The homecoming of religious practice: an analysis of offering sites in the wet low-lying parts of the landscape in the Oer-IJ area (2500 BC-AD 450)
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Citation for published version (APA):
A GEOLANDSCAPE MAP (A CONTRIBUTION BY PETER VOS)\(^1\)

On a geolandscape map the different geological landscapes at the surface are represented. Geological landscapes are the genetic environments in which sediments are formed, like dunes, coastal plains, mud flats and tidal creeks in salt marshes. The geolandscape map shows the last period of active sedimentation in an area. In the Oer-IJ area wind and water transport the sediments that build up the geological landscape units. These units on the geolandscape map are not necessarily formed during the same sedimentation phase. For example, the eastern coastal barriers were formed at an earlier date than the western coastal barriers. In the legend accompanying the map the different time periods which formed the different geolandscape units will be described. The geolandscape map has strong relations with the geomorphological map. But with the first the sedimentary environments that appear at the surface are of central importance and with the latter the shape of the landscape is mapped. However, the geomorphological map plays an important role in the construction of the geolandscape map as the shape of the landscape often follows the boundaries between different geolandscape units, like creek levees or intertidal flats. For this reason the AHN\(^2\) data plays an important role for the delineation of the different sedimentary deposits that are morphological visible. The borders between landscape units that are not as morphological visible, like the border between tidal area and the peat area, are determined on the basis of geological and soil maps of the area.

Another important source of information in regard of the dating of the geolandscaepes at different depths are the large scale excavations, like Assendelver Polders (1980-1983) and Broekpolder (1998-2000). These excavations are key sites from which the direct surroundings are interpreted in combination with the AHN, and geological and soil maps.

A final role in the construction of the geolandscape is expert judgement. Especially in the areas where the surface morphology is disturbed by (sub)recent building activities, the borders between the different geolandscape units are determined on the basis of insight into the Oer-IJ area.

THE GEOLANDSCAPE MAP AREA

The tidal area of the former Oer-IJ estuary lies central on the geolandscape map. The map covers the area north of the Noordzeekanaal, between the coordinates 104.5/493, 115/493, 104.5/512.5 and 115/512.5. The area borders in the west with the Younger Dunes, in the north- and south-west with the former coastal barriers, and in the east with the large peat area of the Zaanstreek.

In comparison to the mouth of the river Rijn and Maas near Rotterdam and the Waddenzee and tidal area of North Netherland, the Oer-IJ estuary is a relatively small tidal system. The distances between the different main geolandscape elements are short, and range from a few hundred meters to some kilometres.

GEOLANDSCAPE ELEMENTS IN THE OER-IJ AREA.

The categorization of the geolandscape units of the Oer-IJ area depends primary on the palaeo-tidal levels, particularly the paleo-tidal levels during the last phase of sedimentation when the landscape units established their final form and position.

Terrestrial landscapes develop above the maximum storm flood level. In the Oer-IJ area terrestrial landscapes are the dunes and the peat area that did not flood during periods of extreme high water levels (EHW).\(^2\)

Tidal landscapes are flooded during high tide. These landscapes can be divided on the basis of the frequency of the flooding. Subtidal landscapes are situated below the water level during mean low tide (MLT). The Noordzee, the tidal inlet, and the large tidal channels, which are permanently under water, are subtidal landscape units. The intertidal landscapes are situated between mean low tide (MLT) and mean high tide (MHT). The sandy

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\(^1\) This text is a translation by the author of a Dutch text written by Peter Vos specifically for this thesis.

\(^2\) Actueel Hoogtebestand Nederland = Current record of heights of the Netherlands.

\(^3\) According to Vos and Van Heeringen (1997) extreme high water levels are the maximum water levels achieved during storm floods once every 20 year.
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and clayey mud flats are intertidal landscape units. The supratidal landscapes are above mean high tide (MHT) and are only flooded during spring tide and storm floods. The tidal flats, saltmarsh basins, saltmarsh creeks and levees, and tidal ridges are supratidal landscape units.

The coastal barrier and beach plain landscape comprises the coastal barriers and the lower areas between them. Sandy beaches and sandy beach plains, with or without sparse plant growth, develop along the coast in the tidal zone between MLT and EHW. The coastal barriers are elongated little developed rises of the ground that consist mainly of sand. These barriers are shaped by the undulation in the coastal zone. In many cases low dunes (Older Dunes) were formed on top of the coastal barriers of which the top is situated above EHW. The dune landscape consists of the dunes with a strong relief (Younger Dunes), which started to form during the Early Medieval Period.

During the prehistoric period the surface of the peat landscape was much higher – some meters above NAP than nowadays. Anthropogenic peat cutting and drainage that took place from the Middle Ages onward, has caused the peat surface to subside to 1 or 2 metre below NAP. Due to the high surface during the prehistoric period, the central peat area was not flooded. Only the edges of the peat were flooded during periods of marine high activity.

On the Geolandscape map the following main landscapes are defined.
I. Dunes, coastal barriers and beach plain landscape.
II. Tidal landscapes of the Oer-IJ area
III. Peat landscapes
IV. Other landscapes.

I. DUNES, COASTAL BARRIERS AND BEACH PLAIN LANDSCAPE

The dunes, coastal barriers and beach plain landscape comprises all the landscape units where coastal or dune sediments are situated near or at the surface. The coastal barrier and beach plain landscape is formed before the Iron Age and lies between Uitgeest-Dorregeest and Limmen; and near Heemskerk and Beverwijk. Geographically this Neolithic-Bronze Age landscape lies to the north and southwest of the Oer-IJ channel. On the west side of the map area the tidal- and coastal barrier and beach plain landscape near Beverwijk/Heemskerk and Limmen are covered by Younger Dunes.

II. TIDAL LANDSCAPES OF THE OER-IJ AREA

The tidal landscape lies around the line Castricum-Assum-Wijkertunnel. The Oer-IJ estuary started to silt up at the end of the Middle Iron Age (300-200 BC). The landscape units on the map are formed during this period. The tidal landscape is divided into former mud flats and former salt marsh/tidal area. The former mud flats lie in the Catricummerpolders and the former salt marsh are situated in the Broekpolder (dune side), and the Assendelver Polders and Uitgeesterbroekpolders (peat side). The tidal area on the dune side has its base on sandy sediments, whereas the tidal area on the peat side are situated on a thick peat layer and are therefore prone to subsidence. Drainage has caused the salt marsh clay on the peat to subside just as the peat area itself and lies at a height of 1-2 m below NAP whereas the the top of the tidal area on the dune side lie above NAP. At locations in the peat area the base on which the salt marshes formed is heterogeneous, like thick sandy channel deposits next to clayey tidal flats, differential subsidence has taken place. The relative thick sandy tidal channel deposits – when the channel has cut into the deposits of the formation of Wormer – has subsided less due to drainage than the adjacent clay on peat areas. This difference in subsidence causes the channel and levee deposits to lie higher then the adjacent salt marsh deposits. These channel ridges are also named ‘inversion

4 Following Jelgersma et al. (1970) these low dunes are named Older Dunes.
5 Following Jelgersma et al. (1970) these high dunes are named Younger Dunes.
6 Vos 1983.
ridges’ as the relief is inversed after the land dried up and the channels (low) have become ridges (high). The tidal landscape on peat is therefore also named inversion landscape. Where the tidal flats were situated on sand (dune side) this inversion of relief did not take place. The silted up tidal creeks are still recognisable as low parts of the landscape. The same applies to the tidal channels in the Castricummerpolders.

III. PEAT LANDSCAPES

The peat landscapes are situated on the east side of the map, near Assendelft, Krommenie and Marken-Binnen. Locally the peat is covered with a thin layer (0-30 cm) of Medieval clay. The peat layer is usually 1.5 to 2 metres thick. Peat formation started around 2500BC in this area and ended during the Late Medieval large peat reclamation. Drainage after peat reclamation has led to the strong subsidence of the peat and the surface of the peat has disappeared due to oxidization.

IV. OTHER LANDSCAPES

The other landscapes on the map are reclamation areas, lakes and canals (water), historic structures, and (sub)recent built areas, like infrastructure and built up areas. These landscape units are (in)directly man-made from the Late Middle Ages until recent.

SOURCES FOR THE CONSTRUCTION OF THE MAP

The geolandscape map is constructed on the base of existing geologic and soil map, and the AHN. From these sources the following geolandscape units are used.
- AHN recorded in 2004 with a vertical resolution of 5x5m and a height precision of 5cm. Used are the morphological patterns in the inter tidal area, tidal ridges, inversion ridges in the tidal area, and the (sub)recent infrastructure (hatched on map).
- Geological map 19W, scale 1:50,000, Westerhoff et al. 1987. Used are the border between tidal area and peat landscape in the Uitgeesterbroekpolders, peat in the subsurface of the beach plain landscape, and the border between the tidal area and the coastal barriers and dune area.
- Simplified geological map of Haarlem and surroundings, scale 1:50,000, Blokzijl et al. 1995. Used is the border between the tidal area and the coastal barrier and dune landscape on map 25W.
- Geological map of the Assendelver Polders, Vos 1983. Used is the border between tidal area and peat landscape in the Assendelver Polders.
- Soil map of Noord-Kennermerland, southern sheet, scale 1:25,000, De Roo 1953. Used is the border of the coastal barriers between Limmen and Dorregeest.
- Soil inventory map, Province of Noord-Holland, southern sheet, scale 1: 50,000, Pons and Kloosterhuis 1953/54. Used are the peat characterisations in the peat area of Krommenie and Assendelft.
- Geomorphological map of the Netherlands, sheet Alkmaar (19) and Lelystad (20), scale 1:50,000, ‘Stichting voor Bodemkartering’ 1979. Used are the shapes of the dunes.
- Paleogeographical maps of the Oer-IJ estuary 2500 BC, 1000BC, 100AD and 900AD, scale 1:50,000, Vos and Sooijus 2004. Used to determine the origin of the deposits occurring at the surface.
- Archaeological map of the Netherlands, sheet Hollands Noorderkwartier, about 1350AD, scale 1:50,000, ROB 1987. Used are the reconstructed dykes of 1350 AD.
- Topographical map of the Netherlands sheets Castricum 19C and Haarlem 25A, scale 1:25000. Used for the (sub)recent built areas (hatched on map).
LITHOSTRATIGRAPHY OF THE OER-IJ REGION

The holocene lithological layers that occur in the Oer-IJ region are analysed according to the new lithostratigraphical classification of Nederland as proposed by ‘TNO Bouw en Ondergrond’. This new stratigraphical classifications replaces the old classification of the former RGD. According to the new lithostratigraphical classification of TNO all peat layers are part of the ‘Formation of Nieuwkoop’ (formerly part of the ‘Westland Formation’). De peat layer at the base of the holocene deposits and on top of the pleistocene deposits is named ‘Basisveen’ and the layers of peat within the holocene deposits are named ‘Hollandveen’.

The marine Holocene sedimentary deposits in the Dutch coastal plain are part of the ‘Formation of Naaldwijk’ (formerly ‘Westland Formation’). The coastal dunes, beach barriers and coastal plain deposits are also part of the ‘Formation of Naaldwijk’. Within this formation the coastal dunes are part of the ‘Deposit of Schoorl’ (former Older and Younger Dunes) and the coastal plain deposits are part of the ‘Deposit of Zandvoort’ (formerly beach sands). The marine clay deposits above the ‘Hollandveen’ are named the ‘Deposit of Walcheren’ (formerly Deposits of Duinkerke) and the bluegray clay underneath the thick ‘Hollandveen’ layers are part of the ‘Deposit of Wormer’ (formerly Deposit of Calais)

The new lithostratigraphic classification does not make a stratigraphic difference between trans-and regression phases within the marine Holocene sedimentary deposits. This was done to avoid a mixing of lithostratigraphy (a classification based on a lithological characterization of sediment) and chronostratigraphy (a classification based on periodization, including transgression phases). With the abandonment of trans- and regression phases the deposits of Calais I-IV and Duinkerke 0-III are no longer in use.

Although the old RGD classification has been replaced, on the level of the layer no alternative stratigraphy has been developed. In this thesis for the Oer-IJ area a new lithostratigraphic classification on the level of the layer is proposed. This classification at the level of the layer is informal in the sense that it has not been published before. The new stratigraphic classification of the Oer-IJ, as written below, will be used for describing the legend units on the geolandscape map.

FORMATION OF NAALDWIJK

DEPOSIT OF SCHOORL

The Holocene coastal dune sedimentary deposits are part of the ‘Deposit of Schoorl’. Following the geo-archaeological map of Den Haag-Rijswijk, the dunes on the elongated coastal barriers (formerly Old Dunes) are part of the ‘layer (or sands) of Voorburg’, and the dunes with strong relief (formerly Younger Dunes) are part of the ‘layer (or sands) of Den Haag’. De dune sands of the ‘layer of Voorburg’ receive a subname per coastal barrier system. The dune sands on the coastal barrier of Uitgeest-Dorregeest are named the ‘sands of Dorregeest’

DEPOSIT OF ZANDVOORT

Following the geo-archaeological map of Den Haag-Rijswijk, the beach plain sedimentary deposits (formerly beach sands) are part of the ‘layer (or sands) of Rijswijk’. Within the ‘layer of Rijswijk’ different sub-layers

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7 De Mulder et al. 2003 TNO bouw en ondergrond translates as TNO building and ground.
8 Zagwijn and Van Staalduinen 1975, RGD = State Geological Service.
9 Vos 2005.
10 Vos 2005.
can be distinguished. In the area Castricum-Zanderij the shell rich washover deposits in the top of the beach plain sedimentary deposits is such a sub-layer. These so-called storm flood deposits are named the ‘Zanderij deposits’.

**DEPOSIT OF WALCHEREN**

**IJ-LAKE DEPOSITS**

The ‘IJ-lake deposits’ are part of the ‘Deposit of Walcheren’ and include all fresh and brackish water sedimentary deposits that are formed in the former IJ-lake and the Crommenije. Also included are the flood deposits form these lakes and waterways within the peat area of Assendelft and the Uitgeesterbroekpolder. The ‘IJ-lake deposits’ are formed from the Roman Iron Age (after the permanent closing of the tidal inlet near Castricum) until the New Period. The influence of the sea was limited to the hinterland of the Oer-IJ region through the Zuiderzee and the stream the Rekere near Alkmaar. Within the ‘IJ-lake deposits’ several sub-layers can be defined: ‘IJ-clay grounds’, ‘pikclay’, and ‘del grounds’. For these sub-layers the old names as given by De Roo (1953) are used.

**IJ-CLAY GROUNDS**

The IJ-clay grounds sublayer consists of heavy, sticky clay that are in most cases humic to strongly humic. The clays can be calcareous and/or contain shell fragments. The name IJ-clay grounds is taken from De Roo (1953). In the old RGD classification these clays are part of the Duinkerke III deposits.\(^1\)

**PIKCLAY**

The ‘Pikclay’ sublayer consists of heavy clay that are deposited on top of the Oer-IJ deposits and or the ‘Hollandveen’ (layer or oxidization level). The clays are usually non-calcareous. In the Assendelver Polders and Uitgeesterbroekpolders the clays are lightly humic, but lateral where the layer turns to peat it becomes strongly humic (peaty). In the Castricummerpolder the layer is more calcareous and usually more sandy. In the old classification this layer is named Pikclay\(^2\) or Duinkerke III deposits. According to the new classification\(^3\) ‘Pikclay’ belongs to the ‘Layer of IJe’. This name is not used here, as the lithostratigraphic unit is viewed as a sublayer instead of a layer. The reason for this choice of naming is that the sublayer ‘Pikclay’ is genetically part of the IJ-lake/lagoon system and all deposits belonging to this system are viewed as ‘IJ-lake deposits’.

**DEL GROUNDS**

The sublayer ‘Del grounds’ consists of light clays with occasionally strong humic (peaty) levels. Sometimes the sublayer has thin sandy layers. The sedimentary deposits can be both calcareous or non-calcareous. These sedimentary deposits have developed in the lower parts of the landscape that are the remains of channels. These low lying parts of the landscape mainly occur in the Castricummerpolder. The ‘Del grounds’ were in the RGD classification part of the Duinkerke III deposits.

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2. De Roo 1953.
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OER-IJ DEPOSIT

The layer ‘Oer-IJ deposits’ consists of all the brackish and marine tidal sedimentary deposits that originate from the tidal inlet and tidal channels of the Oer-IJ. The Oer-IJ tidal system developed from the tidal inlet of Haarlem around 3000-2500 BC. Until the definitive closure of the tidal inlet of the Oer-IJ in the Late Iron Age marine sedimentary deposits have been deposited within the former tidal system. Several sublayers of the ‘Oer-IJ deposits’ appear on or near the surface of the mapped area. These are the sublayers ‘Castricummerpolder layer’, ‘Broekpolder layer’, ‘Uitgeesterbroekpolder layer’, and ‘Ostracode layer’.

CASTRICUMMERPOLDER LAYER

The sublayer ‘Castricummerpolder layer’ consists of sandy deposits, of which the grain size is medium and the larger part is very fine sand. The sandy deposits are calcareous and contain different amounts of clay. The soil can range from sand, light loamy and clay to light sandy. The top of the layer is often relatively homogeneous (low on sedimentary structures or clay lenses). At a larger depth (>1m) the amount of sedimentary structures, like clay lenses and shell(layers) increases. Marine shells can be loose entities or can occur in their natural/growth position. At an even larger depth peat detritus layers or dislocated pieces of peat can be found. The grain size can also increase at a larger depth. These are mainly the mud flat and channel deposits of the Oer-IJ. In older classifications these deposits are named ‘stream ridge and stream channel grounds’ or Duinkerke I/0.

BROEKPOLDER LAYER

The ‘Broekpolder layer’ consists of sandy clays, usually lightly humic and layered with thin winding layers of sand. The clays are usually calcareous and marine shell fragments can occur but never in their natural/growth position. The largest part of this unit lies in the transition zone from the coastal barrier and dune sands of Beverwijk/Heemskerk and Uitgeest towards the central part of the Oer-IJ estuary. They are the former tidal deposits that developed along the edges of the coastal barriers and dunes. In the old classifications these deposits are named ‘beach barrier wash-over grounds’ and ‘beach barrier grounds’ or Duinkerke I/0.

UITGEESTERBROEKPOLDER LAYER

The ‘Uitgeesterbroek layer’ consists of clayey sedimentary deposits (clay, light to strong loamy) that can be both calcareous and non-calcareous. The clays contain thin sandy layers and are calcareous in or near creek deposits. The layer is usually lightly humic, but where the layer transforms into peat laterally, it can become strongly humic and peaty. The lateral clay deposits – thinner than 40cm – are usually non-calcareous and have the remnants of many reed roots. The layer lies between the ‘Pikclay’ above and the ‘Hollandveen’ below. The sedimentary deposits is mainly formed within a tidal environment. On the grounds of development the unit can be divided into following environments, creek, former tidal channel, levee, and tidal basin. In the classification of De Roo this layer is named loam, light clay or peaty clay and in the RGD classification it is named Duinkerke I/0.

OSTRACODE LAYER

The ‘Ostracode layer’ (or Ostracode clay) consists of humic to strong humic clays with many ostracodes. Besides ostracodes the layer can contain many molluscs, like Cardium glaucum and Hydrobia. The Hydrobia

14 De Roo 1953.
16 De Roo 1953.
17 Westerhoff et al. 1987.
are often concentrated in layers. There are nearly no roots in the ‘Ostracode layer’. The layer is situated between the ‘Uitgeesterbroekpolder layer’ above and the ‘Hollandveen’ below. The layer is present as basin-like structures in the Assendelver Polders and Uitgeesterbroekpolders. Possibly they are the remnants of old drainage channels in peat that were under the influence of the tides. De Roo does not mention this layer (to deep) and in the RGD classification it was named as a Duinkerke 0 deposit.

DEPOSIT OF WORMER

Where the Oer-IJ tidal channels have cut into the surface, the Oer-IJ Deposits are situated on top of the ‘Deposit of Wormer’. The top of this deposit, underneath the ‘Hollandveen’, consists of a bluegray clay (also known as old blue sea clay). The top of the deposit is heavy clay to medium loam, calcareous, and medium to heavy rooted. Towards the bottom the deposit usually gets sandier, calcareous and layered with clay with sand or sand with clay. The roots decline steeply at this depth. These are old marine deposits dated before 4500 BP.

HOLLANDVEEN

In the Oer-IJ area the ‘Hollandveen’ consists of different peat layers. All these locally occurring peat layers have not yet received a name. Two layers have been named. The so-called ‘oxidization layer’, a dark peaty layer between the ‘Pikclay and the Oer-IJ deposits and the thick peat layer of the ‘Deposit of Walcheren’ and ‘Hollandveen’. The other named layer is ‘Hollandveen’ or the ‘Deposit of Wormer’. The other non-named peat layers are viewed as ‘Hollandveen split’.

ANTHROPOGENIC LAYER

The layers influenced by human action at site locations are not named and are classified as ‘Anthropogenic layer’. When a profile is described these layers have received a feature number, just like the natural layers.

LEGEND OF THE GEOLANDSCAPE MAP

In this section the different geolandscape legend units will be discussed. Of each legend unit the composition of the soil (lithostratigraphy), the spatial variation, and the morphology (relief) will be described. The geolandsapes are divided into three levels:
1. Main landscapes of the first level that are indicated with Roman numerals. For example, unit II – Tidal landscape.
2. Lanscapes of a second level, which are indicated with a arabic number. For example, unit II.5 – Intertidal landscape.
3. Landscapes of a third level, which are indicated with a small letter. For example, unit II.5b – mudflats, middle height plates.

The landscapes of the first and second level are always mapped even when the surface morphology has been disturbed or completely altered by human actions. The third level landscapes are not shown for the disturbed areas as they are mainly mapped on the basis of relief characteristics which are no longer mapable using the AHN. This concerns the built-up areas and large infrastructure, like (rail)roads. The third level landscapes that are not mapable are classified as undifferentiated and are marked with an ‘x’. The disturbed areas that are larger than a single house are hatched at the map, but the color of the landscape units at the first and second level remains visible.

Besides the geolandscape units, all archaeological findspots used in this thesis are marked on the map with a number. This number relates to the table in appendix 3 in which the name of the findspot, its general date and a characterisation is given. The characteristic are: other finds than/or besides sherds, only sherds, and offering sites (with other finds). These findspots are used for the generation of predictions.
MAIN GEOLANDSCAPE UNIT I: DUNES, COASTAL BARRIER AND COASTAL PLAIN LANDSCAPE.

Main geolandscape unit I comprises all the landscapes that are formed at or near the coastline due to the breaking of the waves onto the coast (beaches) or the windblown sands of the beaches (dunes). The landscape consists of elongated sand ridges and the sandy plains in between that are shaped by water and wind.

GEOLANDSCAPE UNIT I.1 COASTAL DUNE LANDSCAPE

The coastal dune landscape consists of the rich in relief dunes at the coast, including the accompanying plains and low-lying areas. The dune relief ranges from a few to tens of metres. The relief rich dune landscape lies above 1m NAP and is formed from the Early Medieval Period onward. The dune sands belong to the ‘Deposit of Schoorl’. Following the geomorphological map,18 the coastal dunes are divided into two types: high coastal dunes, and low coastal dunes.

I.1a: High coastal dunes with accompanying plains and low-lying areas.
Higher coastal dunes with a relief larger than 5 metres and the accompanying plains and low-lying areas.
I.1b: Low coastal dunes with accompanying plains and low-lying areas.
Low coastal dunes with a relief between 1.5 and 5 metres and the accompanying plains and low-lying areas.

GEOLANDSCAPE UNIT I.2: COASTAL BARRIER LANDSCAPE.

The coastal barrier landscape consists of elongated elevation with a low gradient. The coastal barrier landscape in the Oer-IJ area has come into existence during the Late Neolithic and Middle Bronze Age.

I.2a: Coastal barriers
Coastal barriers are elongated low ridges that are shaped by a combination of undulation and wind. The base of the coastal barriers consists of partly aquatic sands and the top consists of dune sands. The dune sand are part of the ‘Deposit of Schoorl’ and the beach sands below belong to the ‘Deposit of Zandvoort’.

I.2b: Ridges on coastal barriers.
Ridges on coastal barriers are isolated high ridges with a low gradient and little relief on top of the coastal barriers. The sands that make up these low ridges on coastal barriers are dune sands that belong to the ‘Deposit of Schoorl’.

GEOLANDSCAPE UNIT I.3 COASTAL PLAIN LANDSCAPE

The coastal plain landscape consists of the flat terrain between the coastal barriers. In these plains peat has developed that is largely gone due to medieval and subrecent peat reclamation. The sedimentary deposits of the coastal plain landscape are part of the ‘Deposit of Zandvoort’. Locally – especially in the low-lying parts – the sedimentary deposits of the coastal plain landscape can be covered with a thin layer of 10 - 40cm medieval clay (Pikclay).

I.3a: Coastal plain landscape – high.
The relatively high parts within the coastal plain landscape.
I.3b: Coastal plain landscape – middle high.
The areas between the highest and lowest parts of the coastal plain landscape.
I.3c: Coastal plain landscape – low
The relatively lowest parts of the coastal plain landscape.
I.3x: Coastal plain landscape – undifferentiated
The parts of the coastal plain landscape of which the surface morphology has become invisible due to (sub)recent building activities.

18 STIBOKA 1979.
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GEOLANDSCAPE UNIT I.4 DRIFTSAND COVERED COASTAL BARRIERS AND COASTAL PLAIN LANDSCAPE

The driftsand covered coastal barriers and coastal plain landscape is that part of the coastal landscape that has been covered by a relatively thick layer of 0.5-2 metres driftsand. Between this cover and the lower coastal plain sedimentary deposits often a peat layer is formed.

I.4a: Driftsand covered coastal barriers and coastal plain landscape with a peat layer underneath.
The coastal barriers and coastal plain landscape that is covered with a layer of dune sand. Between this wind blown sand layer and the coastal plain deposits a peat layer exists.

I.4b: Driftsand covered coastal barriers and coastal plain landscape without a peat layer underneath
The coastal barriers and coastal plain landscape that is covered with a layer of dune sand, but has no peat layer.

MAIN GEOLANDSCAPE UNIT II: TIDAL LANDSCAPE OF THE OER-IJ AREA

The main geolandscape unit II comprises all the landscapes that are formed by the Oer-IJ tidal system. The sedimentary deposits of this geolandscape unit are part of the ‘Oer-IJ Deposit’. The ‘Oer-Deposit’ is often covered with a thin layer of medieval alluvial clay (Pikclay). Between the ‘Pikclay’ and the ‘Oer-IJ Deposit’ there are often the remains of a post-Roman peat layer (black crumbly peat remains), the so-called ‘oxidization level’. The ‘Pikclay’ has covered the ‘Oer-IJ Deposit’ like a blanket. In this way the shape of the relief of the tidal landscape of the Oer-IJ has remained visible on the AHN.

GEOLANDSCAPE UNIT II.5: INTERTIDAL LANDSCAPE

The intertidal landscape comprises all the landscapes that are formed within the Oer-IJ intertidal system. The former mud flats and the silted up tidal channels that were formed in the Castricummerpolder are part of this landscape unit. De Roo named this landscape unit the ‘inner-delta’. The channel and mud flat sands of this landscape are part of the ‘Castricummerpolder layer’.

II.5a: Mud flat landscape, high flats.
The highest mud flats within the former intertidal area.
II.5b: Mud flat landscape, medium high plates
The medium high flats within the former intertidal area.
II.5c: Mud flat landscape, low plain
The lower plains within the former intertidal area
II.5d: Mud flat landscape, low basins
The low depressions within the former intertidal area. These depression are often the remnants of old silted up large tidal channels.
II.5x: Mud flat landscape, undifferentiated.
Part of the former intertidal area of which the surface morphology is no longer visible due to (sub)recent building activities.

GEOLANDSCAPE UNIT II.6: SUPRA-TIDAL LANDSCAPE ON A THICK DEPOSIT OF TIDAL AND COASTAL PLAIN SEDIMENTARY DEPOSITS (GROUNDED SALT MARSH LANDSCAPE).

The supra-tidal landscape consists of those landscapes that are formed between the MLT and EHW level of the Oer-IJ during the Late Iron Age. These are the salt marsh areas that were only flooded during spring tide or stormfloods. This geolandscape has had no inversion of the relief due to differential subsidence and is therefore also named grounded salt marsh landscape. In this area the tidal channels are often still visible in the landscape as low-lying areas and depressions. The tidal sedimentary deposits in the grounded salt marsh landscape,

19 De Roo 1953, in Dutch ‘binnendelta’.
adjacent to the dunes and coastal barriers, is often sandy and consist of clay layered with crinkly sand layers. The deposits of the salt marsh facies of the grounded salt marsh landscape are part of the ‘Broekpolder layer’.

II.6a: Salt marsh ridges
Salt marsh ridges are elongated elevations that are situated at the edge of the former intertidal landscape. These relatively sandy ridges are formed during spring tide and stormfloods as during the flooding of the salt marsh the relatively coarse sediments (sand and silt) were first deposited.

II.6b: Salt marsh heights
Relatively high parts of the tidal landscape that are usually adjacent to the salt marsh ridges.

II.6c: Salt marsh plain
The salt marsh plain consists of the relatively flat low-lying parts of the tidal landscape.

II.6d: Salt marsh basin
The salt marsh basins are isolated depressions in the salt marsh landscape. Often they are the remnants of silted up tidal channels. The recognisable continuous former channels are indicated with a line within this landscape unit.

II.6x: Grounded salt marsh landscape, undifferentiated
The parts of the grounded salt marsh landscape of which the surface morphology is no longer visible due to (sub)recent building activities.

GEOLANDSCAPE UNIT II.7: SUPRA-TIDAL LANDSCAPE ON PEAT (TIDAL INVERSION LANDSCAPE)

On the eastern peat side of the Oer-IJ the tidal sedimentary deposits are formed on top of a thick (1.5-2m) peat layer. The tidal Oer-IJ deposits on the peat have strongly subsided due to the drainage of the Assendelver Polders and Uitgeesterbroekpolders. This tidal landscape on peat is also named inversion landscape as the sandy creek fills have subsided less than the adjacent tidal cover deposits on peat. The old tidal channels are now recognisable as creek ridges (inversion ridges) in the landscape. The tidal sedimentary deposits in the inversion landscape, adjacent to the peat area, consists mainly of heavy and humic clays. These clayey deposits of the inversion landscape are part of the ‘Uitgeesterbroekpolder layer’.

II.7a: Tidal ridges
Tidal ridges are elongated elevations that are situated at the edge of the former intertidal landscape.

II.7b: Salt marsh heights
Relatively high parts of the tidal landscape that are usually adjacent to the tidal ridges.

II.7c: creek ridges (inversion ridges)
The inversion ridges are wavy elongated elevations that were formed as the relative sandy fill of the tidal creeks subsided less than the adjacent tidal deposits. On these inversion ridges the tidal levees with the former channel in between are still recognisable. The tidal levees are formed in a similar manner to the tidal ridges. During spring tide and storm floods the salt marsh was flooded from the tidal creeks. The relative coarse sediments (sand and silt) that were transposed through the creeks were first deposited along the creeks and formed low ridges on either side of the creeks.

II.7d: Salt marsh plain
The salt marsh plain consists of the relatively flat low-lying parts of the tidal landscape.

II.7x: salt marsh landscape on peat, undifferentiated
The parts of the salt marsh on peat landscape of which the surface morphology is no longer visible due to (sub)recent building activities.

GEOLANDSCAPE UNIT II.8: DRIFTSAND ON TIDAL LANDSCAPE

At some places the tidal landscape is blown over with a relatively thin layer of dune driftsands (0.5-2 m). Near Castricum this is the transitional zone between the higher dune landscape and the intertidal landscape. This geolandscape is situated between the 0 and 2 metres +NAP. The driftsand cover is part of the ‘Deposit of Schoorl’. The cover of driftsands is blown in from the higher dune landscape during the Early Middle Ages.
MAIN GEOLANDSCAPE UNIT III: PEAT LANDSCAPE

The peat landscape consist of the area with peat at the surface or under a thin layer of medieval clay (Pikclay). Within the Oer-IJ region three peat landscapes occur: Eutrophic reed peat, eutrophic and mesotrophic woodpeat, and oligotrophic heath- and sphagnum peat. Reed peat is mainly present along the salt marsh area of the Oer-IJ and along the river Zaan. Oligotrophic peat forms large islands within the reed peat landscape. At some spots a peat type with many twigs and fine wood, like birch, is discovered between the reed peat and the heath- and sphagnum peat. This woodpeat is formed under eutrophic to mesotrophic environmental conditions.

GEOLANDSCAPE UNIT III.9: REED PEAT LANDSCAPE.

Euthrophic peat that mainly consists of the remains of reed. This peat is formed under nutrient rich to medium conditions in a wet environment.

GEOLANDSCAPE UNIT III.10: BIRCH-, BOG MYRTLE- AND SEDGE PEAT LANDSCAPE

Eutrophic to mesotrophic peat consisting of sedge, twigs and fine wood, like birch. This peat is formed under nutrient rich to medium conditions in a wet environment.

GEOLANDSCAPE UNIT III.11: SPAGHNUM- AND HEATH PEAT LANDSCAPE.

Oligotrophic peat that consists of twigs of heath, sphagnum and rush. Oligotrophic peat is formed under nutrient poor wet conditions. This peat depends for its water on nutrient poor rain water. Oligotrophic peat consist of sphagnum peat, and heath-and rush peat.

MAIN LANDSCAPE UNIT IV: OTHER LANDSCAPE ELEMENTS

The other landscape elements are those parts of the landscape that are of importance for the general view of the landscape but, which are formed from the Middle Ages onward through human action.

GEOLANDSCAPE UNIT IV.12: RECLAIMED LAND

The reclaimed lands are the former lakes that have been reclaimed by humans since the 16th century. IV.12a: Deep lake bottoms. Deep reclaimed land that are completely cleared of peat and the bottom of the lake consists of the ‘Deposit of Wormer’.

IV.12b: Deep lake bottoms with peat remains. Reclaimed lakes with peat remains at the surface.

IV.12c: Undeep lake bottoms and dammed areas. Reclaimed shallow lakes, for example, ‘de Crommenije’.

GEOLANDSCAPE UNIT IV.13: LAKES AND CANALS.

The larger water surfaces of lakes and canals are mapped as water. The smaller water surfaces of ditches are not mapped.

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Pons and Kloosterhuis 1953/54.
APPENDIX 2

GEOLANDSCAPE UNIT IV.14: HISTORIC AND SUBRECENT ANTHROPGENIC LANDSCAPE ELEMENTS.

The larger important buildings from the Late Medieval Period and Subrecent Period are mapped separately. IV.14a: Castle remains ‘Oud Haarlem’. IV.14b: Castle gardens ‘Marquette’. IV.14c: The World Heritage Monument ‘Hollandsche waterlinie’.

GEOLANDSCAPE UNIT IV.15: DYKES

Dyke that separates the ‘Noord-Hollandsch Kanaal’ from the ‘Alkmaardermeer’.

GEOLANDSCAPE IV.16: BUILT-UP AREA AND LARGE INFRASTUCTURE.

The built-up areas and large infrastructure are hatched at the map. The morphological characteristics of these areas are no longer visible. The main geolandscape units are, however, distinguished and have received the main color on the map of the geolandscape unit they belong to.