



## Towards an open delta...

### Research and design for sustainable urban landscapes in an open Dutch Southwest Delta

#### Project description

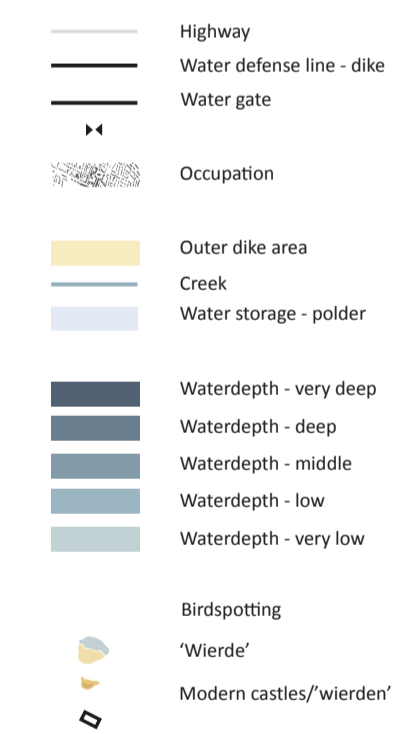
The invention of technology for land reclamation in the 10th century started a unique transformation in the delta. Sand plates were dike-ed and pumped and became polders. Examples of early harbor cities created on the dike-ring are Ooltgensplaat and Oude Tonge. These cities were founded at the main creek of a sand plate. The polders created a condition for more sediment deposition, due to the hard edges of the dikes. Outside the dike-ring sediment cumulated and formed new sand plates. These sand plates formed the basis of a new adjacent polder and a new harbor settlement.

The latest polders date from 1930's, but technically the process came to an end in 1953 with a stop of sediment transportation in the delta. The Watersnoodramp in 1953 led to the engineering of a great and expensive water defense project that would protect the inhabitants of the Southwest Delta against probable storm surges. Shortening the Dutch coast line and closing the Dutch Southwest Delta. However, the Delta Werken caused complications that were not predicted in time of planning and construction. The world known water defenses created environmental problems as blue algae in the Krammer Volkerak, lack of oxygen in the Grevelingenmeer, and the decline of sand plates and fish migration in all the water bodies. [Programmbureau Zuidwestelijk Delta, 2009] Today, these problems triggered the discussion of re-opening the estuaries of the Dutch Southwest Delta.

The graduation project provides research by design on the spatial implementation of the paradigm 'working with nature' in an open Dutch Southwest Delta. The open delta scenario, as proposed by H+N+S (Toekomstbeeld ZW Delta) and WNF (Met Open Armen), gradually restores the delta dynamics in the Krammer Volkerak. The process towards an open delta not only provides a form of the urban landscape. It also contains a new and innovative approach by integrally constituting value in the urban, cultural and natural layer. The new relation of delta cities with water, nature development combined with fresh water storage and day-recreation depict a scenario that sustains the dynamics of a natural delta landscape, social initiative and the improvement of the socio-economic condition of the delta cities Oude Tonge and Ooltgensplaat. A possible future of an open delta.

The graduation project provides research by design on the spatial implementation of the paradigm 'working with nature' in an open Dutch Southwest Delta. The open delta scenario, as proposed by H+N+S (Toekomstbeeld ZW Delta) and WNF (Met Open Armen), gradually restores the delta dynamics in the Krammer Volkerak. The process towards an open delta not only provides a form of the urban landscape. It also contains a new and innovative approach by integrally constituting value in the urban, cultural and natural layer. The new relation of delta cities with water, nature development combined with fresh water storage and day-recreation depict a scenario that sustains the dynamics of a natural delta landscape, social initiative and the improvement of the socio-economic condition of the delta cities Oude Tonge and Ooltgensplaat. A possible future of an open delta.

PROGRAMMA BUREAU ZUIDWESTELIJKE DELTA (2009). Toekomstbeeld Zuidwestelijke Delta 2050. Retrieved 10 september 2011, from [http://www.zwdelta.nl/dynamisch/bibliotheek/70\\_0\\_NL\\_toekomstbeeld\\_delta.pdf](http://www.zwdelta.nl/dynamisch/bibliotheek/70_0_NL_toekomstbeeld_delta.pdf).



5th July 2012

Nathan den Besten  
Studentnr. 1303775  
nd\_best@hotmail.com

1st mentor:  
Prof.dr.ir. Han Meyer (Urban Design)

2nd mentor:  
Ir. Inge Bobbink (Landscape Architecture)

Delta Interventions Graduation Studio  
MSc Urbanism  
Faculty of Architecture  
Delft University of Technology  
Delft, The Netherlands

Studio coordinator:  
Ir. Anne Loes Nillesen  
<http://www.deltainterventions.com/>



#### R&D Location

The Dutch Southwest Delta is located in Northwestern Europe. The project location is the Krammer Volkerak. The site is chosen because of the multiple problematics and changes of an open delta come together in the Krammer Volkerak. In addition, the Krammer Volkerak will change the most dramatically and as the first of all water bodies in the delta.



Harbor, Oude Tonge, 1910-1935  
Photo by: C. Steenberg  
Source: Rijksdienst voor het Cultureel Erfgoed  
From: [www.geheugennederland.nl](http://www.geheugennederland.nl), 2012



Harbor, Oude Tonge, 2012  
Photo by: N. den Besten



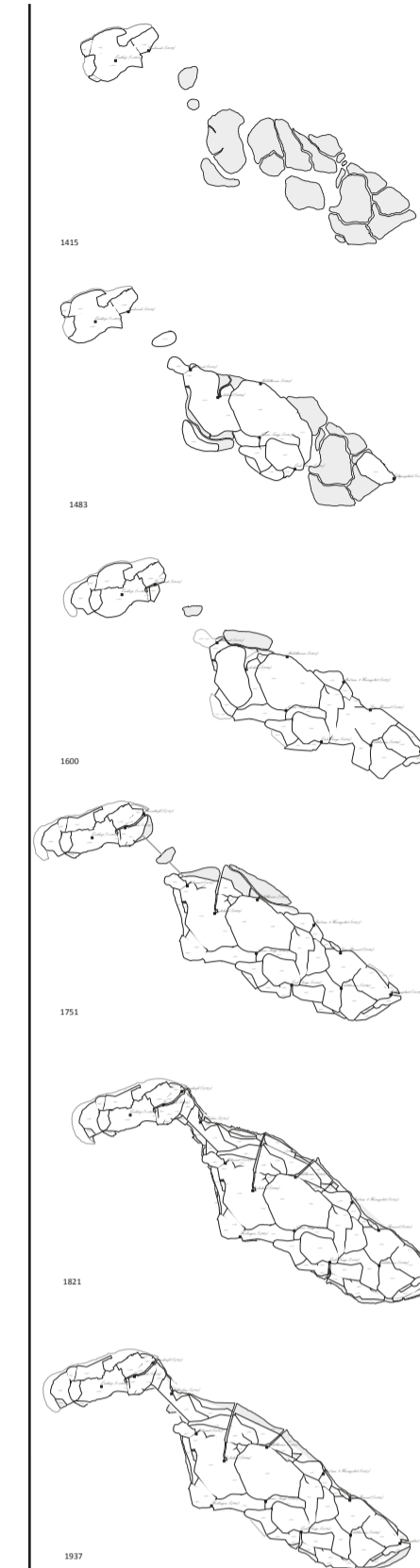
Oude Kerk (Hevormd), Oude Tonge, 1910-1935  
Photo by: C. Steenberg  
Source: Rijksdienst voor het Cultureel Erfgoed  
From: [www.geheugennederland.nl](http://www.geheugennederland.nl), 2012



Oude Kerk (Hevormd), Oude Tonge, 2012  
Photo by: N. den Besten

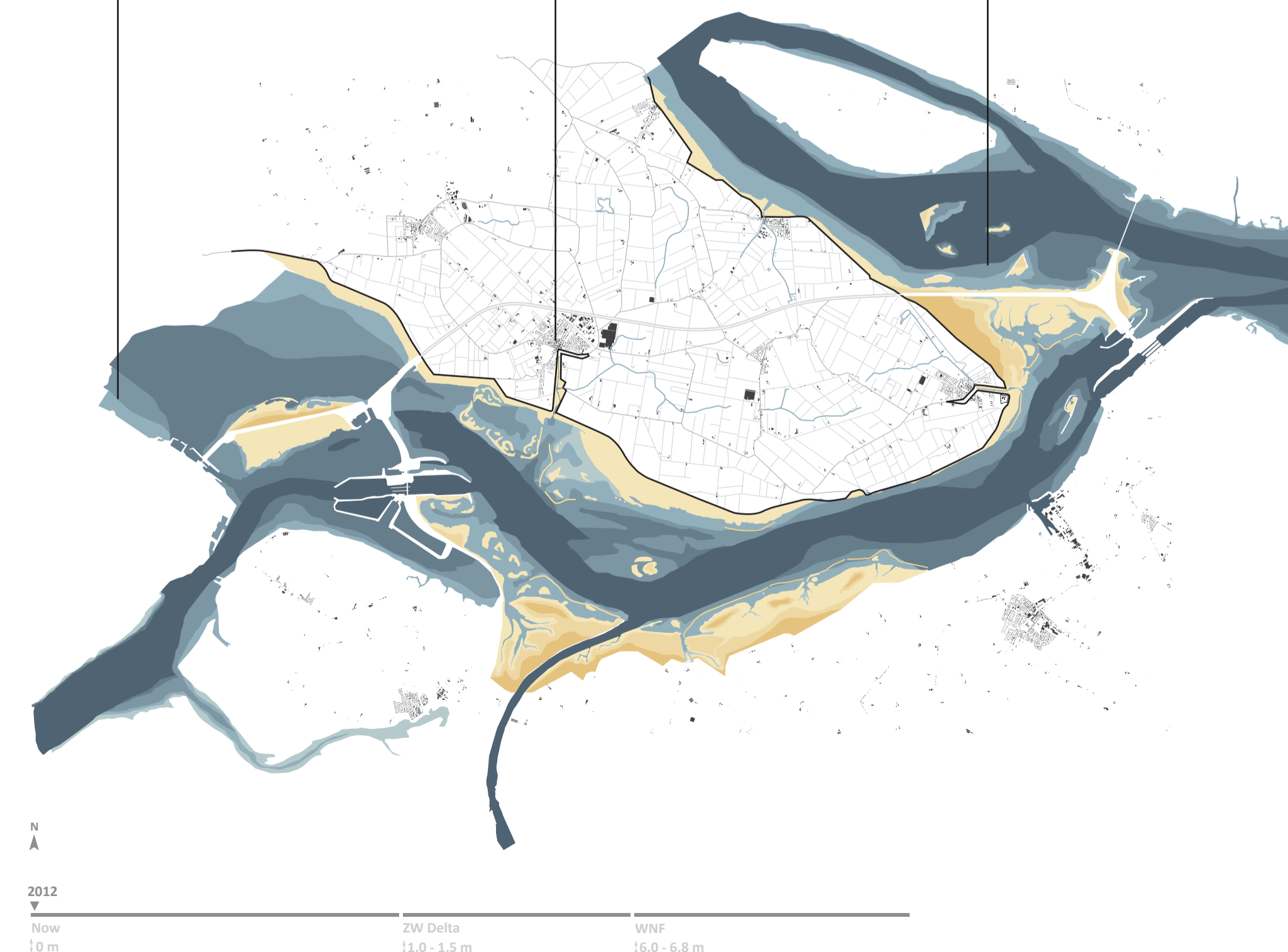
#### Lost small scale relation with water

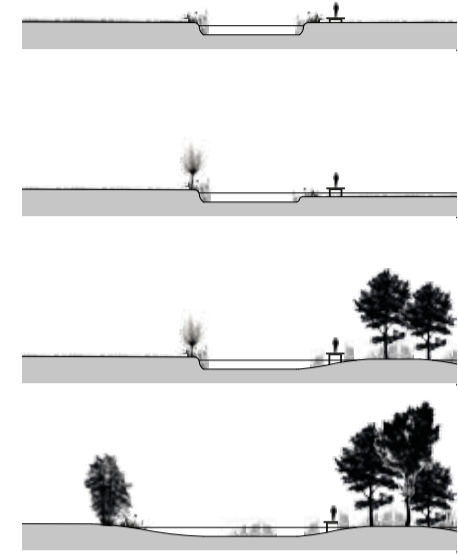
The delta cities Oude Tonge and Ooltgensplaat used to be harbor cities, but have in time become polder cities. Not only have the delta cities lost their direct relation with an intertidal area. Also public space, the small scale, has lost its historic relation with water.



#### Lost large scale relation with water

In the Medieval period Goeree Overflakkee existed of a dune with the village of Oudorp and multiple sand plates. The intertidal area did not contain any villages or settlements and belonged to the vagaries of natural processes. The delta was a rich fishing ground and an ideal place for trade, and thus for urbanization. The plates were surrounded by a ring dike and cultivated. Villages were founded at the (main) creek of the reclaimed sand plate. The creek provided water discharge of the polder and in addition kept the harbor open (from sedimentation). The accretion of sediment. The process of sedimentation and reclamation show that early delta cities that once lay on water have been embedded in the island and have been transformed from a harbor city in a polder city.





'Koninginnenkruid'  
Epipactium  
Cannabium

'Duinriet'  
Calamagrostis  
Egypcijs

'Schietwilg'  
Salix Alba



'Rietpopulier'  
Populus Tremula

'Knotwilg'  
Salix Alba

'Zachte Berk'  
Betula Pubescens

**From cultural to natural landscape**

The process towards an open delta in combination with the paradigm 'working with nature' provides a design attitude that let nature provide solutions and value to an urban landscape. The extended creek network, based on historic creeks, transforms during the phases from a cultural or maintained element in the landscape to an area given back to nature providing both water storage, nature development and an attractive recreation route.

The first stage of the transformation of the creek is that it is used for inundation and in the following phases the inundation polder is given back to nature in which hard edges become soft and flora and fauna find residence.



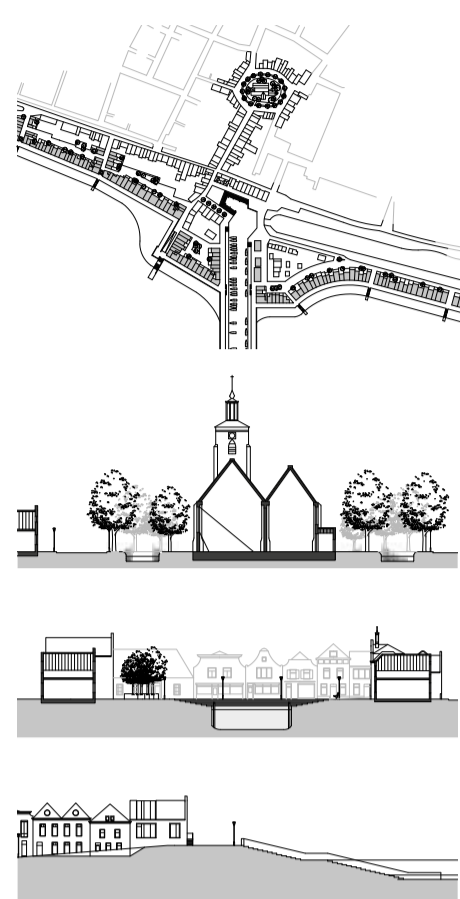
**Waterstorage of the creek network**

Rain storms occur more often and the discharge and storage of this rain water is lacking on the island of Goeree Overflakke, resulting in lost of crops due to high ground-water levels in an already wet environment. To provide waterstorage and rain water discharge on the island the historic creek network is restored and connected to each other. This will provide the farmers and agricultural businesses protection for their crops. In addition, with a possible re-establishing of an open delta, the sedimentation process will re-occur in the Krammer Volkerak. High discharge is also beneficial to keep the harbor and the canal open.



**Room for the River [RvR]**

The Krammer Volkerak becomes a part of the program Room for the River (RvR) by developing an inundation area. Although the frequency of flooding will be low, the area will be without housing. And assigned for nature development. This can be related to a closely related project in Zuid Holland: Tiengemeten (Natuur-monumenten), where a part of the inner dike area is given back to nature. The flooding of the polder can be 1m at maximum.



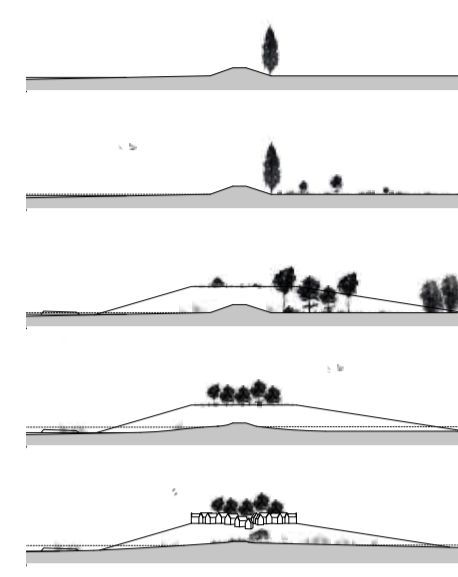
**New urban relation(s) with nature**

The concept for the urban extension is to combine an enhanced water defense with a re-vitalized harbor. The new housing are a face to the intertidal area and the promenade a recreative walking route for the inhabitants of Oude Tonge. The harbor is the spindle between the main street (from the church ring) to the intertidal area and the ship canal (to the harbor). The L-shape in the harbor re-introduces the characteristic and historic shape but has a touch to it. Instead of a quay the harbor is designed as a public space where people on a small scale can relate to water. The stairs leading to the water bridges the height difference of the square and the water. In addition, the old water ditch of the church ring is restored to hold water in heavy rain fall. Public initiative is a key term for housing development on this eastern hill in a transforming and attractive landscape in the vicinity of delta cities.



**Nature development**

The inundation area be assigned as a nature development by extending the Natura 2000. The intertidal area functions as a breeding place for (migrating) birds in which the 'scottish highlanders' keep selected areas open from forestation. This natural area will attract eco-tourist, wanderers, and birdspotters.



**Towards an (de)integrated dike**

As part of the design attitude 'from cultural' to natural' the dike transforms from a hard border between open water and polder to a landscape that provides natural water defense. The 'wierden' can transform during different phases from a natural forest to landscape living.



'Tiegels Slaggras'  
Spartina Anglica

'Zeeolief'  
Salicornia brachyloba

'Koninginnenkruid'  
Epipactium  
Cannabium



'Zeeolief'  
Aster Populium

'Moedooier'  
Cotulaque Monogyna

'Koninginnenkruid'  
Epipactium  
Cannabium



'Duinriet'  
Calamagrostis  
Egypcijs

'Schietwilg'  
Salix Alba

'Zachte Berk'  
Betula Pubescens

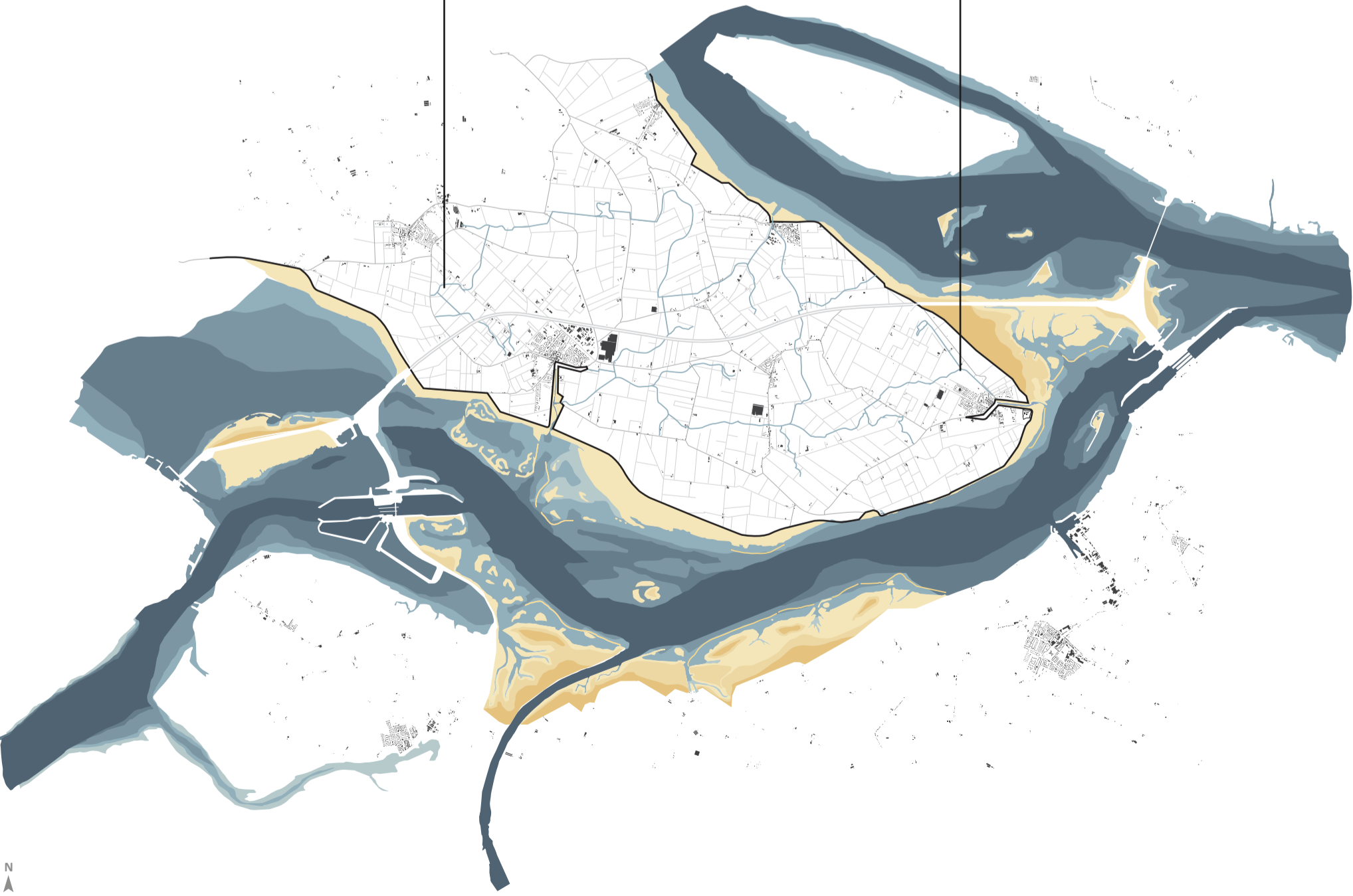


'Rietpopulier'  
Populus Tremula

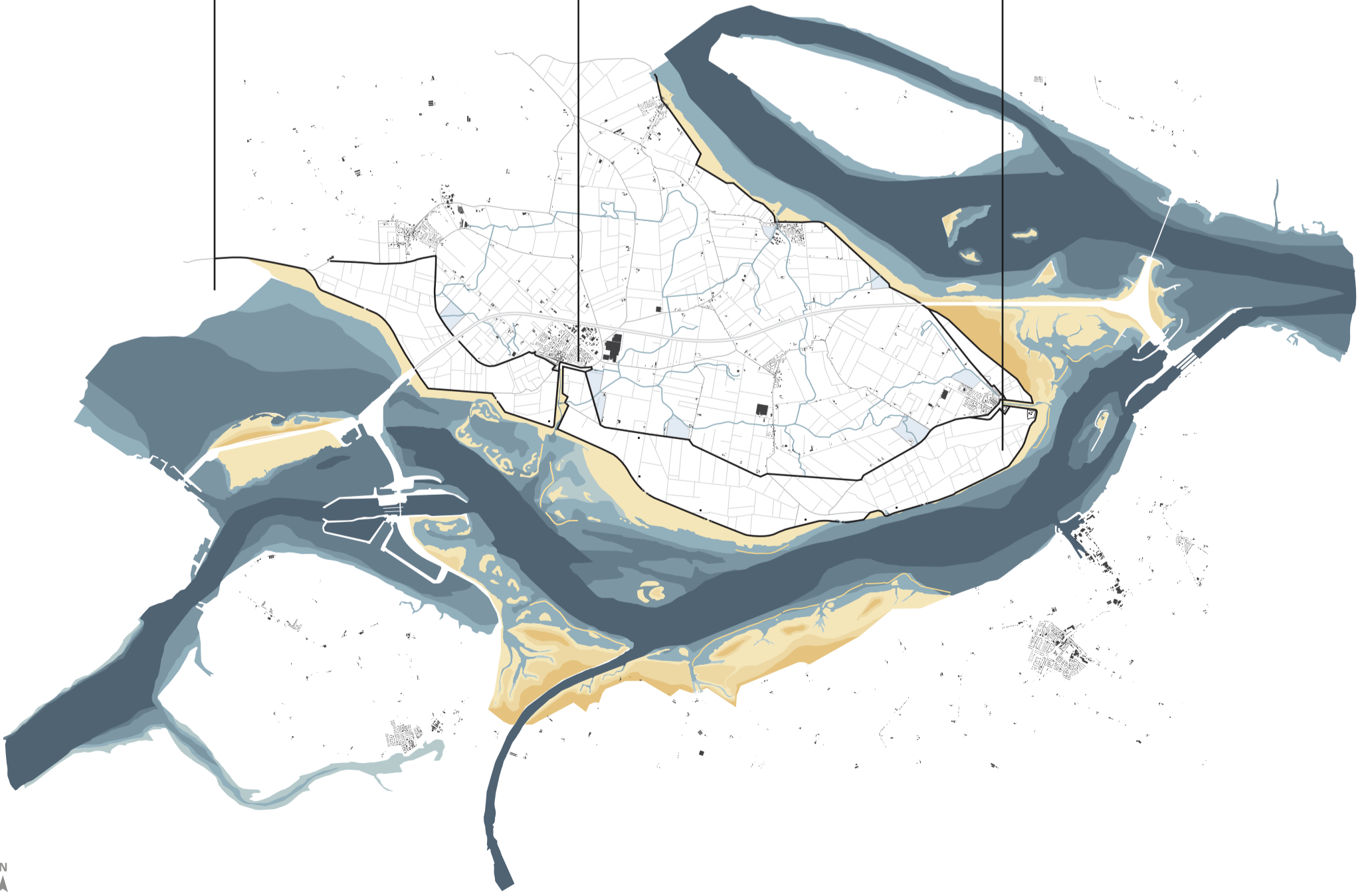


**Day recreation**

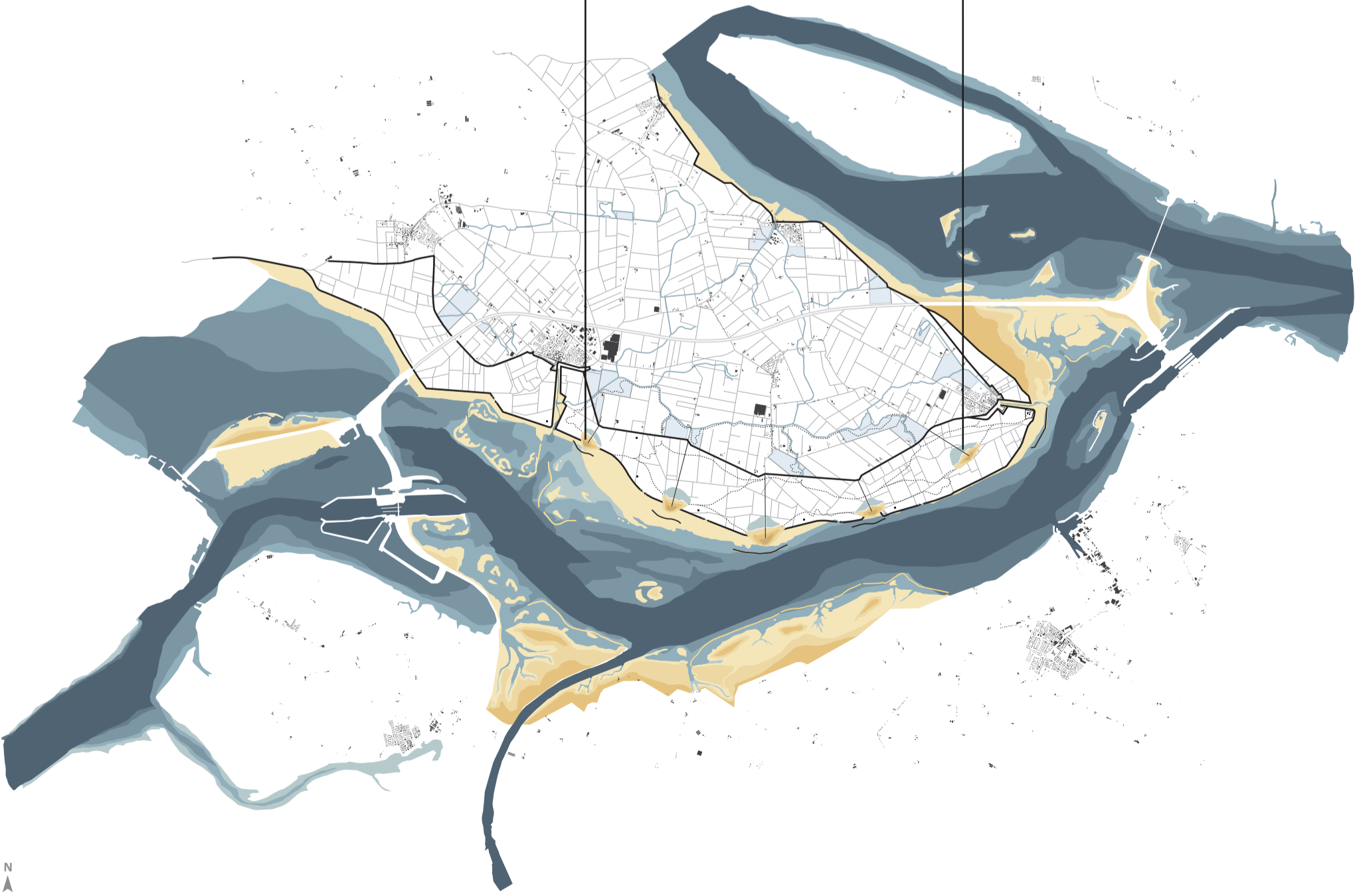
The recreation route showcases the transforming landscape in the inundation area and the polder area. The route also connects to the delta cities and the 'wierden'. The 'wierden' provide a place for 1-day-camping and regular camping. The pool adjacent to the earthen hill is the result of excavation and will be used for swimming and water recreation.



2015  
Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m



2020  
Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m



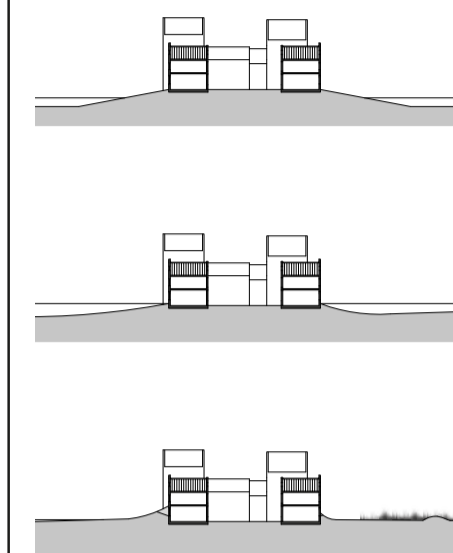
2040  
Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m



**From inundation to intertidal area**  
 The Dutch Southwest Delta is re-opened as part of the plan of ZW Delta and H+N+S Landscape architects. Tidal dynamics are restored and will provide a water level difference of 1,0m to 1,5m. The watergates built to let the area be inundated will now be set open to establish an ecologic transformation in the inundation area or intertidal area. The open delta in this phase is a controlled delta, where the (modified) Delta Works still provide water defense against the sea. With the re-opening of the delta the water in the Krammer Volkerak becomes salt/brackish and the problematics with algae will be solved.



**Living in a transforming landscape**  
 The dynamic landscape of the intertidal area provides an ideal location for attractive living or landscape living. In the vicinity of the delta cities Oude Tonge and Ooltgensplaat modern castles will be built that in time embeds itself in the landscape. Within 30 - 40 minutes of Rotterdam the housing is ideal for people looking to escape to nature.



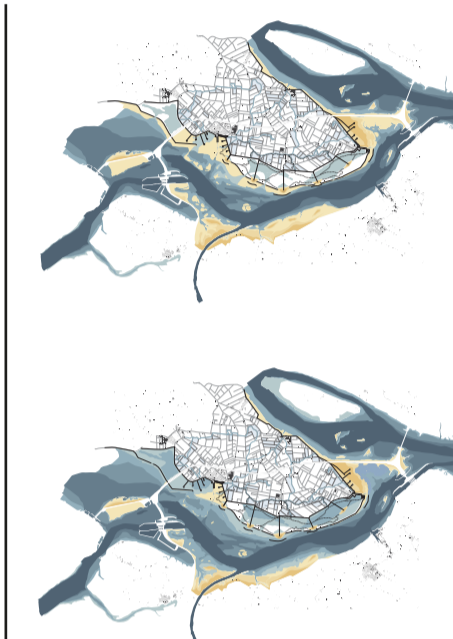
**Living in the contact zone**  
 The ecologic transformation from a fresh water ecology to a brackish ecology continues and the process of sedimentation provide new flora (and fauna) in the Krammer Volkerak. Inhabitants of the modern castles will witness a process of changing vegetation. From 'engels slijlgras' to 'strandweeik' and 'zeeaster'. The intertidal area could in this sense also be described as a contact zone between urban form and nature.



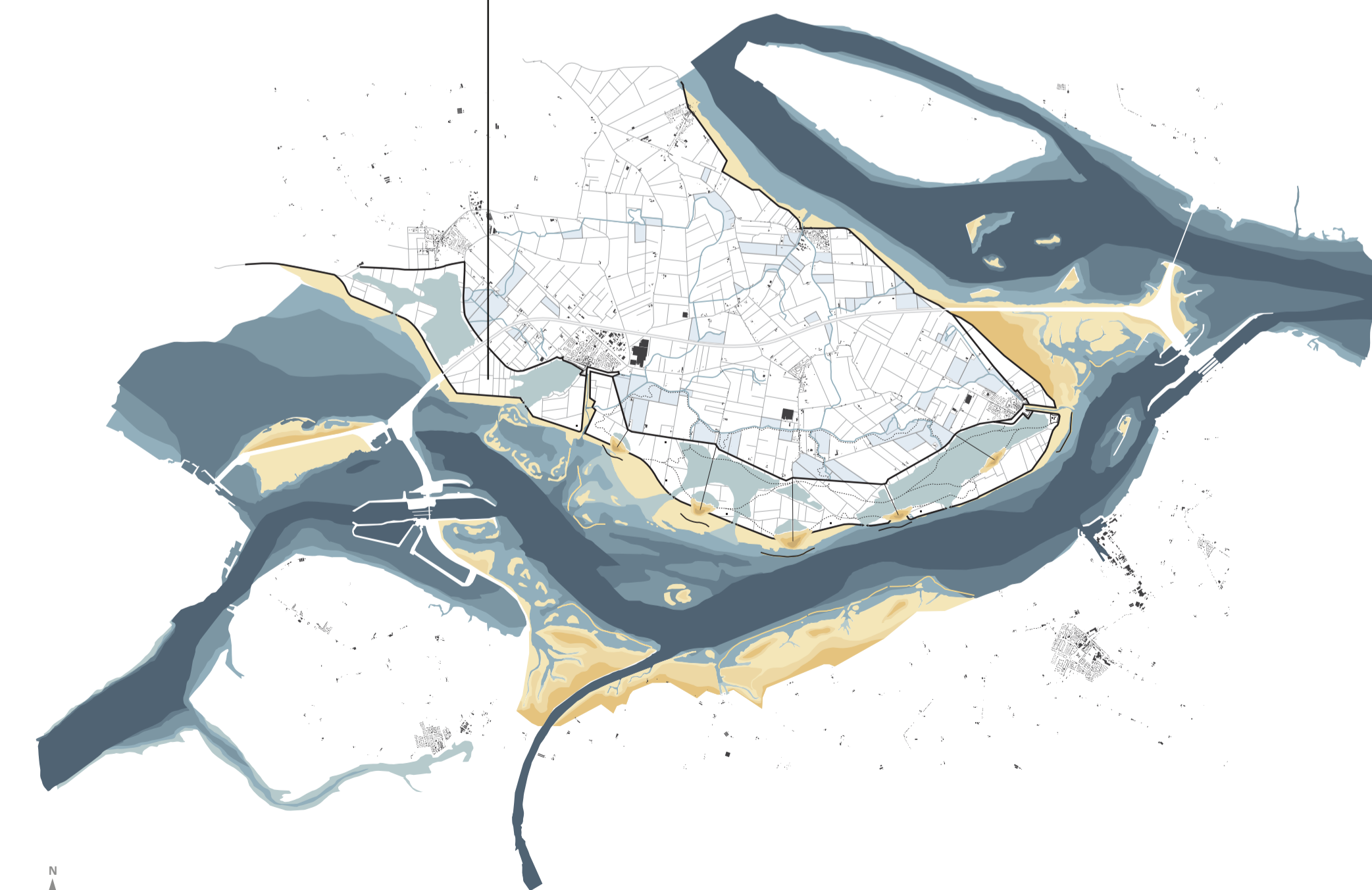
'Engels Slijlgras' *Sperma Anglica* 'Zeekraal' *Salicornia Brachystachya* 'Strandweeik' *Elymus Athericus*



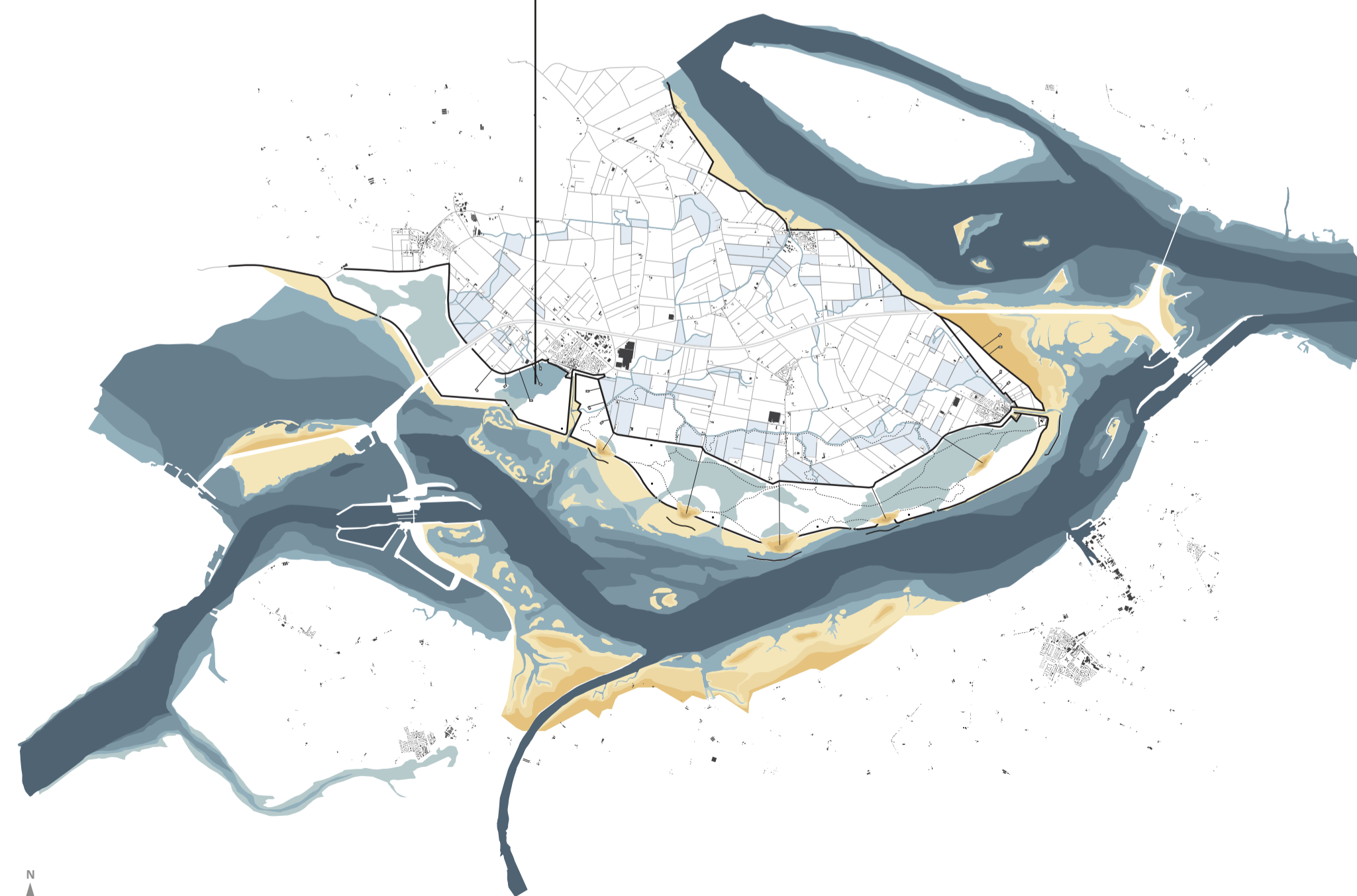
'Zeeaster' *Aster Tripolium*



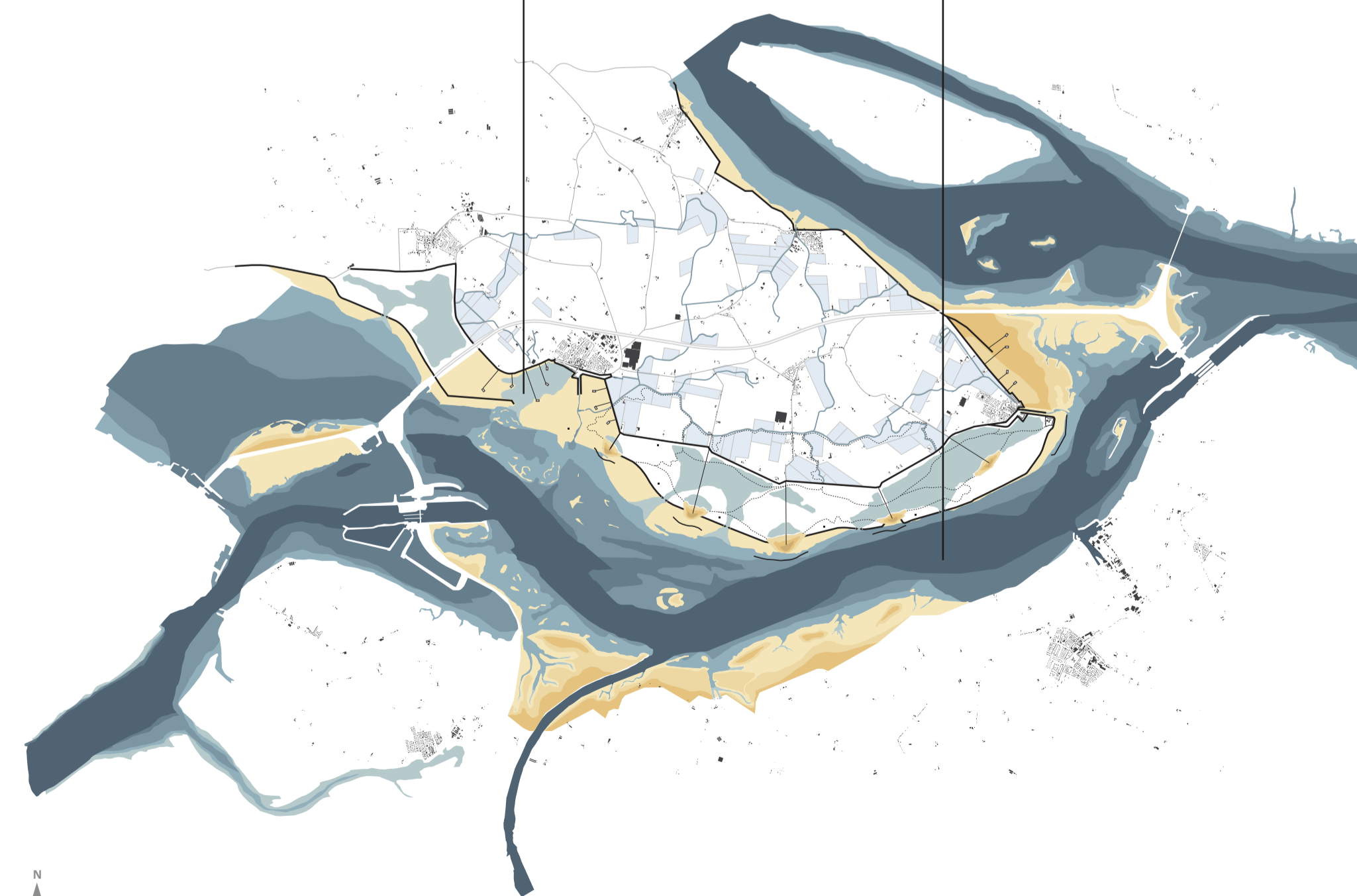
**Controlled tidal dynamics**  
 The relation between open water, intertidal area and delta cities is restored. The city has, as in the past, a direct relationship with water. In this transformation the (old) water defenses on the island will be enhanced. The Delta Works till this phase has functioned as primary water defense to protect the delta during hazardous water levels.



Now 10 m  
 2050  
 ZW Delta 11,0 - 1,5 m  
 WNF 16,0 - 6,8 m



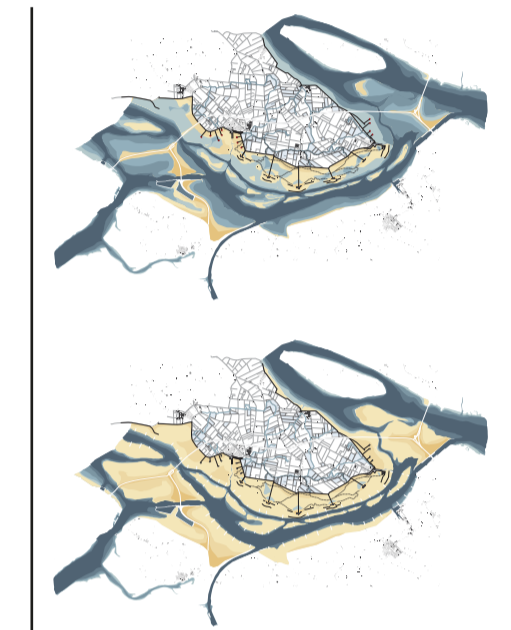
Now 10 m  
 2055  
 ZW Delta 11,0 - 1,5 m  
 WNF 16,0 - 6,8 m



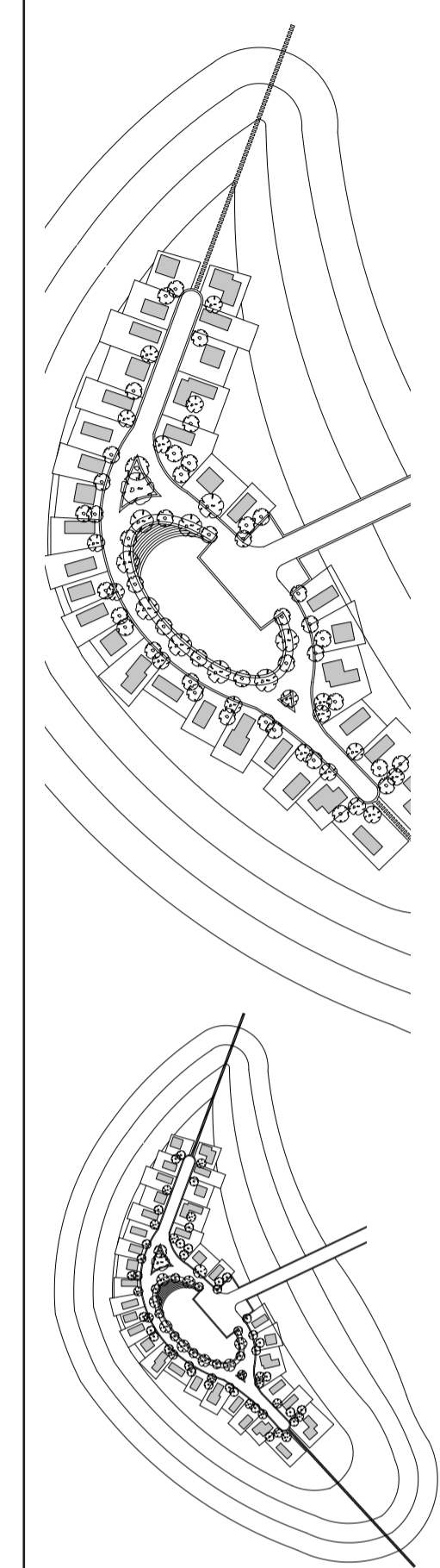
Now 10 m  
 2065  
 ZW Delta 11,0 - 1,5 m  
 WNF 16,0 - 6,8 m



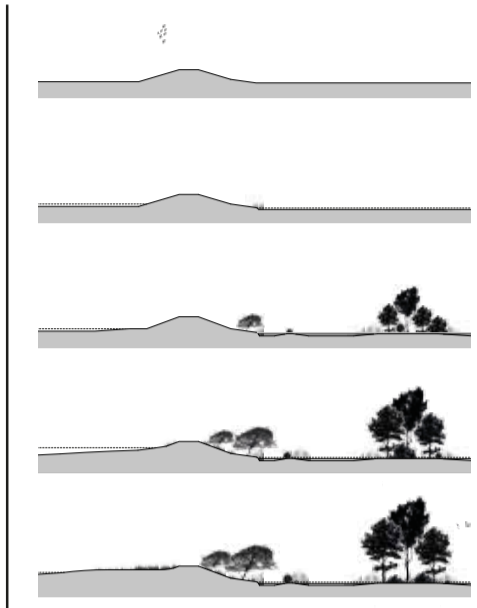
**Attractive shipping route**  
The manipulation of the waterflow with groynes, islands are created that separate cargo and recreation shipping in the Kramer Volkerak. This generates more safety, but increases the attractiveness of the shipping route.



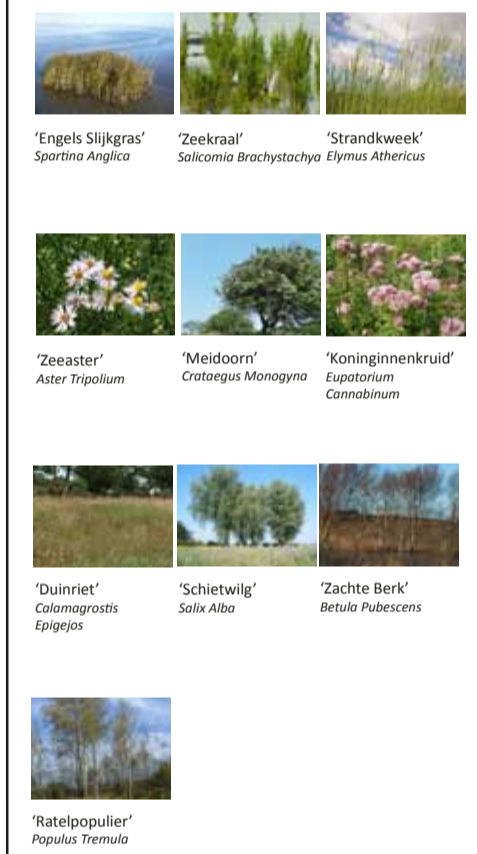
**Open delta**  
The vision of WNF to have natural water defenses, landscape living are integrated in this last phase. The sedimentation in the Kramer Volkerak continued. But with increased sedimentation there is a threat of silting up the area that unables shipping and decreasing water storage. To maintain an open shipping route groynes are used to narrow the shipping lane, providing a stable and high waterspeed that can transport sediment.



**Living on a 'wierde'**  
The design of landscape living on the Wierde is based on the case study research on 'wierden' of the Waddenzee. The form is not circular but is stretched to embed itself in the dike, the parcels follow this form. The pool and the garden/vegetation in the middle of the 'wierde' are characteristics that are used to relate to the study and 'wierden' in general. Public initiative is a key term for housing development on this earthen hill in a transforming and attractive landscape in the vicinity of delta cities.

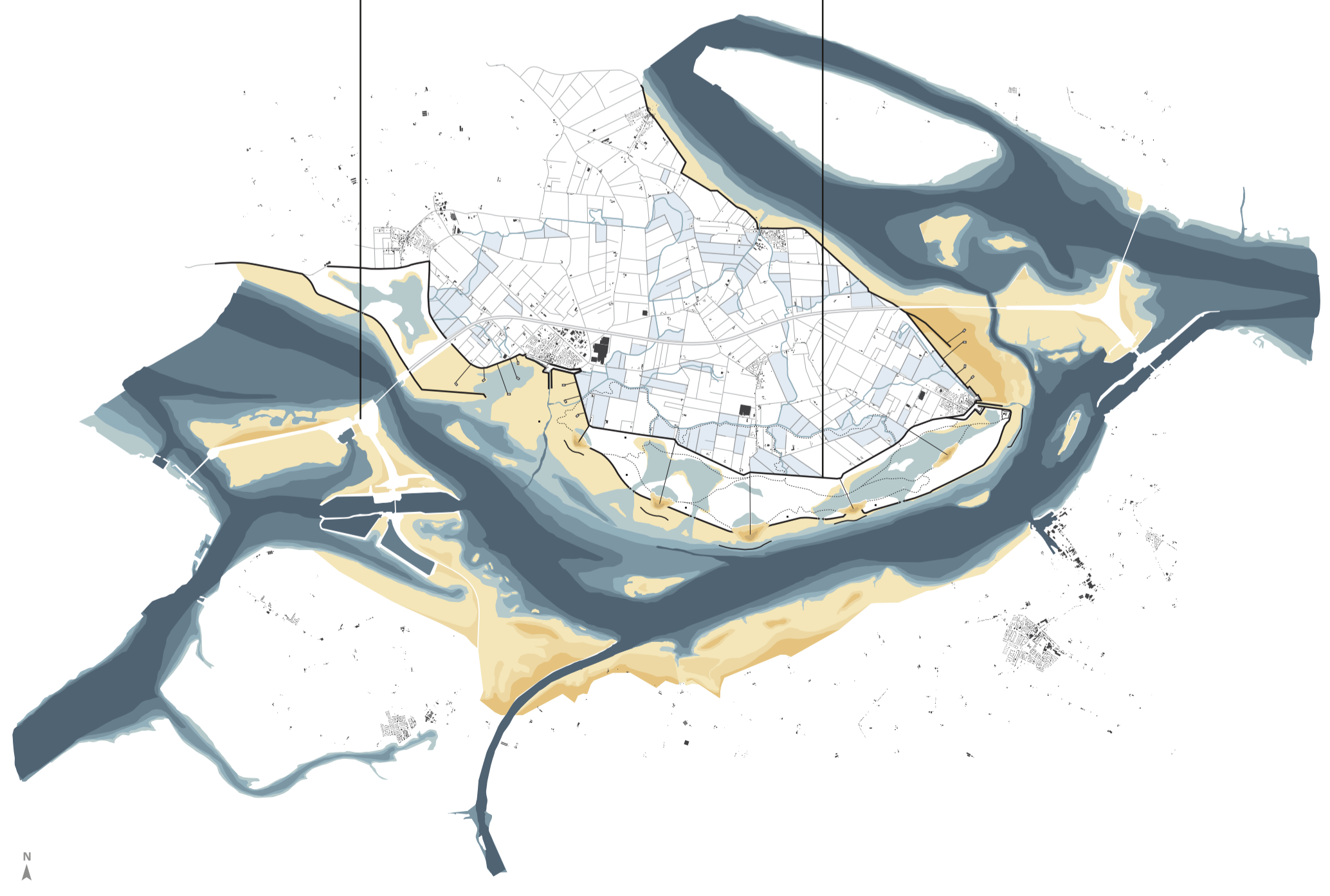


**Natural water defense**  
As the outer dike, the inner dike transforms from a hard border to an integrated element in the landscape. The water defense in the Kramer Volkerak is natural and relates the intertidal area with the polder area.

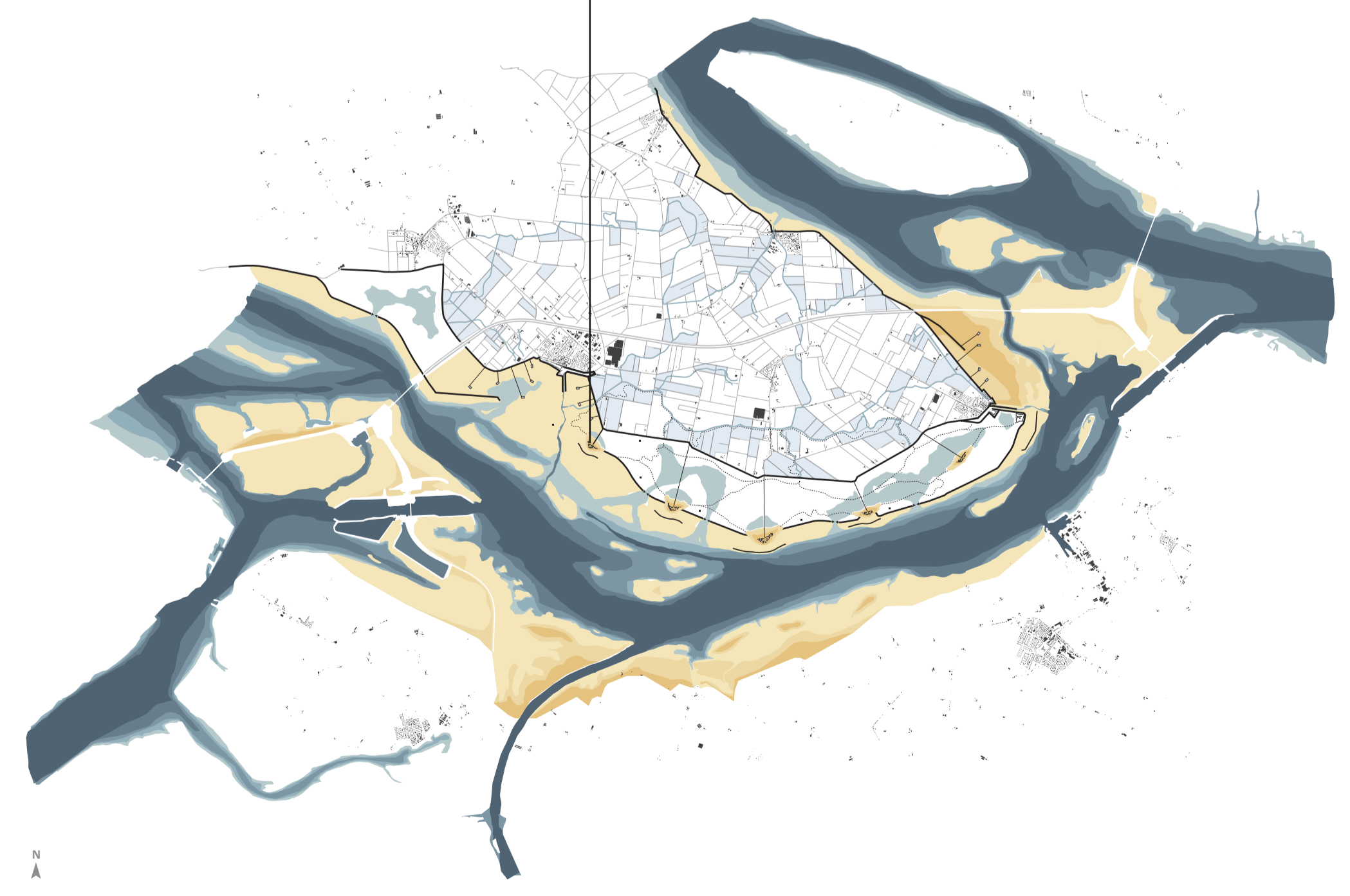


**'Ratpopulier'**  
*Populus tremula*

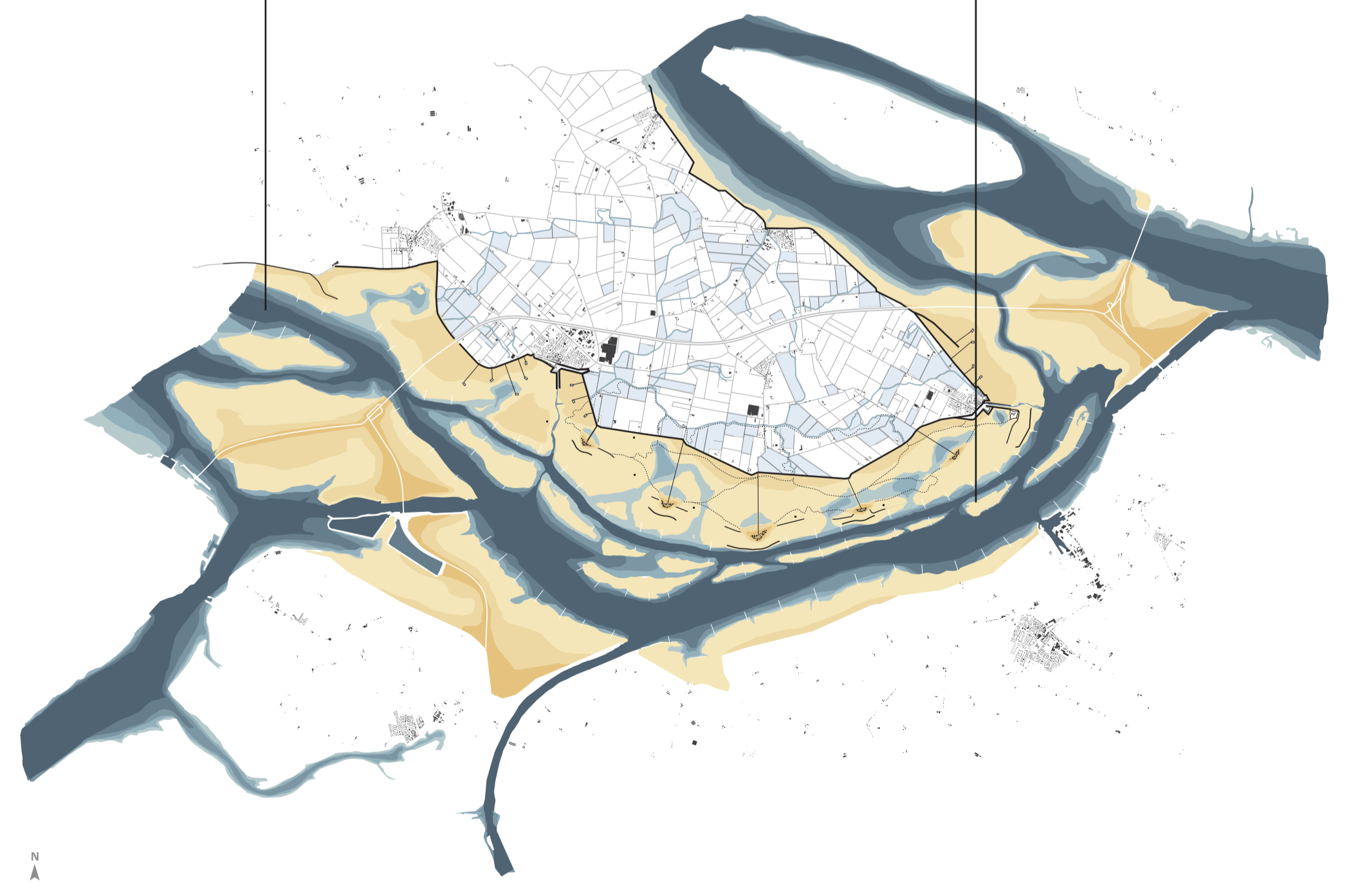
**Open delta**  
The Dutch Southwest Delta is completely open. With a fully open delta, the sedimentation process is fully re-established. The defensive function of the Delta Works has made way for the catchment of nature and sediment. The tidal dynamic has a fluctuation of 6,0m to 6,8m (3,0m to 3,4m above NAP) (Bath, The Netherlands is used as reference for this fluctuation). The fresh water storage on Goeree Overflakkee is essential.



Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m  
2075



Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m  
2085



Now 10 m  
ZW Delta 11,0 - 1,5 m  
WNF 16,0 - 6,8 m  
2100