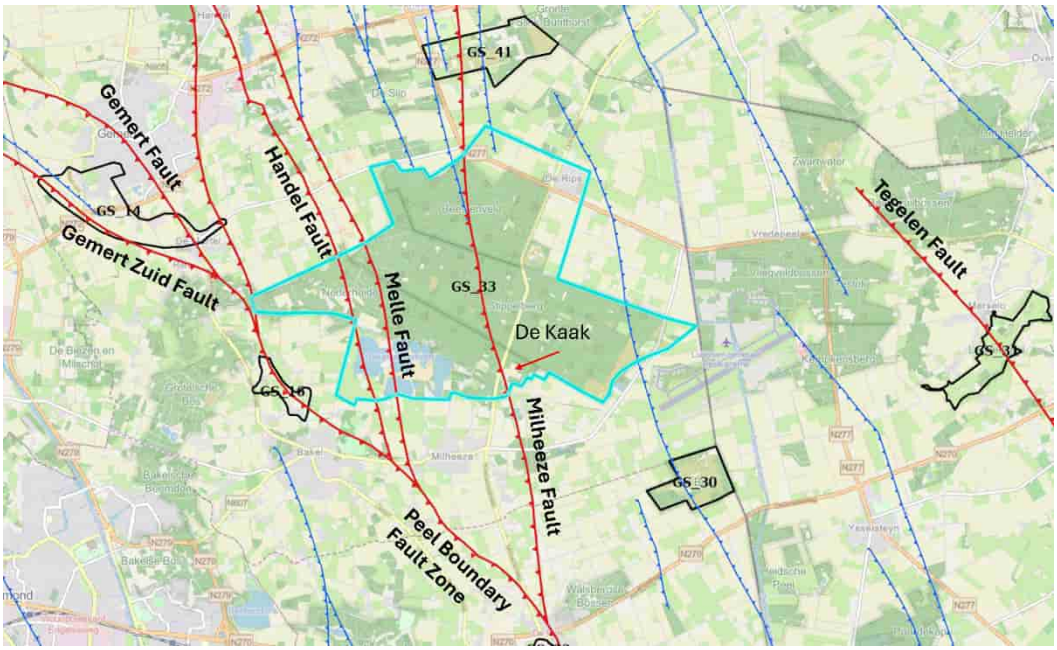
fern), while the Beestenveld forest is nutrient-poor and characterized by frogbit, milk-parsley, common skullcap, lesser water parsnip, royal fern, male fern, lady fern, flowering rush, and various-leaved water-starwort. In the wijst area of De Kaak grow sharp-flowered rush, marsh St John's wort, and greater bird's-foot trefoi.
Like many Dutch forests, the Stippelberg was originally a production forest with low biodiversity. Natuurmonumenten is working to make the forest more natural, increasing tree species diversity and creating more open spaces and connections between heathlands.

Industrial & Economic:
Thousands of years ago, predecessors of the Meuse and Rhine flowed through East Brabant, leaving river deposits rich in gravel. Because the Bakelse Plassen lie on the elevated Peel Horst, which has been uplifted by the Peel Boundary Fault, these river deposits are close to the surface. This is why gravel extraction has taken place here since 1986, creating an ever-expanding lake that continues to grow today.

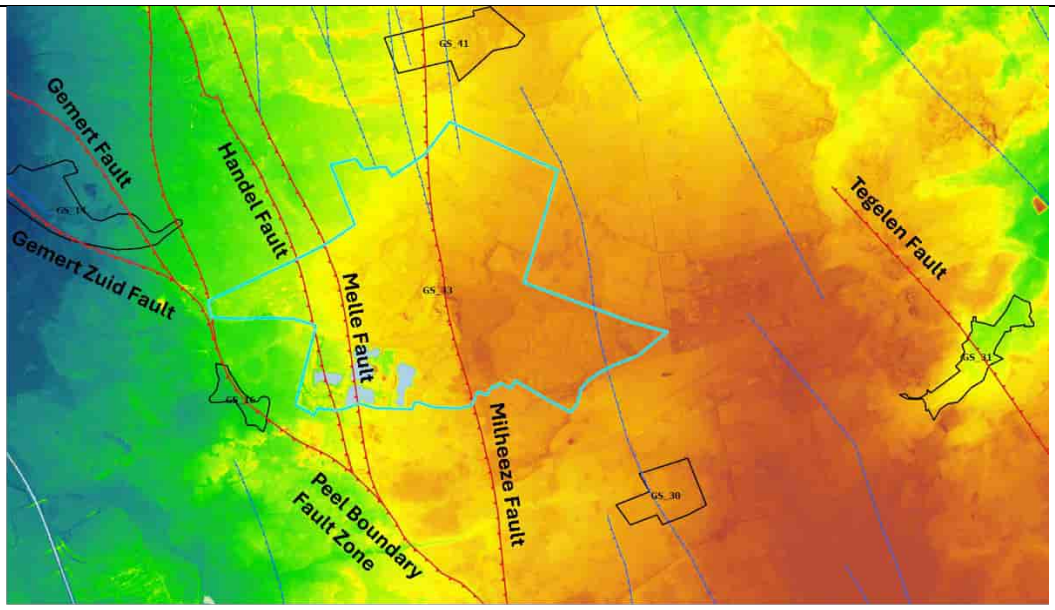
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_33 Stippelberg indicated with a light blue outline. All red faults shown, except the Tegelen Fault, are branches of the Peel Boundary Fault Zone



AHN image of GS_33 showing terrain steps along the faults of the Peel Boundary Fault Zone around the Stippelberg

Wijst area De Kaak (indicated on the map)

Geosite: GS_34 **Significance: Regional** **Coordinates (RD): 191634, 375805**	**Name** 't Zinkske, Marisberg, Molentje
Municipality	Deurne, Peel en Maas
Province and country	Noord-Brabant, Limburg
Protection status	Natura-2000
Site management organizations	Staatsbosbeheer, private oensers
Accessibility	Visitors can enter 't Zinkske via a small gate. The path contains a striking amount of rubble, originating from the church in Meijel that was destroyed during the war. The canal banks provide pleasant walking routes, although 't Zinkske is largely fenced to allow sheep grazing.
Relevance for tourism	The Peel remnant 't Zinkske is part of the Geopad Verheven Peel. The canal banks offer walking opportunities.
Relevance for education & information	Differences in groundwater levels and vegetation on either side of the Peel Boundary Fault are illustrated here.
Teaching equipment	

Description

1. Location

This geosite comprises the Peel remnants 't Zinkske, 't Molentje, and Marisberg. The elevated peatlands ("Verheven Peel") of the Deurnese Peel, Mariapeel, and 't Zinkske are bordered by the Deurne Canal. On the west side of the canal, in the seepage zone, lie wet meadow areas: Leegveld and 't Molentje.

't Zinkske is a 130-hectare Peel remnant located between Neerkant and Helenaveen in the municipality of Deurne. It forms a small, separate part of the much larger Deurnese Peel. The Zinkske lies on the provincial border with Limburg, just north of the point where the Helenavaart and the Deurne Canal meet.

2. Landscape formation and description

Origin of the landscape

Peel remnant with hydrological nature restoration. 't Zinkske is one of the remaining fragments of the once vast Peel bog. Traces of the earliest peat extraction remain here in so-called boerenkuilen (farmers' pits): peat pits dug in a single day (and refilled with water the next day). These pits are important because they still host true raised bog plants.

The Marisberg woodland is the highest area of the Peel Horst, lying four to five metres higher than 't Molentje. The microrelief is striking: small variations in elevation formed in two phases. First, during the Ice Age, wind created a gently undulating sandy landscape. Later, in the Middle Ages, deforestation caused renewed sand drift, which was later stabilised by reforestation.

During the middle part of the Ice Age, the River Meuse still flowed through what is now 't Molentje, carving a broad, shallow valley that was later filled with raised bog. Seepage water from the nearby Marisberg, 4–5 metres higher and located on the other side of the Peel Boundary Fault, was blocked

by the impermeable fault, creating marshy conditions. This is demonstrated by a double groundwater gauge.

Geomorphology:

Hydrology:
The Marisberg is important for the Peel's water system because it lies at a watershed junction: one north–south through the Mariapeel, another along the Noordervaart.
Peat formation at 't Molentje is explained not only by the presence of the old Meuse valley but also by seepage against the Peel Boundary Fault. Together, they form a large wijst area. The seepage originates from the Marisberg, where rainwater infiltrates, flows over a relatively low-lying impermeable layer (Breda Formation) westwards, and resurfaces as seepage because it is forced upward against the impermeable Peel Boundary Fault. This infiltration–seepage system is explained and visualised by a double groundwater gauge showing both seepage water (in deeper layers) and groundwater (in upper layers). Between them lies a thin impermeable layer, probably formed on the floor of the former Meuse valley, creating a perched water table.
The excavated Blankerplas in the Molentje area is also fed by seepage water.

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History
The Zinkske is one of the remaining Peel remnants of the once immense Peel bog. Traces of the earliest peat extraction remain in boerenkuilen, which are important because they still support true raised bog vegetation.
The Marisberg area is relatively high, and several Roman finds have been made nearby, suggesting possible agricultural use in Roman times. There may still be remnants of an ancient agricultural landscape beneath the sand drifts. Further research (deeper drilling) is needed to confirm this.

Flora & Fauna:
Alongside the cut-over peat plain, now covered with heath, a young birch forest grows, and remnants of an old peat canal (het wiekie) are visible.
To the south, 't Zinkske connects to the former wet farmland 't Molentje and the Peel remnant Heitrakse Peel. Together, these three areas, linked by the Deurne Canal, form a coherent, extensive nature zone, almost entirely owned by Staatsbosbeheer. Southwards, this zone continues along the Helenavaart into the municipality of Peel en Maas (formerly Helden) with nature reserves such as Scherliet, Het Kwakvors, and Marisberg.
On the dry, sandy Marisberg, water infiltrates and re-emerges in species-rich wet grasslands. Between these lie the raised bog remnants Scherliet and Zinkske, where living sphagnum moss still occurs locally. This infiltration–seepage system, demonstrated by two groundwater gauges, illustrates on a small scale how the vast Peel bog developed. The moorland is home to many water and marsh birds, observable from a bird hide at the Blankerplas. Surrounding peat meadows host waders such as curlew, lapwing, and black-tailed godwit. Historical traces remain, such as two old peat canals (with many beaver gnaw marks).
On the north-east side of Meijel lies the restored nature reserve 't Molentje, which became farmland after peat cutting. For restoration, the topsoil was removed. It lies above the Peel Boundary Fault, and

buffered groundwater supports wijst indicator species such as royal fern, six-stamened waterwort, tuffed loosestrife, bristle club-rush, marsh lousewort, and heath lousewort. The Blankerplas attracts ducks, waders (when mudflats are exposed), and dragonflies, thanks to seepage-fed waters.

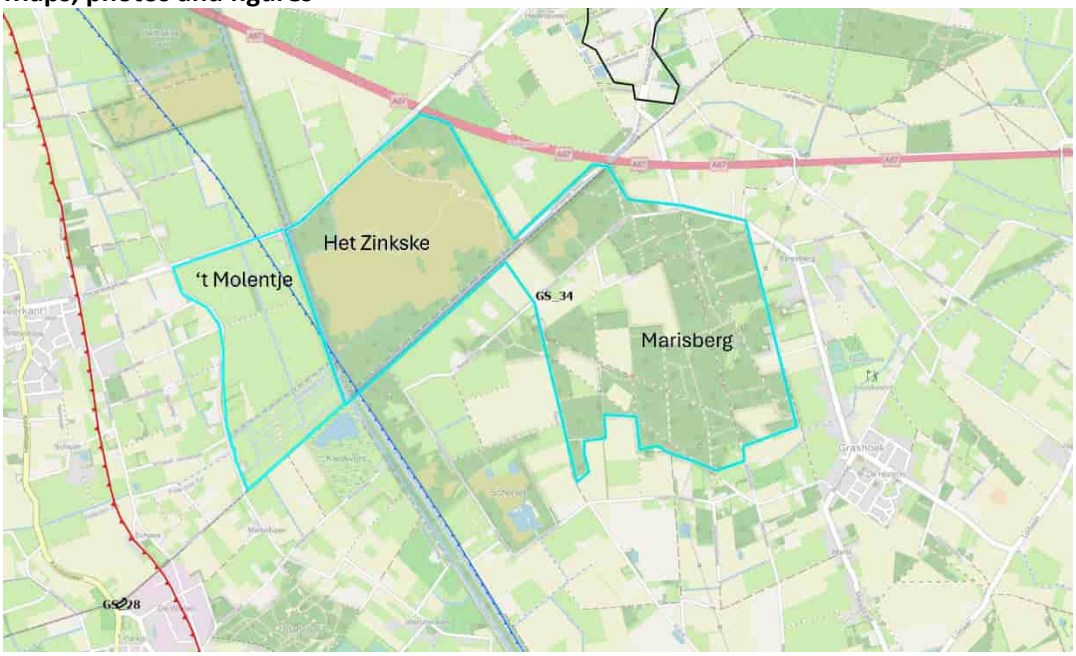
Industrial & Economic:

4. Relation with other geosites

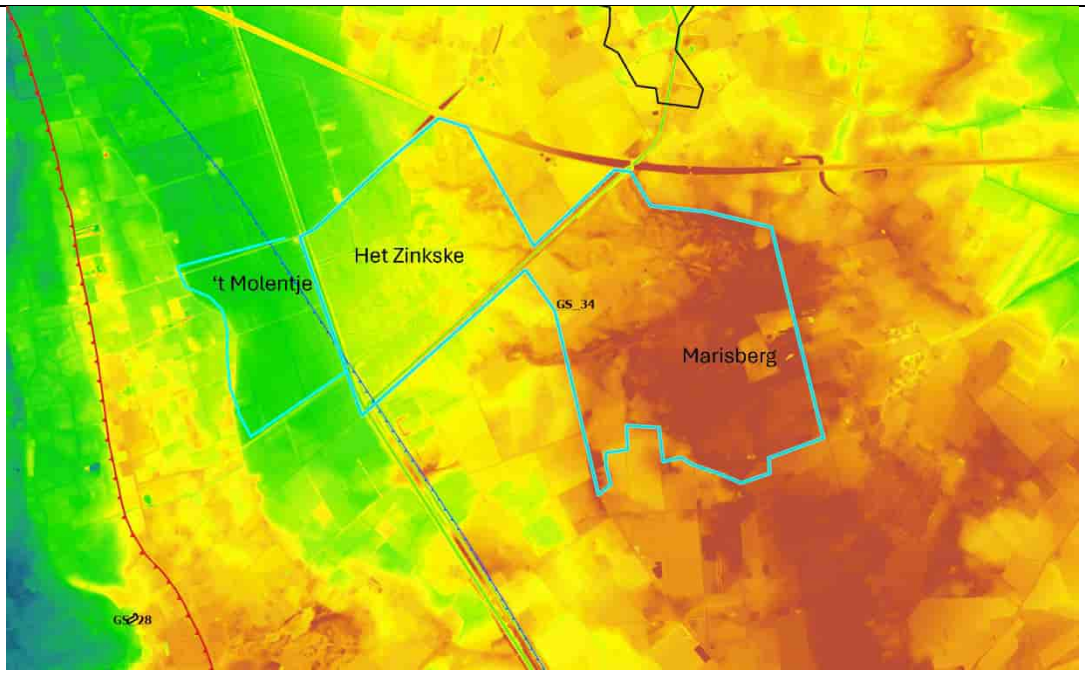
Deurnse- en Mariapeel (GS_11)

5. Documentation & Resources

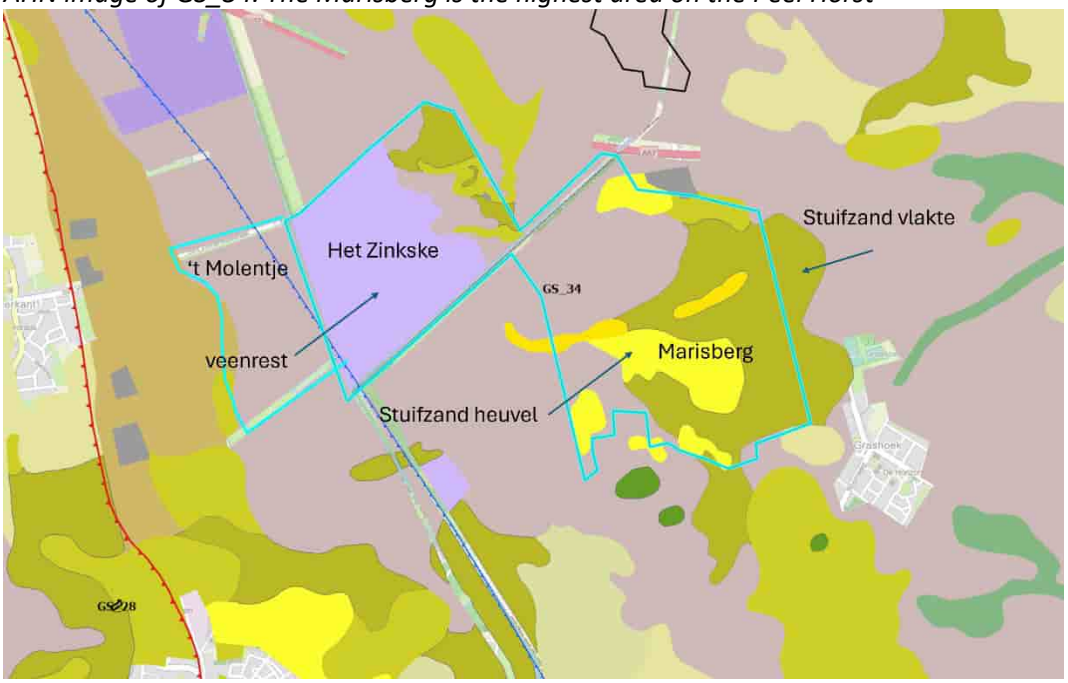
6. Maps, photos and figures



Location of GS_34 with the Zinkske, Marisberg, and 't Molentje



AHN image of GS_34. The Marisberg is the highest area on the Peel Horst



Highly varied geomorphology with cut-over peatlands, peat remnants, and wind-formed sandy areas

Geosite: GS_35 **Significance: National** **Coordinates (RD): 176780, 414199**	**Name** De Hooge Raam
Municipality	Land van Cuijk - Maashorst
Province and country	Noord-Brabant
Protection status	Natuurnetwerk Nederland (NNN), Natte Natuurparel
Site management organizations	Waterschap Aa en Maas
AccessibilityH	The area is located near Hoogeweg, Zandvoortsestraat, and Busweg, with several access points and walking opportunities.
Relevance for tourism	Recreation is an important component of the area plan. Space is explicitly created for walking, cycling, and nature experience, but mass tourism is not desired. The emphasis is on small-scale, sustainable recreation.
Relevance for education & information	
Teaching equipment	

Description

1. Location

The Hooge Raam nature reserve lies in the village of Zeeland on the border with Langenboom. It consists of a wijst reserve, a restored section of the Hooge Raam stream, and the centuries-old Smitsbos woodland. The brook, the Hooge Raam, rises in a wijst area located on the Peel Horst, flows through the Smitsbos, and joins the Raam (or Graafsche Raam) just south of Escharen. The Raam flows into the River Meuse at Grave.

2. Landscape formation and description

Origin of the landscape

The brook “Hooge Raam” originates in a wijst reserve situated above one of the southern faults of the Tegelen Fault Zone. The area between this southern branch and the northern branch near Mill forms an elevated horst structure. The wijst area lies on this horst, and the seepage water drains northwards via the Hooge Raam brook.

Geomorphology:

A total of 150 hectares of new nature will be created, including woodland and restoration of historical elevation differences. Implementation of the redevelopment is expected to start in 2026/2027.

Hydrology:

The excavated banks of the Hooge Raam form a steep edge, fed by iron-rich seepage water. The area has been designated as a Natte Natuurparel (Wet Nature Pearl) and will feature a natural stream course, providing space for water, nature, and recreation.

Deposits & Fossils:

River & Streams:
The wijst reserve was established in 2005 and forms part of the valley of the old Hooge Raam. Downstream, land along the brook has been purchased and the bank excavated. In one section, the meander has been restored.

3. Geosite Interests

Cultural History
The planned redevelopment will make the area more accessible and enjoyable, with attention to cultural history and landscape quality.

Flora & Fauna:
The Hooge Raam flows through the wijst reserve in a historic channel dating from before land consolidation. During restoration, the old seed bank was exposed, allowing the original vegetation to return in part. In recent years, a distinctive marsh orchid has appeared, considered an ecotype and variety of the Hooge Raam. Iron-rich seepage (wijst) binds phosphates, enabling the original flora to recover. A small population of heath spotted orchids is an example of this.
The Smitsbos is characterized by alder carr woodland, with transitions to bird cherry–ash woodland. Due to desiccation, common silver birch, pedunculate oak, and American black cherry have expanded significantly. The woodland is highly valuable for its rich flora, including common seepage indicators such as garlic mustard and lesser celandine, as well as rarities like Herb Paris, Moschatel, Lords and Ladies, and opposite-leaved golden saxifrage (“Goudveil-Essenbos”). This is the only site of this rare plant community in Brabant.
In recent years, beavers have settled in this area, precisely in the zone designated for free meandering. Beaver activity, such as dam building, influences water levels and contributes to natural dynamics. The Hooge Raam sometimes dries up in summer; however, pools behind beaver dams allow fish and macrofauna to survive. Kingfishers and reed birds such as Reed Warbler, Marsh Warbler, Reed Bunting, and Bluethroat breed here.

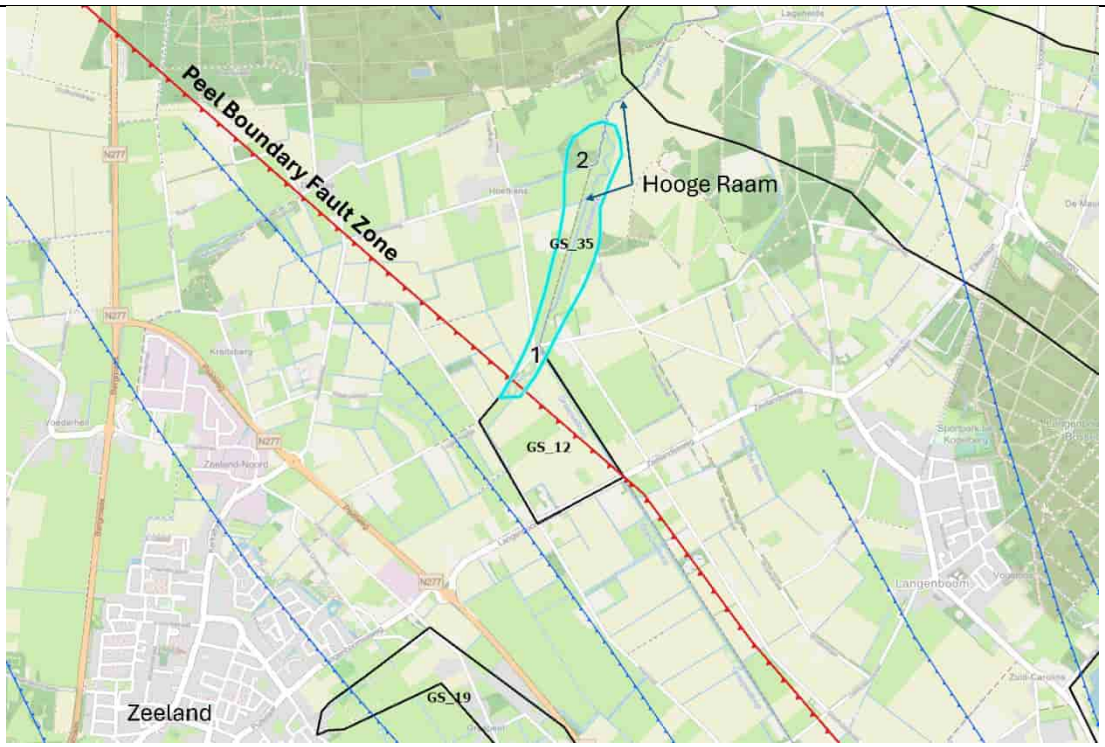
Industrial & Economic:
At the point where the Rusvensche Loop enters the old Hooge Raam channel via a weir lies the centuries-old Smitsbos. The Smitsbos was established by the Smits family from Reek, organ builders (organ of St James the Greater Church in Zeeland, municipality of Landerd). For organ building, wood from crack willow was used, both planted and naturally occurring here.

4. Relation with other geosites

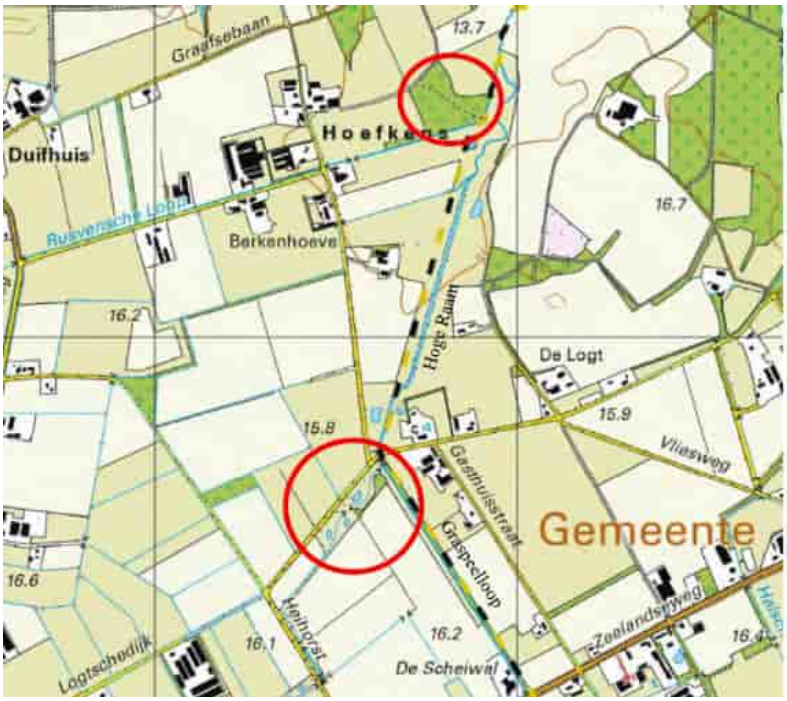
GS_12 Wijstboerderij Zeeland borders this geosite to the south.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_35 De Hooge Raam indicated with a light blue outline



Detail map showing the Hooge Raam (1) and the Smitsbos (2) circled

Geosite: GS_36 **Significance: Regional** **Coordinates (RD): 192281, 410678**	**Name** De Vilt
Municipality	Land van Cuijk
Province and country	Noord-Brabant
Protection status	Designated nature reserve with special ecological value
Site management organizations	Stichting Brabants Landschap
Accessibility	Several access gates are available.
Relevance for tourism	Car parks at De Kleine Vilt and De Grote Vilt. Various walking routes.
Relevance for education & information	Various excursions organised by IVN
Teaching equipment	
Scientific interest	Palaeogeographical reconstruction of the River Meuse, Woolderink et al., 2018.

Description

1. Location

De Vilt is a nature reserve located between Oeffelt and Beugen in the Dutch province of Noord-Brabant. It covers an area of 154 hectares and is owned by Stichting Brabants Landschap.

2. Landscape formation and description

Origin of the landscape

During the Allerød period (10,950–11,900 years ago), the River Meuse flowed here, cutting a large bend (meander) through the landscape. During the Younger Dryas, the climate became significantly colder once more, and the meandering river changed into a braided system with a wide riverbed that cut through the old meanders (see Woolderink et al., 2018). Since the last Ice Age, the Meuse has resumed meandering and has shifted in a north-easterly direction on the tectonically tilting Venlo Block. During the Holocene, the Meuse valley experienced an above-average number of shifts, visible today as abandoned meander loops. The valleys of streams that developed mainly after the Younger Dryas also indicate a drainage system caused by tectonic tilting, originating at the Tegelen Fault and discharging into the Meuse.

Geomorphology:

De Vilt lies in the floodplains of the present-day Meuse and represents an abandoned Meuse meander from around 12,000 years ago, now recognisable as low-lying wet areas or oxbow lakes. The former river bend now forms an attractive enclosed landscape with striking elevation differences. On the high inner bend of the river, known as Hoog Werveld, lie open fields. In the channel itself, called Laag Werveld, there is a mosaic of water, wet woodland, and moist grasslands. The woodland and grasslands occupy the less deeply excavated or now silted-up parts of the channel.

Hydrology:

Deposits & Fossils:

River & Streams:
De Vilt represents an old Meuse bend that was cut off from the river between 9000 and 1000 BC. The elevated inner bend (point bar or omloopberg) is characterized by river deposits of sand and gravel. To construct the railway between Boxtel and Wesel, the point bar was almost completely excavated. De Vilt illustrates the contrast between natural cut-offs of Meuse bends and those artificially created in the 20th century, such as those north of the weir and lock complex at Sambeek. This complex can be visited, and during guided tours, lock attendants explain the operation and history of the weir and locks.

3. Geosite Interests

Cultural History
After the Meuse bend at De Vilt was cut off, a peat bog formed here, lasting until the Middle Ages when people learned to use peat as fuel. The peat was excavated, and in the deepest pits, the lakes De Vilt and De Kleine Vilt formed. Around 1850, peat extraction resumed, and by 1920 all the peat had been removed.

Flora & Fauna:
Nadat al het veen was afgegraven, begon de Vilt weer te verlanden en in de jaren 50 en 60 van de 20e eeuw waren er soorten te vinden als Roerdomp, Zwarte stern en Boomkikker. Daar de Oeffeltse Raam dwars door het gebied stroomde, en deze in die tijd sterk vervuild was en ook voedselrijk water bracht, verruigde het gebied. Toen dit riviertje was gesaneerd werd een plan tot natuurherstel uitgevoerd tussen 2007 en 2010. Huidige zeldzame plantensoorten en indicatoren van kwel in het gebied zijn Waterdrieblad, Draadzegge en Grote boterbloem. De Oranjetip is een vlinder die in moerasweitjes te vinden is. Tot de broedvogels behoren: Grauwe gans, Dodaars, Waterral en Ransuil. In 2007 werden twee ooievaarspalen geplaatst, waarvan sindsdien ieder jaar minstens één bezet is.

After peat removal, De Vilt began to silt up again. In the 1950s and 1960s, species such as Eurasian Bittern, Black Tern, and European tree frog were present. The Oeffeltse Raam stream flowed through the area, but at that time it was heavily polluted and nutrient-rich, causing the area to become overgrown. After the stream was cleaned up, a nature restoration plan was implemented between 2007 and 2010. Current rare plant species and seepage indicators include Bogbean, Slender Sedge, and Greater Spearwort. The Orange Tip butterfly is found in the marsh meadows. Breeding birds include Greylag Goose, Little Grebe, Water Rail, and Long-eared Owl. In 2007, two stork nesting poles were installed, and at least one has been occupied every year since.

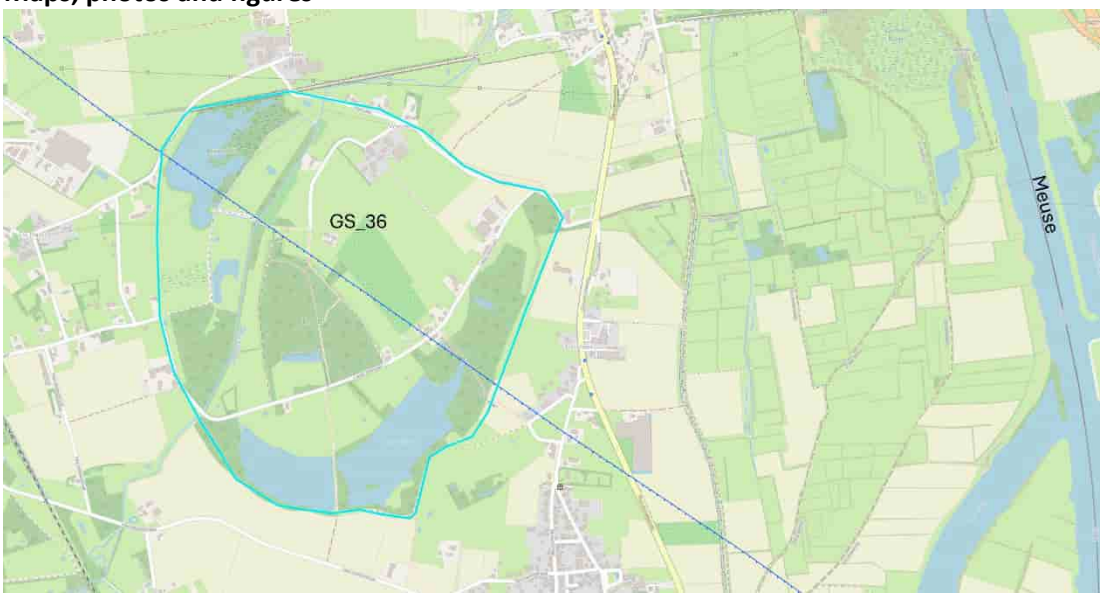
Industrial & Economic:
After the closure of the Meuse bend at De Vilt, a peat bog formed here, until the Middle Ages when people learned to use peat as fuel. The peat was excavated, and in the deepest excavated depressions, the waters De Vilt and De Kleine Vilt formed. Around 1850, peat extraction began. By 1920, all the peat had been removed.

4. Relation with other geosites

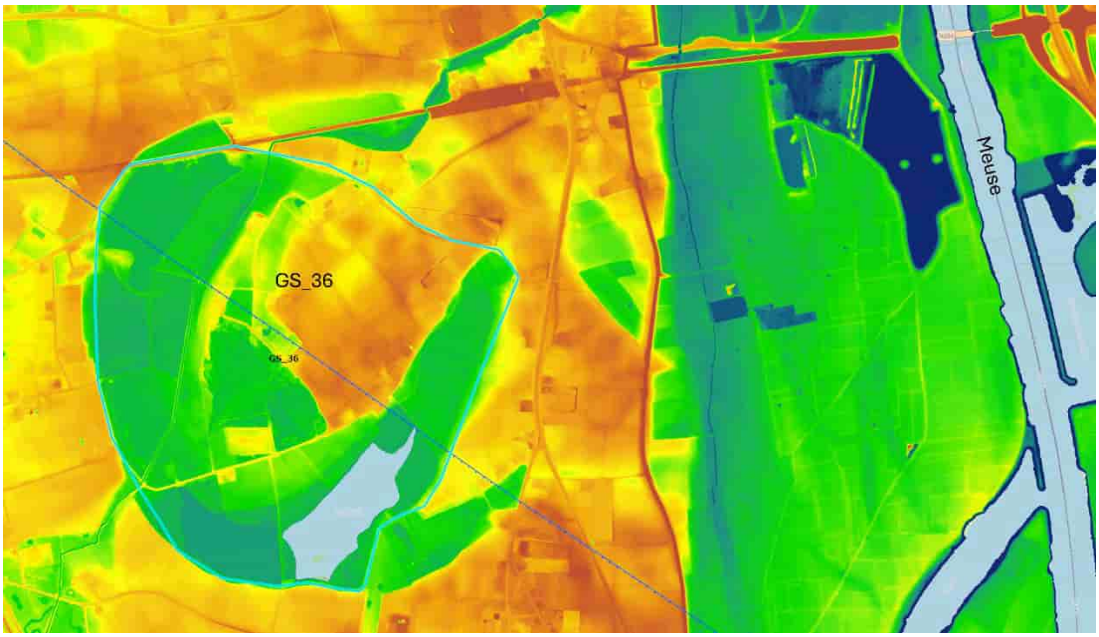
Maasheggen (GS_01)

5. **Documentation & Resources**
   https://nl.wikipedia.org/wiki/De_Vilt

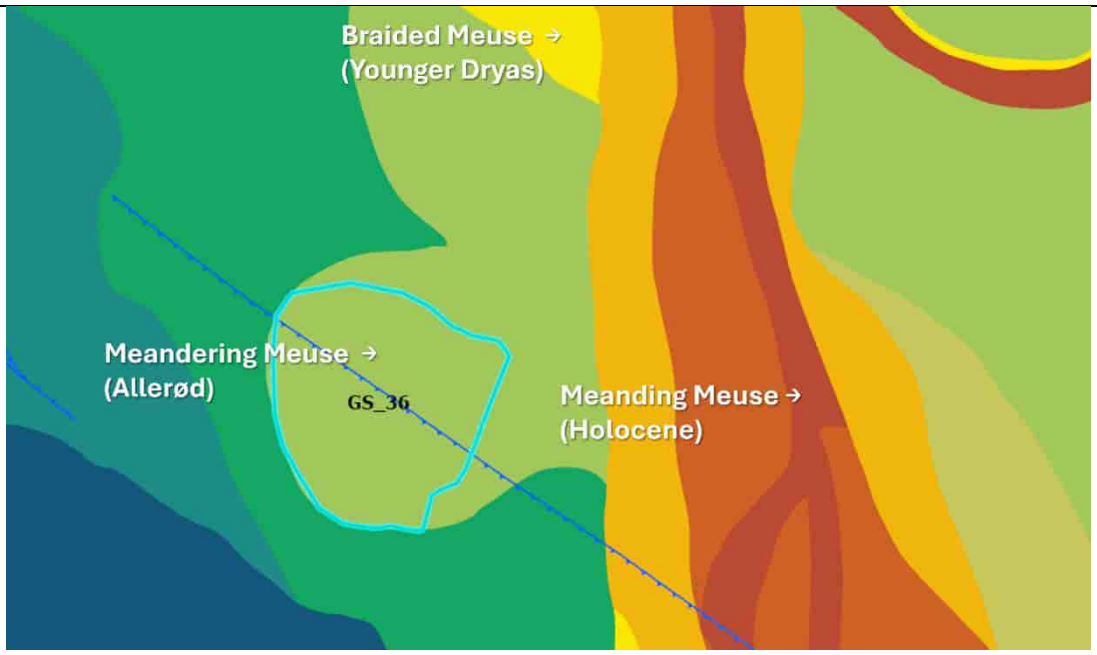
6. **Maps, photos and figures**



Location of GS_36 De Vilt indicated with a light blue outline



AHN image of GS_36 clearly showing the abandoned Meuse meander



Reconstruction of former Meuse courses (Woolderink et al., 2018): Green colors – meandering Meuse before the last Ice Age, Yellow – braided Meuse during the last Ice Age, Orange colors – meandering Meuse after the last Ice Age.

Geosite: GS_37 **Significance: Regional** **Coordinates (RD): 188755, 402074**	**Name** Watermolen Oploo
Municipality	Land van Cuijk
Province and country	Noord Brabant
Protection status	
Site management organizations	De Hollandsche Molen
Accessibility	The watermill is open to the public.
Relevance for tourism	Several walking and cycling routes pass by the watermill.
Relevance for education & information	
Teaching equipment	

Description

1. Location

The watermill D'n Olliemeulen stands in Oploo on the Vloet brook (also called the Oploose Molenbeek), close to the windmill De Korenbloem.

2. Landscape formation and description

Origin of the landscape

The choice of location for the watermills was partly determined by the point where the Vloet brook crosses the Tegelen Fault. Strong seepage in front of the fault ensured a relatively constant water supply, while the difference in elevation between the horst and the graben provided additional fall for water power.

Geomorphology:

Hydrology:

Wijst phenomena (iron-rich seepage zones).

Deposits & Fossils:

River & Streams:

This geosite clearly illustrates that the most suitable location for a watermill on a brook is at or just downstream of the point where the brook crosses a fault. Along the Tegelen Fault, several waterwheel mills have operated since the Middle Ages. They functioned thanks to the streams draining the Peel Horst towards the River Meuse.

3. Geosite Interests

Cultural History

The mill belonged in 1516 to the Lordship of Oploo under the Van Steenhuys family. The current mill building dates from 1725. Over the centuries, the mill has been used as an oil mill, grain mill, and peeling mill. The watermill operated as an oil mill until the early 20th century. Because the water level of the Vloet was not always sufficient, horse power was also used to keep the mill running. Later, the mill switched to grinding grain, first using water power and later with the help of a diesel engine. In 1800, a windmill—the post mill De Korenbloem—was built near the watermill to allow milling in all seasons.

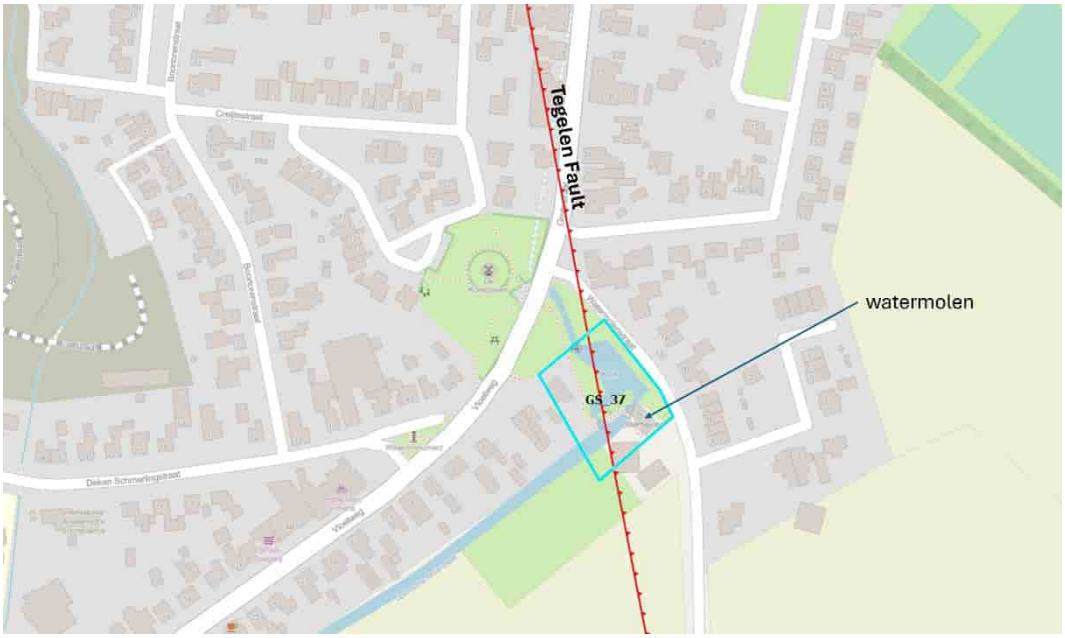
Flora & Fauna:

Industrial & Economic:

4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_37 Oploo Watermill indicated with a light blue outline.

D'n Olliemeulen – photo courtesy of Marcel van Nies (30-08-2016)

Geosite: GS_38 **Significance: Regional** **Coordinates (RD): 162763, 414244**	**Name** De Berkt
Municipality	Bernheze (Heesch)
Province and country	Noord-Brabant, the Netherlands
Protection status	Provincial Nature Map and Natuurnetwerk Nederland (NNN), National Monument (no. 26527)
Site management organizations	Private ownership
Accessibility	The estate is open to the public.
Relevance for tourism	The estate is included in the regional walking and cycling route networks. Accommodation options are planned on the estate.
Relevance for education & information	IVN organises excursions on the estate.
Teaching equipment	

Description

1. Location

Castle De Berkt lies just north of the hamlet of Munnekens Vinkel in a semi-open cover sand landscape. The original surrounding estate of De Berkt unfortunately lost part of its small-scale landscape elements during large-scale land consolidation in the 20th century.

2. Landscape formation and description

Origin of the landscape

This geosite is located in the Roer Valley Graben, a tectonically subsiding area bounded on the east by the Peel Boundary Fault. However, immediately west of De Berkt lies another fault line, considered a subsidiary fault of the Peel Boundary Fault Zone. Because groundwater flows from east to west and the vertical fault plane is less permeable to water than the surrounding sediment, the presence of this fault creates relatively wet conditions at De Berkt and the local occurrence of wijst phenomena.

Geomorphology:

The landscape of the Roer Valley Graben is dominated by a cover sand relief intersected by shallow stream valleys, though this was degraded by large-scale land consolidation in the 20th century. Castle De Berkt stands on a cover sand ridge, which in the Middle Ages was further raised by applying a mixture of stable manure and heath sods (so-called potstal culture).

Hydrology:

Local wijst occurs: the emergence of iron-rich seepage water due to the nearby presence of a poorly permeable fault plane. This can be recognized by the blue sheen of iron oxide on the water surface.

Deposits & Fossils:

A c. 10 m thick layer of silty sand (Middle and Late Pleistocene periglacial deposits; Boxtel Formation) is generally overlain by a 1–2 m thick layer of low-silt cover sand (Late Pleistocene aeolian deposits; Boxtel Formation, Wierden Member). At De Berkt, a mixture of stable manure and heath sods was

applied on top of the cover sand, enriching and thickening the soil (known as ‘esdek’).

River & Streams:
Drainage in the area is provided by a network of ditches, partly following former stream courses such as the Vinckel.

3. Geosite Interests

Cultural History
Castle De Berkt originally formed part of the De Berkt estate, which emerged around 1800 through the reclamation of heathland and marshland. At that time, the landscape consisted of shallow stream valley soils situated between the Vinckel brook and the higher, already cultivated arable lands of the hamlets Munnekens Vinkel and Zoggel. Today, remnants of the old estate remain: historic buildings, a moat, an old orchard with standard fruit trees, a star-shaped woodland, monumental trees, and avenues.

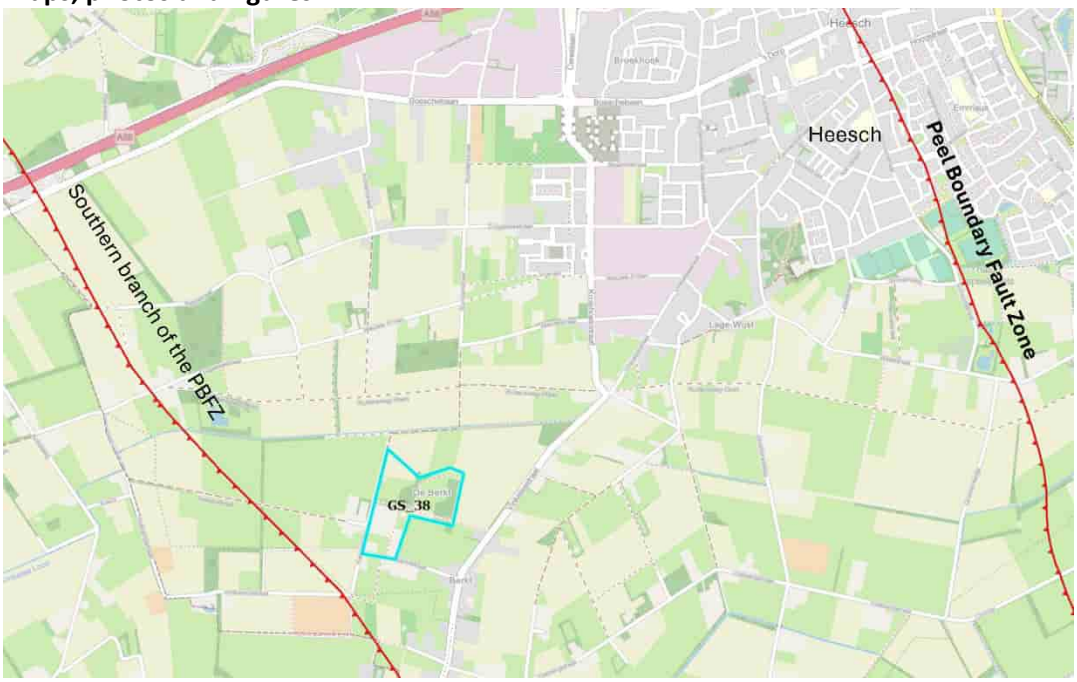
Flora & Fauna:
Rare plant species such as Greater Tussock-sedge and Flowering Rush, along with rich woodland species like Male Fern, Yew, and Holly, indicate the presence of iron-rich seepage water (wijst).

Industrial & Economic:

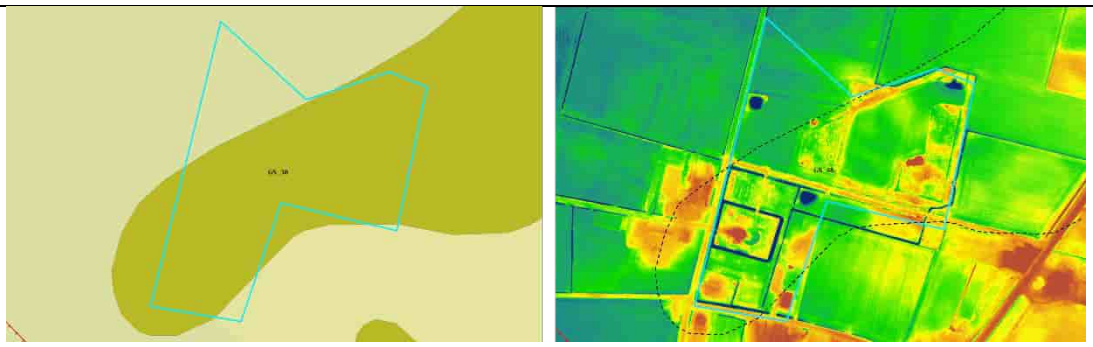
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_38 De Berkt indicated with a light blue outline. The geosite lies strictly within the Roer Valley Graben, between the main Peel Boundary Fault Zone and a southern branch of it



Left: De Berkt lies on a cover sand ridge (olive green). Right: Despite degradation by land consolidation, the cover sand ridge (dashed line) is still visible in the AHN image.

Castle De Berkt (photo: Annélien van Kuilenburg)

Geosite: GS_39 **Significance: Regional** **Coordinates (RD): 168512, 414416**	**Name** Het Loo
Municipality	Bernheze
Province and country	Noord-Brabant, The Netherlands
Protection status	Brabants Landschap and part of the Natuurnetwerk Nederland (NNN)
Site management organizations	Staatsbosbeheer
Accessibility	Easily accessible via walking and cycling paths
Relevance for tourism	Walking trails such Boswachterspad, several Canoe routes
Relevance for education & information	
Teaching equipment	

Description

1. Location

Het Loo is a woodland and heathland area east of the A50 in the municipality of Bern

2. Landscape formation and description

Origin of the landscape

This geosite lies on the Peel Horst and consists of a woodland and heathland area intersected by the south-west to north-east trending Peel Boundary Fault. Over the barely visible fault lie several broad, shallow stream valleys that locally give rise to wijst phenomena. These valleys formed during the last Ice Age, when rain and meltwater could not infiltrate due to permafrost, instead flowing over the surface and carrying away part of the sandy sediment. The heathland is a cultural landscape created by overgrazing and soil erosion in the Middle Ages. Wind-blown sand from exposed soils formed elongated drifting sand ridges.

Geomorphology:

The cover sand and drifting sand relief are still relatively intact, though poorly visible in the field due to forest cover. The broad, shallow stream valleys on the south-western side have largely been parcelled out, disturbing the original morphology.

Hydrology:

Due to large-scale lowering of the groundwater table, seepage water (wijst) now only appears locally at the surface. Currently, watercourses are being made shallower and weirs installed to retain more water in the area.

Deposits & Fossils:

Coarse, gravelly river sand deposited by the Rhine and Meuse (Early and Middle Pleistocene; Waalre and Beegden Formations) is locally overlain by a 1 m thick layer of silty cover sand deposited by wind at the end of the last Ice Age (Late Pleistocene; Boxtel Formation). On top of this lie several elongated

drifting sand dunes (Holocene; Boxtel Formation, Kootwijk Member), formed by human activity.

River & Streams:
The narrow, canalised brook south of the hamlet of Het Loo lies in a broad, shallow periglacial valley and is therefore an example of an “underfit river”.

3. Geosite Interests

Cultural History
Nearby are the cultural-historical sites Paalgraven and Vorstengraf, though these are not part of this geosite.

Flora & Fauna:
Grazing European bison keep the heathland open and varied.

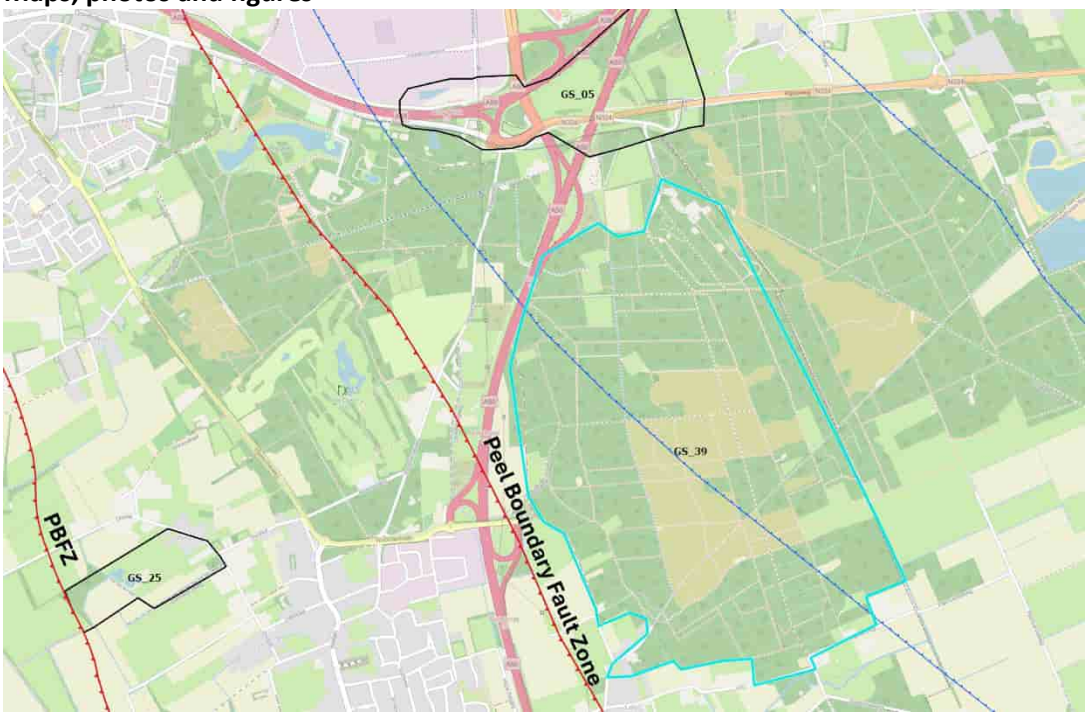
Industrial & Economic:

4. Relation with other geosites

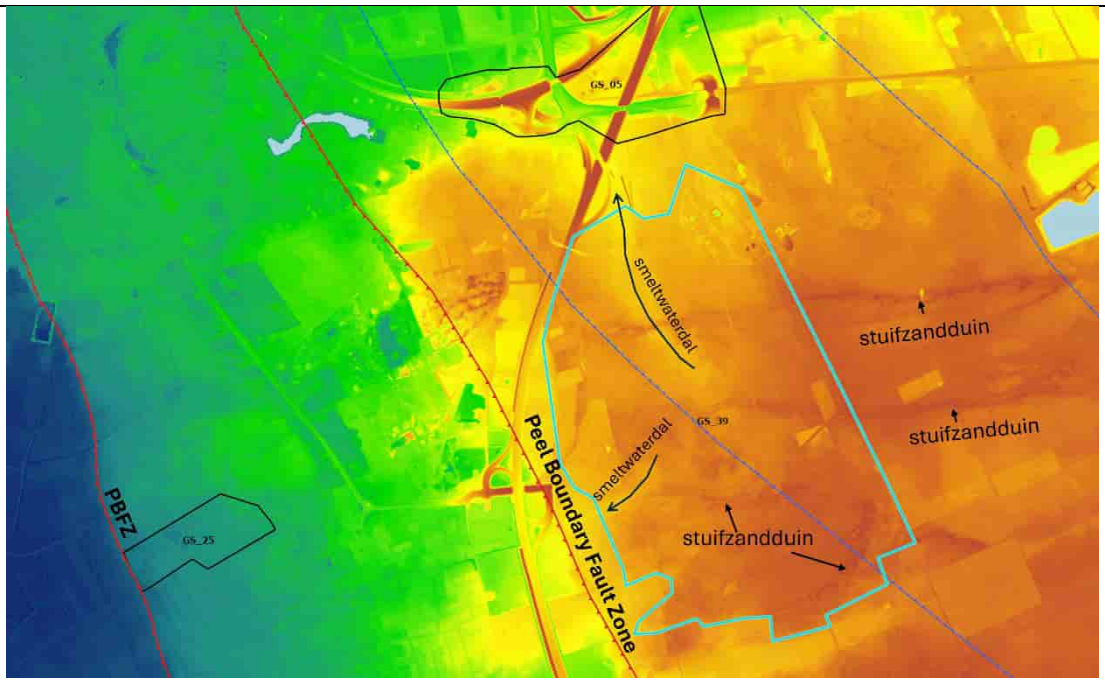
This area has a similar setting to Slabroek (GS_13), though the landscape around Slabroek is somewhat better preserved.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_39 Het Loo indicated with a light blue outline



AHN image of GS_39 clearly showing higher ground on the eastern side of the Peel Boundary Fault and drainage patterns

Geosite: GS_40 **Significance: Regional** **Coordinates (RD): 192246, 367671**	**Name** Waterbloem
Municipality	Leudal
Province and country	Limburg
Protection status	Natte Natuurparel
Site management organizations	Staatsbosbeheer
Accessibility	Via Heibloem
Relevance for tourism	
Relevance for education & information	
Teaching equipment	

Description

1. Location

On the border between Meijel and Heibloem in the municipality of Leudal lies the Waterbloem nature reserve (450 ha), intersected by the Roggelsche Beek. The Peel Boundary Fault runs east of Waterbloem but shows multiple branches here. The Waterbloem nature reserve is a former poorly drained depression enclosed by the Peel Horst, up to 3 metres higher on the north side, and cover sand ridges on the south side. Until around 1850, this area was an extensive marshland, but today it consists of a highly varied woodland landscape with patches of heath, farmland, and still some wetlands.

2. Landscape formation and description

Origin of the landscape

The Waterbloem area clearly illustrates the complexity of a fault zone in relation to the deposition of cover sand during the last Ice Age. Here, the Peel Boundary Fault branches into several faults, creating multiple horsts and grabens. The impermeability of individual faults explains the occurrence of numerous wijst phenomena. It is an extensive area with wet and dry forests, occasional moist grasslands, and several artificial streams.

Geomorphology:

On the road from Panningen to Heibloem, the elevation drops by 1.5 m over a distance of 75 m at the Peel Boundary Fault. In other places, the difference can reach up to 3 m. The high arable field on the west side of the road borders a lower-lying wet meadow.

Hydrology:

Here, the hydrological situation appears reversed: the wet areas lie below the Peel Boundary Fault, and the dry areas above it. The near absence of wijst phenomena with iron-rich seepage is also atypical. This is explained by the presence of large amounts of cover sand deposited over the Peel Boundary Fault, which almost eliminated the fault-related elevation difference. The loam and loamy

sand at the base of the cover sand prevent water from draining away easily. The construction of the drainage canal on the Peel Horst also ensured that seepage water was quickly removed, greatly reducing the supply of wijst water towards the Roer Valley Graben and thus limiting wijst phenomena. The presence of alder carr and birch carr woodland indicates a subsidiary fault (branch) of the Peel Boundary Fault on the western side of Waterbloem: a seepage zone and rainwater lens.

Deposits & Fossils:
Cover Sand ridges

River & Streams:
The Roggelse Beek lies in an old Meuse channel, which the brook has incised over the centuries to keep pace with the deepening Meuse. This has created a significant elevation difference in the landscape. The original source of the Roggelse Beek lies in the wetland nature reserve Waterbloem, north of Heibloem. The brook flows through the Leudal nature reserve (where it is called the Zelsterbeek) towards the Meuse. The Roggelse Beek was straightened in the 1960s–70s. Some sections, such as here, have been restored and now meander again as before.

3. Geosite Interests
Cultural History
From 1850 onwards, the marshy Waterbloem was reclaimed and managed as an estate by the Haffmans notary family, who also used it as a hunting ground. Staatsbosbeheer later planted production forests here.
That the higher side of the Peel Boundary Fault must once have been much wetter (before the drainage canal was built) is evident from the elevated position of roads and names such as Roggelse Dijk, which formed part of the trade route between Cologne and ’s-Hertogenbosch. This road dates back at least to the 18th century and was well maintained to remain passable year-round.

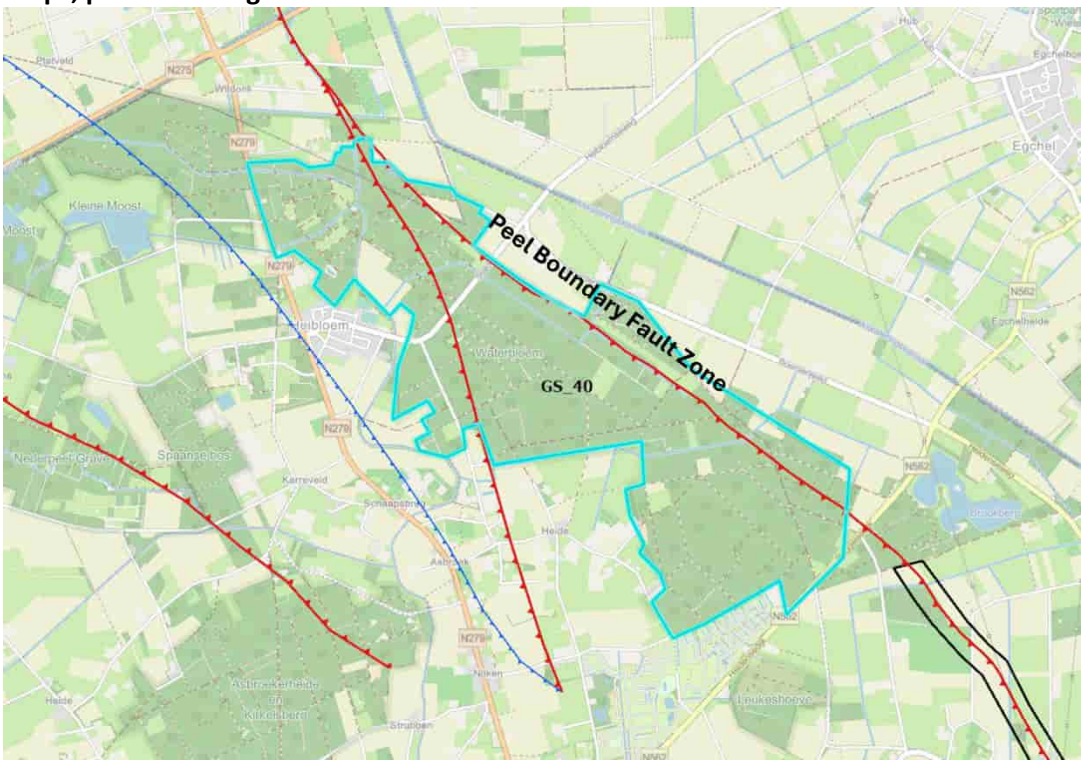
Flora & Fauna:
These wijst areas in Waterbloem are marked by alder carr woodland. In addition to the well-known wijst indicator Water Violet (probably the origin of the name Waterbloem), the relatively rare Floating Water-Plantain, which is protected under European law, also occurs here. The presence of Marsh Violet, Lousewort, Heath Milkwort, and Tormentil indicates a rainwater lens. Heath Milkwort winged pea is typical of transitions from heath to marsh vegetation such as bluegrass meadows. Rare butterflies such as the Chequered Skipper and Large Chequered Sskipper still inhabit Waterbloem. The area is rich in birdlife, and the chances of encountering roe deer are high. Rooting traces reveal the presence of wild boar.
With rewetting measures, the water authority hopes to restore characteristic plant communities. The works aim to connect the nature reserve to the remaining peat bogs of the Peel and create an ecological corridor between them. Agricultural drainage water will be diverted so that water remains in the area for longer.

Industrial & Economic:

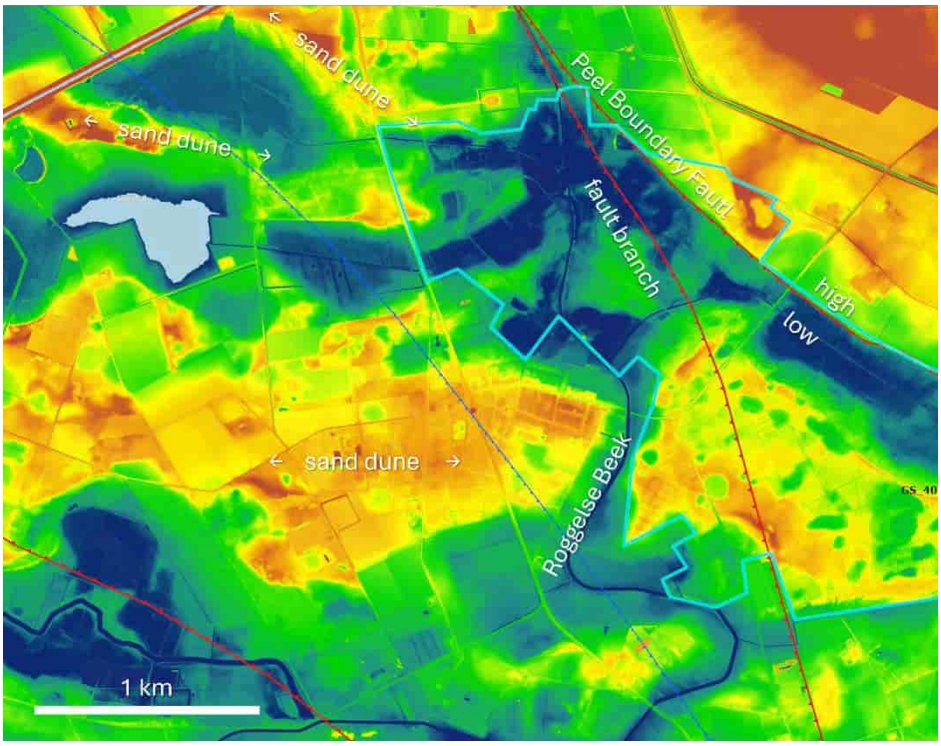
4. Relation with other geosites
The geological setting is comparable to geosite GS_28 Sint Willibrordusput.

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_40 Waterbloem indicated with a light blue outline



AHN image of GS_40 showing the various morphological elements

Geosite: GS_41 **Significance: Regional** **Coordinates (RD): 182945, 398302**	**Name** De Krim
Municipality	Gemert-Bakel (Elsendorp)
Province and country	Noord Brabant
Protection status	Natuurnetwerk Nederland (NNN)
Site management organizations	Brabants Landschap
Accessibility	
Relevance for tourism	Several cycling and walking routes pass through the area
Relevance for education & information	Informatiepanel at De Krim “Niet alles ontgonnen, heel slim” (“Not everything reclaimed – very wise”)
Teaching equipment	

Description

1. Location

De Krim is an estate in the Peel region near Elsendorp. The estate covers approximately 100 hectares and is owned by Brabants Landschap. De Krim is surrounded by other small nature reserves managed by Brabants Landschap and connects to the estates Groote Sink and Bunthorst. De Krim tells the story of the last Ice Age and contains a preserved pingo ruin. Moreover, the area has never been reclaimed.

2. Landscape formation and description

Origin of the landscape

What makes the nature of the De Krim estate unique is that it has never been reclaimed. Other parts of the Peel have been restored to their former glory (such as the Klotterpeel), but De Krim, thanks to its untouched state, still contains a pingo. The majority of the area consists of wet heathland, three ponds, and the aforementioned pingo ruin, a remnant from the last Ice Age (the Weichselian). During this last Ice Age, Brabant was not covered by ice, but it was extremely cold and dry, and the upper soil layer was permanently frozen (permafrost).

A pingo is a low-lying spot where water accumulates beneath the frozen ground. In winter, this water freezes and expands, creating a circular mound. This mound persisted until the end of the Ice Age, when the accumulated ice and permafrost melted, leaving a circular depression in the ground. These depressions often became filled with peat. During various land consolidations and Peel reclamations, pingos were often completely levelled. The pingo ruin in De Krim has a diameter of about 90 metres.

Geomorphology:

The pingo ruin in De Krim has a diameter of approximately 90 metres

Hydrology:

Deposits & Fossils:

River & Streams:

3. Geosite Interests

Cultural History

The area had various owners until 1920, when it was first developed as a small-scale farm. There were three wooden cottages along the Middenpeelweg, of which one farm remains, but the vast majority of the land was never cultivated.

Flora & Fauna:

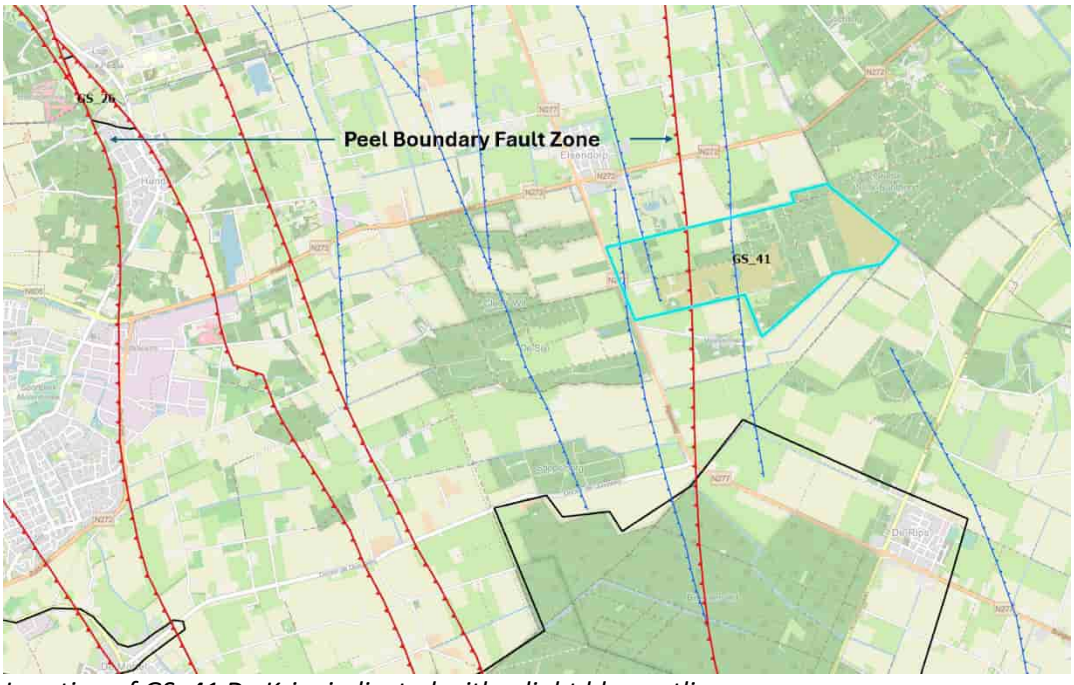
De Krim is one of the few remaining heathland relics, left untouched by landowners for hunting purposes. The idea was that a varied landscape would provide a diverse supply of game. De Krim is a habitat for the viviparous lizard, nightjar, and stonechat. Two artificial ponds host the great crested newt, a species characteristic of highly acidic waters.

Industrial & Economic:

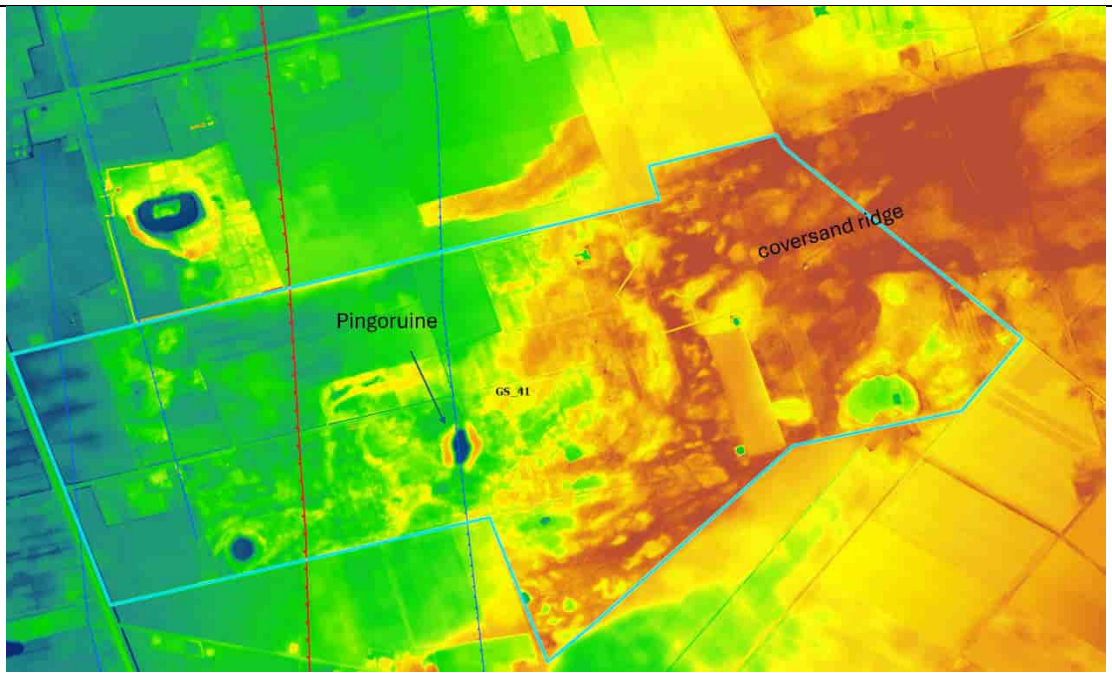
4. Relation with other geosites

5. Documentation & Resources

6. Maps, photos and figures



Location of GS_41 De Krim indicated with a light blue outline



AHN image of GS_41

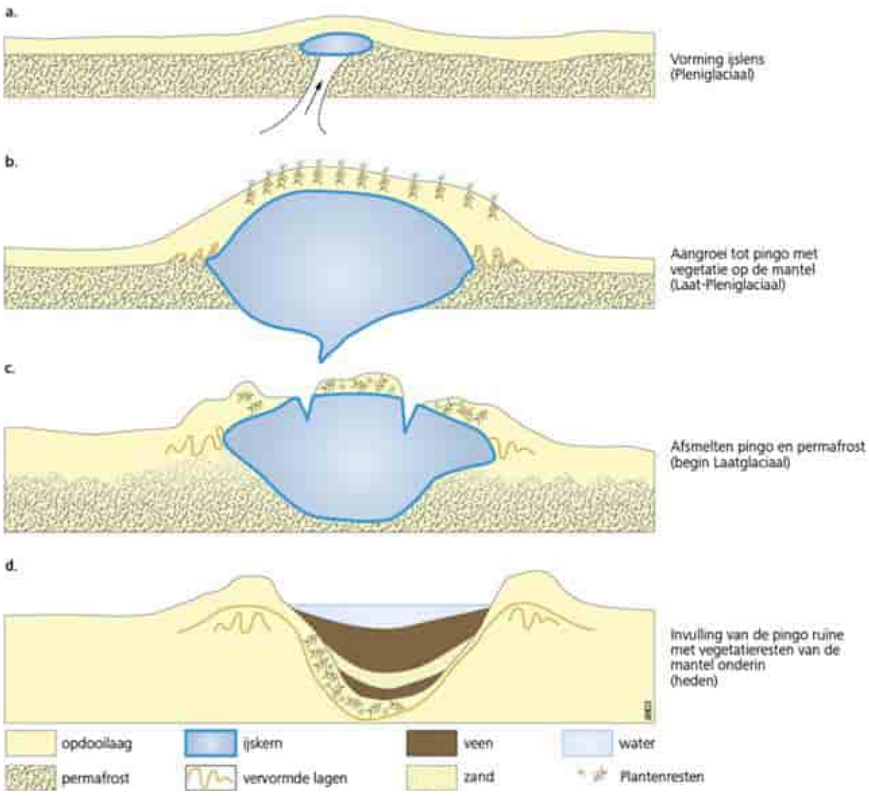


Diagram showing the formation of a pingo ruin (adapted from Drenthse Pingoruïnes website, June 2025).

Informatiepanel about de Krim

Geosite: GS_42 **Significance: Regional** **Coordinates (RD):**	**Name** De Elsbeemden
Municipality	Horst aan de Maas
Province and country	Limburg
Protection status	
Site management organizations	Staatbosbeheer
Accessibility	Access from the Maasbreeseweg.
Relevance for tourism	Several walking routes run through the area.
Relevance for education & information	
Teaching equipment	The area is highly suitable for field biology and nature education.

Description

1. Location

De Elsbeemden (beemd means wet hay meadow) is a nature reserve south of Sevenum. The area covers 65 hectares and forms part of Staatsbosbeheer's Molenbeekdal project. Two streams flow through the area: from the west comes the Groote Molenbeek, which was restored a few years ago to a meandering, shallower, but wider course; from the south comes the Elsbeek, which joins the Groote Molenbeek.

2. Landscape formation and description

Origin of the landscape

On the fault map of North Limburg, several faults are shown in addition to the Peel Boundary Fault. On the GeoparkPlus map, only the Peel Boundary Fault is indicated. However, in De Elsbeemden there are clear wijst indicators, which can be attributed to the Sevenum Fault. This fault impounds water in De Elsbeemden, creating a large area of wet grasslands or beemden. The Groote Molenbeek carries the water across the fault eastwards to the River Meuse. The beemden are nutrient-poor due to iron-rich seepage water and can only be used for haymaking. The area is rich in rushes.

Geomorphology:

Hydrology:

Due to interventions in the streams, the entire area has become wetter. The vegetation consists largely of carr woodland and wet grasslands.

Deposits & Fossils:

High iron concentrations were found mainly where deposits belonging to the marine Miocene lie relatively close to the surface (sometimes less than 10 m below ground level). These deposits formed between about 23 and 5 million years ago. The iron in the groundwater on the Peel Horst probably originates largely from glauconite, which occurs abundantly in marine Miocene sediments.

Glauconite contains high iron levels (ranging from about 6 to 19% Fe_2O_3 and 4 to 5% FeO).
In addition, remnants of the Peel peat bogs are important. The highest iron concentrations are found where water has infiltrated through peat or highly humic soils. This acidic infiltration increases the solubility of iron.

River & Streams:
The Groote Molenbeek is the longest stream on the eastern side of the Peel Horst and rises in an intake area east of the watershed near Grashoek.

3. Geosite Interests

Cultural History:
Excavations of foundations of churches destroyed during the war in North Limburg revealed that iron ore was widely used as a foundation material for churches in this region, including the church tower of Sevenum.

Flora & Fauna:
The fault line is marked by vegetation of Black Alder, grading into downy birch and pedunculate oak. Near the fault grow characteristic wijst indicators such as Guelder Rose, Spindle, Hop, and Red Ddogwood. In the streams and ditches, iron-rich seepage increases near the fault. Aquatic plants include Needle Spike-rush, Brooklime, Various-leaved Water-starwor, and Bog Pondweed.
Since 2001, the bird group ’t Hökske has monitored breeding birds here. Between 2001 and 2006, 67 bird species were recorded as breeding. In addition to common species, the group recorded an average of six pairs of Nightingales per year, as well as Stonechats, Kingfishers, Bbluethroats, Little Grebes, Water Rails, Reed Warblers, Marsh Warblers, and also Grasshopper Warblers, Yellowhammers, and Reed Buntings.

Industrial & Economic:
Iron ore was mined in the Elsbeemden near Sevenum.

4. Relation with other geosites

5. Documentation & Resources

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6. Maps, photos and figures

Location of GS_42 De Elsbeemden indicated with a light blue outline

De Elsbeemden with the Groote Molenbeek crossing the Sevenum Fault (from Ettema, 2021). See topographic map for location

Appendix B
Bibliography

This appendix contains the Bibliography compiled by the Scientific Board of the Geopark Peelhorst & Maasvallei, supplemented with the key references of this report.

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