A Future for the Past

A new destination for Fort Honswijk

Eline van Bemmel

MSc Thesis Landscape Architecture

Wageningen University & Dienst Landelijk Gebied

A Future for the Past

A new destination for Fort Honswijk

This sign, which is used in the header of every page, every chapter and on the frontpage, is a print of the floorplan of the tower of Fort Honswijk.

Colofon

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Preface

This Master thesis is the major part of the Master program Landscape Architecture at Wageningen University and the end product. In this thesis all the knowledge gathered during the years of my BSc and MSc in Landscape Architecture will be combined into one project which shows all the stages I have been through during the different courses during the years.

I started the BSc program Landscape Architecture after studying Earth Sciences at the University of Utrecht for one year. I transferred to Wageningen because the study program of Earth Sciences was too technical for me. During secondary school I already got my fascination for cultural heritage, especially for war heritage, this was shaped during history classes, excursions, TV-series (Apocalypse World War 2) and by the stories of my uncle, who is a regional historian and knows a lot about history of the surrounding of my hometown and history in general. At Wageningen University I took classes of Jelle Vervloet about cultural heritage, who made me even more enthusiastic.

During my BSc thesis I have made a design for "Werk aan de Groeneweg", an element of the New Dutch Waterline, closely located to Fort Honswijk. The goal of this thesis was to make it accessible for visitors, because it was overgrown with bushes and trees and it is an unique place because of the large amount of bunkers.

During writing and designing for this thesis I was supported by several persons. First of all, I would like to thank Rudi van Etteger and Gabriëlle Bartelse who gave feedback and comments on my work and helped me through difficult phases. Furthermore, I would like to thank Dienst Landelijk Gebied, especially Kees van der Velden, Jan Vrielink and Michel Ronden, who involved me in the process of redeveloping Fort Honswijk. I would like to thank Pieter Boone for providing facilities at Dienst Landelijk Gebied which made my work easier.

I also want to thank my family and friends who supported me during this project. Tonneke, for taking me out of my study environment for relaxation time when I needed it and pushing me to pick a deadline-date. My sister Marissa, for involving me in her thesis project, which made me critical about my own work, and checking my work. My sister Renske for keeping me 'down to earth' by pushing me to pick a deadline-date. Gerard, for always wanting to go with me on a fieldtrip, helping me with my choice of materials and asking questions I had never thought of. And last but not least Tom, for also helping me with choices of materials and shapes and with my maquette.

With this thesis I want to give insight in the Dutch Waterline and especially Fort Honswijk, which is regarded as a magical place by whoever visits it.

Summary

In 2008 the 'Pact van Rijnauwen' was signed in which 5 provinces and 5 ministries made agreements about the implementation programme of the New Dutch Waterline. 'Behoud door ontwikkeling' (EN: 'Conservation through development') is the key. For the fortresses Honswijk and Everdingen an ambition was formulated to let them redevelop by private initiative for the purpose of sustainable new use on commercial basis. The premise is that the parties involved (the government, provinces and municipalities) are allowed to formulate preconditions. The main goal formulated by Dienst Landelijk Gebied was "to transform the fortresses and their surroundings, while paying attention to culture- and nature values, to a trigger with social functions, which is an important economic pillar for the sustainable development of the whole area."
The subject of this thesis emerged after an internship at Dienst Landelijk Gebied, an agency of the Ministry of Economic Affairs. DLG is committed to cooperation in finding solutions that satisfy the demands of local authorities and citizens and which also takes the site specific features into account. DLG is currently involved in the process of finding a new owner for Fort Honswijk. The first steps are taken and the next steps are to finish the spatial quality framework and to make a marketing guideline. This framework gives an outline of the requirements for future buyers and shows the possibilities for redevelopment of the fortress.

To give the research a scientific and broader context, this thesis focuses on redevelopment (adaptive re-use) in general and international context. Fort Honswijk is used as an example of a case of a cultural heritage object which will be redeveloped. But in literature no list of criteria for redevelopment were found, only many examples of cases. This thesis compares these cases and with these conclusions, an outline or method for redeveloping Fort Honswijk is derived. The thesis starts with explaining the research itself. The main research question is: "What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?" This question is subdivided into sub questions: (1) "In what way has been taken care of fortresses of the Dutch Waterline?", (2) "What are current functions of fortifications of the Dutch Waterline and abroad?" and (3) "Which possible future functions could be given to Fort Honswijk, taking into account the limitations and restrictions?". The research is done with the help of a literature search, expert interviews, site analysis, case study analysis, sketches and impressions and evaluation.

Fort Honswijk is part of the New Dutch Waterline. In the Netherlands many of these types of defence systems can be found. The oldest defence line in the Netherlands is the Roman limes and later fortresses and castles were designed. The Old Dutch Waterline was designed in the 17th and 18th century to protect Holland, but it did not include the city of Utrecht, so later the New Dutch Waterline was invented, of which Fort Honswijk was a part. The Dutch Waterline consisted of several aspects, like an inundation system. Land was flooded to defend Holland from enemy troops. Also planting was used as a defence mechanism. Fort Honswijk was built in the years 1841-1848 to defend the Lekaccess and one of the larger and a smaller inundation lock. The main element of Fort Honswijk is its tower. The invention of artillery with a rifled barrel was the end of the tower-fortresses; they were quite vulnerable, were easy targets and lost their defensive power within several years. Fort Honswijk is the largest tower-fortress in the Netherlands.

Fort Honswijk is included in the policy framework of Panorama Krayenhoff and Nota Belvedére. In both policy framework attention is paid to the Dutch Waterline. The consequence is that the renovation of the Waterline has been put on the agenda of many provinces and municipalities again. A list of demands has been made by DLG and other involved parties in a workshop. These demands are that the new function of the fortress should add something to the current situation, the terrain should be publicly accessible, there should be no traffic generating effect, the fortresses Honswijk and Everdingen will be sold separately, there must be on buying party even though the fortress can be used for different projects, the building map is guided, parking should take place at the fortress and the rampart around the fortress should be restored.
There are some limiting factors to the design, besides the list of demands from DLG. These factors are flora- and fauna restrictions. The bat population living at the

fortress needs specific attention, but the result of a lot of data available about bats and fortresses makes clear that still many things are possible and bats should not be seen as a limiting factor, but an opportunity.

The theoretical framework explains the concept of cultural heritage and its future. 'The meaning and importance of our built heritage have been changing continuously over recent years and the politics for preservation have evolved.' (Gazaneo 2003, p.411) The economic crisis forces us to be more creative in the search for new means of preserving cultural heritage. The government is less involved and has reduced funding. 'The heritage sector will therefore have to continue to show its true worth in terms of responsible management, expert repair work and clever ways of adjusting to the new situation.' (Janssen 2012) Furthermore, the concept of adaptive re-use is explained as the process of reusing a building or an old site for a purpose other than which it was built or designed for. Together with brownfield reclamation, it is seen as the key factor in land conservation and the reduction of urban sprawl. It can be regarded as the compromise between demolition and historic preservation. There are five reasons for implementing adaptive re-use mentioned by Latham (2000): (1) the building under consideration has archaeological value, (2) the building under consideration is a visual amenity or a cultural contribution, (3) the building under consideration can make economic sense, (4) the building under consideration has a functional value or (5) the building under consideration fills a psychological need. Weijschede et al. (2006) states a list of recommendation when coping with the re-use of military sites specifically: (1) the fortifications are a gift from our history, which should be cherished, (2) give attention to the way the defence system operated in its regional and European context, (3) reinforce the local and regional identity, when making the heritage visible, (4) the re-use of military heritage is a good way of preserving this heritage, (5) the possibilities of new use are endless; but every new form should be considered in each local situation and (6) local initiatives should be supported by the government. Modernization of fortresses can take place by changing their function and by making it more sustainable by using sustainable energy sources.

The fortress is located in the area called 'Het Eiland van Schalkwijk' which is located to the south-east of the city of Utrecht, alongside the river Lek. The surrounding landscape has strong landscape- and cultural-historical qualities and originally a strong agricultural identity. The fortress is located in a river landscape, characterized by levees, lower backlands, dikes and floodplains. Map analyses made clear that water is an important aspect in the area, like it was when the Dutch Waterline was still operating.

Case studies were done to get insight of what already has been done when redesigning cultural heritage objects or fortresses. Aspects that were interesting and which could be used when designing are to strengthen national (and international) visibility and to make a design for a longer time span. Furthermore, a connection to important infrastructure is recommended and to organize year-round activities. It should be kept in mind that everything can be possible, as long as it suits the location and sometimes remodelling is not necessary, only small adaptations can make huge changes.

The list of demands and the analysis of the fortress made clear that at least three aspects of the fortress needed to be redesigned. The first one is the main entrance, because of the restoration of the rampart there will be no entrance for cars anymore. But in case of emergency and for inhabitants living on the island it is necessary to have an extra entrance. This entrance will be made as a gap in the rampart. Secondly, an extra entrance on the east-side of the fortress is necessary for safety reasons and because this extra entrance will most likely attract visitors. And thirdly, a solution should be found for parking at the fortress. But from analysing the terrain, it is decided not to make a large parking lot at the fortress (only a small one for inhabitants), but near the dock of the 'Liniepontje'.

Design principles were made to guide the design process. These design principles were the result of analysis of other fortresses in the Netherlands and abroad and a literature study. From this can be concluded that making a division in type of landscape is a common phenomenon in military history and something that makes sense for the location of Fort

Honswijk. This design principle can be applied in the future on other locations. In the case of Fort Honswijk, the terrain was divided into a north and south section. This principles was also applied in the other design principles; a division in function between north and south and a division in type of planting between north and south. The final design principle was to make a connection with the aspect of water, because that played an important role in the history of Fort Honswijk and the Dutch Waterline. Fort Honswijk is located on an unique location alongside the river Lek, and why not make use of this location? This is done by making a waterside with the character of the Dutch Waterline, with concrete and a soil-covered shelter.

The answer to the main question "What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?" is thus to find out what makes the object unique, which is in the case of Fort Honswijk its location alongside the river Lek. Furthermore, the aspect of a division of the terrain can be very well applied to this location because this was used in history as well and makes the terrain more suitable for different functions. The future of Fort Honswijk will most likely include a combination of buyers and a combination of function, because this would generate the most money to finance the maintenance of the fortress.

Samenvatting

In 2008 is het Pact van Rijnauwen getekend waarin 5 provincies en 5 ministeries afspraken hebben gemaakt over het uitvoeringsprogramma van de Nieuwe Hollandse Waterlinie. 'Behoud door ontwikkeling' (EN: 'Conservation through development') is het speerpunt hiervan. Voor de forten Honswijk en Everdingen is een ambitie geformuleerd om ze op basis van privaat initiatief te laten herontwikkelen met als doel duurzaam nieuw gebruik op commerciële basis. De voorwaarde is dat de betrokken partijen (de regering, provincies en gemeentes) voorwaarden mogen formuleren. Het belangrijkste doel dat formuleert door Dienst Landelijk Gebied was, is om de forten en hun omgeving te transformeren tot een trekker met sociale functies, terwijl er aandacht wordt besteed aan cultuur- en natuurwaarden, welke een belangrijke economische pijler wordt voor duurzame ontwikkeling in het hele gebied."
Het onderwerp van deze scriptie is ontstaan tijdens een stage bij Dienst Landelijk Gebied, een agentschap van het Ministerie van Economische Zaken. De taak van DLG is om samen te werken in het vinden van oplossingen die aan de eisen van de lokale overheden en inwoners voldoen en die ook rekening houdt met de plek-specifieke kenmerken. DLG houdt zich momenteel bezig met het proces van het vinden van een nieuwe eigenaar voor Fort Honswijk. De eerste stappen zijn gemaakt en de volgende stappen zijn om het ruimtelijke kwaliteitskader af te maken en om een verkoopleidraad te maken. Dit kader geeft een overzicht van de eisen voor toekomstige kopers en laat de mogelijkheden voor herontwikkeling van het fort zien.

Om het onderzoek een meer wetenschappelijk en bredere context te geven focust deze scriptie zich op herontwikkeling (adaptief hergebruik) in algemene en internationale context. Fort Honswijk is gebruikt als voorbeeld van een case van een cultureel erfgoed object dat zal worden herontwikkeld. Maar in literatuur is er geen lijst van criteria voor herontwikkeling te vinden, alleen veel voorbeelden van cases. Deze scriptie vergelijkt deze cases en met die conclusies is een methode voor herontwikkeling van Fort Honswijk afgeleid. Deze scriptie begint met het uitleggen van het onderzoek zelf. De hoofd-onderzoeksvraag is: "Welke ontwerpprincipes moeten in acht worden genomen wanneer er besloten moet worden wat de best mogelijke toekomstige functie voor een cultureel erfgoed object zoals Fort Honswijk is?". Deze vraag is opgedeeld in deelvragen: (1) "Op welke manier is er voor forten van de Hollandse Waterlinie gezorgd?", (2) "Wat zijn huidige functies van forten van de Hollandse Waterlinie en in het buitenland?" en (3) "Welke mogelijke toekomstige functies kunnen worden gegeven aan Fort Honswijk, rekening houdend met de beperkingen en restricties?". Het onderzoek is gedaan met behulp van een literatuurstudie, interviews met experts, een analyse van de plek, een case study analyse, schetsen en impressies en een evaluatie.

Fort Honswijk is een onderdeel van de Nieuwe Hollandse Waterlinie. In Nederland kunnen meerdere soorten verdedigingssystemen gevonden worden. De oudste verdedigingslinie is de Romeinse limes en later zijn er forten en kastelen ontworpen. De Oude Hollandse Waterlinie is ontworpen in de 17e en 18e eeuw om Holland te beschermen, maar de stad Utrecht was hier nog niet bij inbegrepen, dus later werd de Nieuwe Hollandse Waterlinie ontwikkeld, waar Fort Honswijk een onderdeel van was. De Hollandse Waterlinie bestond uit verschillende aspecten, zoals een inundatie systeem. Land werd onder water gezet om Holland de beschermen tegen vijandelijke troepen. Ook beplanting werd gebruikt als een defensiemechanisme. Fort Honswijk is gebouwd in de jaren 1841-1848 om het Lekacces te beschermen en een van de grotere en een kleinere inundatiesluis. Het belangrijkste element van Fort Honswijk is de toren. De uitvinding van artillerie met een getrokken loop was het einde van de torenforten; ze waren erg kwetsbaar, makkelijke doelen en hadden hun defensieve kracht verloren in enkele jaren. Fort Honswijk is het grootste torenfort in Nederland.

Fort Honswijk is opgenomen in het beleidskader van Panorama Krayenhoff en Nota Belvedére. In beide beleidskaders is aandacht besteed aan de Hollandse Waterlinie. Het gevolg hiervan is dat de renovatie van de Waterlinie opnieuw op de agenda van veel provincies en gemeentes is gezet. Een lijst van eisen is opgesteld door DLG en andere partijen in een workshop. Deze eisen zijn dat een nieuwe functie van het fort iets moet toevoegen aan de huidige situatie,

het terrein publiek toegankelijk moet zijn, dat er geen verkeer aantrekkende werking mag zijn, dat de forten Honswijk en Everdingen apart van elkaar verkocht gaan worden, dat er een kopende partij moet zijn, ookal kan het fort gebruikt worden voor verschillende projecten, de gebouwenkaart is leidend, parkeren moet plaatsvinden op het fort en de wal rond het fort moet hersteld worden.
Er zijn wat limiterend factoren aan het ontwerp, behalve de lijst van eisen van DLG. Deze factoren zijn flora- en fauna restricties. De vleermuispopulatie die op het fort leeft heeft speciale aandacht nodig maar de resultaten van een heleboel data over vleermuizen en forten maakt duidelijk dat er nog steeds veel dingen mogelijk zijn en dat vleermuizen niet gezien moeten worden als limiterende factor maar als kans.

Het theoretisch kader legt het concept cultureel erfgoed en haar toekomst uit. 'De betekenis en het belang van ons gebouwde erfgoed veranderd continu over de afgelopen jaren en politiek voor behoud is ontwikkeld.' (Gazaneo 2003, p.411) De economische crisis zorgt ervoor dat we meer creatief moeten zijn in het vinden van nieuwe middelen voor het behoud van cultureel erfgoed. De regering is minder betrokken en heeft subsidies gereduceerd. 'De erfgoedsector zal daarom moeten doorgaan om zijn echte waarde te laten zien op het gebied van verantwoord beheer, expert reparatiewerk en slimme manieren om aan te passen aan die nieuwe situatie.' (Janssen 2012) Verder wordt het concept van adaptief hergebruik uitgelegd als het proces van het hergebruiken van een gebouw of een oude plek met als doel iets anders dan waarvoor het oorspronkelijk was ontworpen. Samen met het herontwikkelen van braakliggende terreinen wordt het gezien als de belangrijkste factor in het onderhoud van land en de historische afname van staduitbreiding. Het kan worden gezien als de compromis tussen sloop en monumentenzorg. Er zijn vijf redenen voor het implementeren van adaptief hergebruik die genoemd worden door Latham (2000): (1) het gebouw heeft archeologische waarde, (2) het gebouw is horizonvervuiling of een culturele bijdrage, (3) het gebouw heeft economische waarde, (4) het gebouw heeft een functionele waarde of (5) het gebouw kan aan een psychologische behoefte voldoen. Weijschede et al. (2006) noemt een lijst van aanbevelingen wanneer er omgegaan moet worden met militair cultureel erfgoed: (1) de forten zijn een gift van onze geschiedenis, welke gekoesterd moeten worden, (2) geef aandacht aan de manier waarop het verdedigingssysteem opereerde in regionale en Europese context, (3) versterk de lokale en regionale identiteit wanneer het erfgoed zichtbaar wordt gemaakt, (4) het hergebruiken van oorlogserfgoed is een goede manier om dit erfgoed te behouden, (5) de mogelijkheden voor nieuw gebruik zijn eindeloos; maar elke vorm moet overwogen worden op elke lokale situatie en (6) lokale initiatieven moeten worden ondersteund door de regering. Modernisatie van forten kan plaatsvinden door het veranderen van functies en door de forten meer duurzaam te maken door het gebruik van duurzame energiebronnen.

Het fort ligt in een gebied dat 'het Eiland van Schalkwijk' wordt genoemd, wat ligt ten zuidoosten van de stad Utrecht, aan de rivier de Lek. Het omringende landschap heeft sterke landschappelijke- en cultuurhistorische kwaliteiten en van origine een sterke landbouw identiteit. Het fort ligt in een rivierlandschap, dat gekenmerkt wordt door oeverwallen, kommen, dijken en stroomruggen. Kaartanalyse maakte duidelijk dat water een belangrijk aspect is in het gebied, net zoals toen de Hollandse Waterlinie nog in werking was.

Case studies zijn gedaan om inzicht te krijgen in wat er al gedaan is op het gebied van het herontwerpen van cultureel erfgoed objecten of forten. Aspecten die interessant waren en die gebruikt konden worden terwijl er ontworpen werd zijn om de nationale (en internationale) zichtbaarheid te versterken en om een ontwerp te maken voor een langere tijdspanne. Verder wordt een connectie met belangrijke infrastructuur aangeraden en om het gehele jaar door activiteiten te organiseren. Er moet rekening gehouden worden met dat alles mogelijk kan zijn, zolang het maar bij de plek past. Soms is herontwerp helemaal niet nodig en zijn kleine aanpassingen voldoende om grote verschillen te maken.

De lijst van eisen en de analyse van het fort maken duidelijk dat er tenminste 3 onderdelen van het fort herontwerpen moeten worden. De eerste is de hoofdingang, omdat door het herstellen van de fortwal er geen ingang meer zal zijn voor auto's. Maar in geval

van nood en voor de bewoners van het fort is het nodig om een extra ingang te hebben. Deze ingang zal worden vormgegeven als een incisie in de fortwal. Ten tweede is er een extra ingang ten oosten van het fort nodig voor veiligheidsredenen en omdat deze extra ingang waarschijnlijk extra bezoekers zal aantrekken. En ten derde zal er een oplossing gevonden moeten worden voor parkeren op het fort. Maar uit een analyse van het fortterrein is besloten om geen grote parkeerplaats op het fort te maken (alleen een kleine voor bewoners) maar bij de aanlegplaats van het Liniepontje.

Ontwerpprincipes zijn gemaakt om het ontwerpproces te leiden. Deze ontwerpprincipes zijn het resultaat van de analyse van andere forten in Nederland en in het buitenland en een literatuurstudie. Hieruit kan worden geconcludeerd dat het maken van een scheiding in type landschap een veelvoorkomend fenomeen is in oorlogsgeschiedenis en iets dat logisch is op Fort Honswijk. Deze ontwerpprincipes kunnen worden toegepast in de toekomstplannen van andere locaties. In het geval van Fort Honswijk is het terrein verdeeld in een noordelijk en zuidelijk deel. Dit principe is ook toegepast in de andere ontwerpprincipes; een verdeling in functie tussen het noordelijke en zuidelijke deel en een verdeling in beplanting tussen het noordelijke en het zuidelijke deel. Het laatste ontwerpprincipe is om een verbinding te maken met het aspect water, omdat dit een belangrijke rol heeft gespeeld in de geschiedenis van Fort Honswijk en de Hollandse Waterlinie. Fort Honswijk ligt op een unieke locatie langs de rivier de Lek, en waarom zou je geen gebruik maken van deze locatie? Dit is gedaan door het maken van een waterkant met het karakter van de Hollandse Waterlinie, met beton en een grondgedekte beschutting.

Het antwoord op de hoofdvraag "Welke ontwerpprincipes moeten in acht worden genomen wanneer er besloten moet worden wat de best mogelijke toekomstige functie voor een cultureel erfgoed object zoals Fort Honswijk is?" is dus om uit te vinden wat het object uniek maakt, wat in het geval van Fort Honswijk de locatie langs de rivier de Lek is. Verder is het aspect van een verdeling van het terrein goed toe te passen op deze locatie omdat dit in de geschiedenis ook al is gebruikt en het het terrein meer geschikt maakt voor verschillende functies. Fort Honswijk zal waarschijnlijk worden gekocht door een combinatie van kopers en gebruikt worden door meerdere functies, omdat dit het meeste geld zal opleveren om het onderhoud van het fort te financieren.

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1. Introduction

Fort Honswijk
(Photo: Panoramio)

1. Introduction

In this introductory chapter it will be explained what the background of this thesis-subject is. It will start with the problem statement, in which it will explain what policy framework is concerned with redesigning Fort Honswijk. Furthermore, the purpose of this research and this thesis will be explained.

1.1 Problem Statement

In 2008, the '*Pact van Rijnauwen*' was signed, in which 5 provinces and 5 ministries made agreements about the implementation program of the New Dutch Waterline. '*Behoud door ontwikkeling*' (EN: 'Conservation through development') is the key.

For the fortresses Honswijk and Everdingen an ambition was formulated to let them redevelop by private initiative for the purpose of sustainable new use on commercial basis. The premise is that the parties involved (the government, provinces and municipalities) are allowed to formulate preconditions.

The main goal is "*to transform the fortresses and their surrounding, while paying attention to culture- and nature values, to a trigger with a social function, which is an important economic pillar for the sustainable development of the whole area*". (Dienst Landelijk Gebied 2012, p. 2)

Within those preconditions, which are stated in a '*Publiek Programma van Eisen (PPvE)*', several directions of development are possible. The PPvE is a spatial and legal framework in which proposals and plans for the redevelopment and exploitation of the fortresses are developed.

The strategy for the marketing approach is summarized as '*Richten zonder te verplichten*' (EN:'Focussing without obliging'). The fortresses will be sold to the party that offers the most valuable suggestion.

In the past, much research has been done into the possible future developments of both fortresses. It has even been the subject of a workshop at the International Biënnale Redevelopment & Vacancy at Maastricht. An important document about the redevelopment of the fortresses is '*Beeldkwaliteitsplan forten Honswijk, Everdingen en Lunet aan de Snel*'. This document has been defined by the '*Enveloppecommissie Linieland*'. However, the plan has not been discussed with the municipalities, which makes it not legally binding, but it contains important information and is an important module for the upcoming process of redevelopment.

For the redevelopment collaboration between project developers, construction firms, advisors and operators is necessary. It is unlikely that one party has all it takes to redevelop a fortress. (Dienst Landelijk Gebied 2012; Gemeente Houten 2013)

Internationale Biënnale
Leegstand
& Herbestemming

International Biënnale Redevelopment & Vacancy 2011

The redevelopment of the fortresses Honswijk and Everdingen has been part of the workshop at the International Biënnale at Maastricht. The question was to:

- get new ideas and insights for the complex assignment, which are compiled in the booklet '*Eindrapportage werkatelier Forten Honswijk & Everdingen*' by Liesbeth Jansen (Linkeroever) & Hans Stelwagen (Mindscapes)
- get attention for this redevelopment assignment

Most important criteria for the assessment of the future plans will be:

- the brand strength of the concept
- the temporary use
- the independent operation

(Jansen & Stelwagen 2011)

1.2 Purpose

Dienst Landelijk Gebied (DLG) (EN: The Government Service for Land and Water Management) is an agency

of the Ministry of Economic Affairs. DLG is committed to cooperation in finding solutions that satisfy the demands of local authorities and citizens and which also takes site specific features into account. Abstract policy is translated into tangible projects, when developing open space for recreation, nature, water management and agriculture. (Dienst Landelijk Gebied 2013)

Dienst Landelijk Gebied is currently involved in the process of finding a new owner for Fort Honswijk. The first steps are made; a layout for the 'spatial quality framework' (NL: Ruimtelijk Kwaliteitskader) is developed, an information-day was organised for inhabitants of the 'Island of Schalkwijk' (NL: Eiland van Schalkwijk) and the first consultations have taken place with the municipality and other parties involved. The next step is to finish the 'spatial quality framework' and to make a 'marketing guideline' (NL: Verkoopleidraad). But facts which need to be included in these documents will be provided by the ministry of Defence, the current owner of Fort Honswijk. It is a matter of weeks, or maybe months, when this ministry will definitely leave the terrain of the fortress and the terrain will be owned by the ministry of Economic Affairs. The 'spatial quality framework' will be developed in collaboration with the government and the municipality of Houten and includes the possibilities and preconditions for the sale. This framework gives an outline of the requirements for future buyers and shows the possibilities for redevelopment of the fortress. This framework will be determined by public parties. Next, a Pre-Qualification Questionnaire (PQQ) will be drawn up and the market of buyers will be approached. It will be sold to the party that, on the basis of predefined criteria, offers the most valuable suggestion. (Ministerie van Economische Zaken 2013)

1.1 Signs have been placed along the highway to make people more aware of the location of the New Dutch Waterline in the landscape (Geofort)

To give the research a scientific and broader context this thesis focuses on redevelopment (adaptive reuse) in general- and international context. Fort Honswijk will be an example of a case of a cultural heritage object which will be redeveloped. But in literature no lists of criteria for redevelopment are found, only many examples of cases. These cases will be compared and with these conclusions, an outline or method for redeveloping Fort Honswijk will tried to be derived. Fort Honswijk is a good example of what is happening nowadays with cultural heritage objects. There are different processes that lead to new owners or new functions, depending on the current owner and the type of object. The fortress of Fort Honswijk is a very vulnerable object, because of its ancient and unique buildings, so not all functions are possible. Besides that, unique flora and fauna entails restrictions too. As mentioned in the previous paragraph, a combination of parties will be most likely to be the future owners of the fortress.

What is missing is a clear overview of other cultural heritage projects that have been redeveloped, the consequences of this redevelopment and a method for making a design. What criteria should be taken into account? In what way should be dealt with cultural heritage in general? This thesis tends to find design criteria which should at least be taken into account when making a design for a new function of Fort Honswijk and which restrictions and limitations should be taken into account. It focuses on making a good basis for the process of redeveloping Fort Honswijk, where the emphasis is on the uniqueness and beauty of the fortress.

1.3 Outline of the report

This thesis starts with an explanation of the research

process. Chapter 2 explains the aim of the research and the research questions. Furthermore the research strategy will be explained as well as the research procedures. Chapter 3 is about the project area; Fort Honswijk. It starts with the history of defence in the Netherlands and after that the history and aspects of the Dutch Waterline will be explained, like the inundation system and planting on fortresses. The chapter continues with a paragraph about Fort Honswijk itself; its history and value and a paragraph about the policy framework. The main policy is framed by Panorama Krayenhoff and Nota Belvedére. The chapter concludes with a paragraph about flora- en fauna restrictions. Chapter 4 is about the theoretical framework. It starts with explaining the future of cultural heritage. Besides that, adaptive re-se, rezoning and the sustainable use of fortresses are topics which will be adressed in this chapter. Chapter 5 is about the analysis; the landscape analysis, the user analysis and the space analysis. Chapter 6 is about the case studies done. It starts with a case study of the re-use of defence systems in Europe, re-use of other fortresses of the Dutch Waterline, examples of adaptiv re-use and rezoning and concludes with a gallery of rezoning and adaptive re-use and a paragraph about the re-use of other fortresses. Chapter 7 is about the design opportunities. This chapter also includes the actual design for Fort Honswijk. The chapter starts with the object plans, plans that already have been made for the fortress. After that there is a paragraph about the possibilities for deployment and activities and the design assignement. Scenarios are also included in this chapter as well as the design principles. The chapter concludes with the plan and after that an analysis of this plan. The thesis concludes with a conclusion and recommendations in Chapter 8 and after that a list of References and an Appendix.

2. Research

Aerial photo of Fort Honswijk, where the inundation lock (right) is still in tact
(Photo: DLG)

2. Research

In this chapter the aim of the research and the research questions will be explained. Furthermore, the strategy and procedures which are used will be described. These shape the research and act as a guideline.

2.1 Aim of the research and research questions

Redevelopment of old buildings or adaptive reuse is a subject which have been intensively researched. The redevelopment of fortresses of the Dutch Waterline is a very recent topic. More and more fortresses lose their original function. Because they are regarded as valuable, they are not just overgrown with bushes and left without any specific function. Many fortresses were restored and got a new function, like Fort Voordorp (Figure 2.1) which is a meeting- and event centre and Fort aan de Nieuwe Steeg (Geofort) (Figure 2.2) which is transformed into an educational facility for everything regarding to geography. Fort Honswijk is an example of a fortress which has not got a new function yet.

The problem of how to deal with cultural heritage and to redesign these sites, is very broad. To be more specific, the goal of this research is:
To gain knowledge and understanding of how cultural heritage and the reuse of old buildings and sites is dealt with and to develop an approach of how to redesign such unique sites by the use of an exemplary case: Fort Honswijk.

The goal can be divided into two specific aims:

- To develop an approach to redesign cultural heritage objects, like Fort Honswijk
- To develop design criteria which should be taken into consideration when deciding what should be the best future function of a cultural heritage object, like Fort Honswijk

To achieve these aims, a main questions is formulated and divided into three sub questions. The aims have shaped the research and the type of research that is necessary to perform this research.

The main research question is:
"What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?"

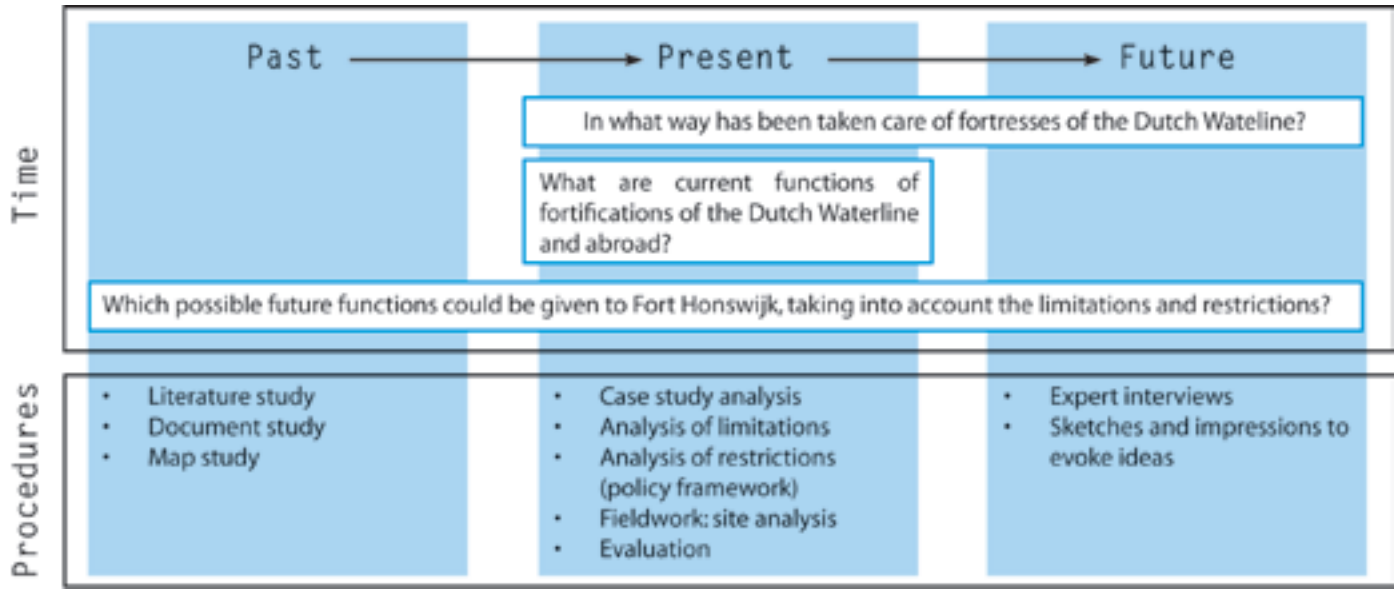
Sub questions were used to further specify the main research question:

1. In what way has been taken care of fortresses of the Dutch Waterline?
2. What are current functions of fortifications of the Dutch Waterline and abroad?
3. Which possible future functions could be given to Fort Honswijk, taking into account the limitations and restrictions?

Each of these questions requires a specific procedure to gain answers. The research covers different time periods: past, present and future. The research questions can be structured in these time periods. (Figure 2.3)

2.1 Fort Voordorp has been transformed into an event location (Skills Events)

2.2 The maze at Fort aan de Nieuwe Steeg (Geofort) (MMEK)



2.3 Overview of the research strategy

(Adapted from Struckman 2012)

2.2 Research strategy

The design strategy used is qualitative research. It will "*explore and understand the meaning individuals or groups ascribe to a social or human problem*". (Creswell 2009, p.232) The research will also be evaluative, because other cases of redesign of cultural heritage objects will be judged and valued. Fort Honswijk is chosen as a site to evaluate the design principles on. Fort Honswijk was specifically designed for the military function it had and it cannot be regarded as blank sheet when redesigning. Attention should be paid to the limitations of the old and vulnerable buildings and the unique flora and fauna. Also to attention should be paid to restrictions drawn up by Dienst Landelijk Gebied, the municipality and other involved parties. These make the outline of what is and what is not possible when redesigning Fort Honswijk.

2.3 Research procedures

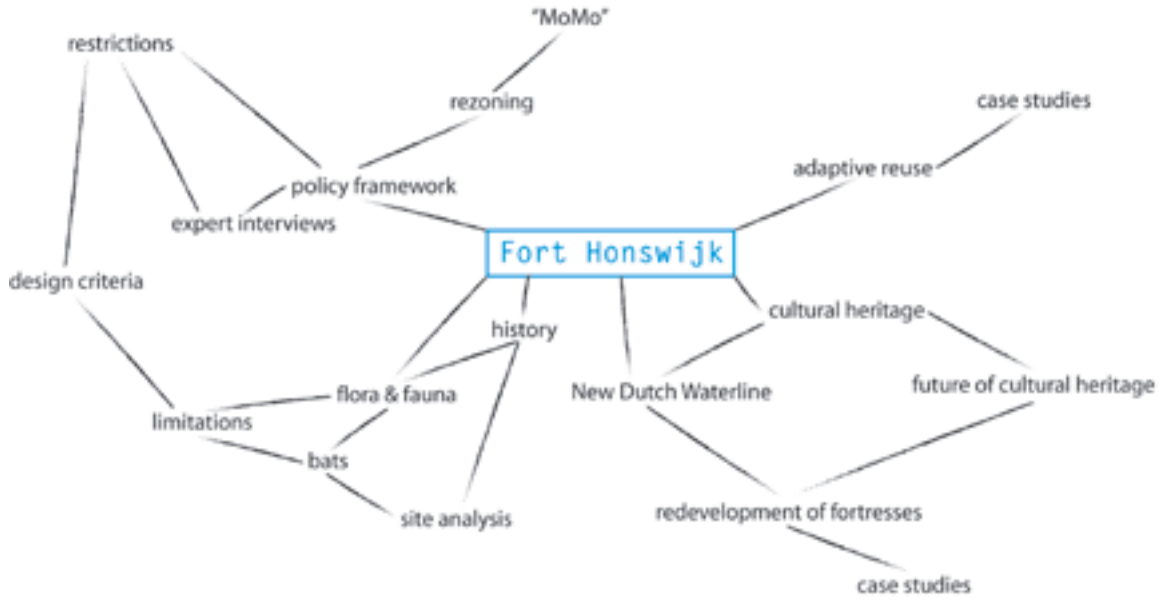
The research procedures need some explanation in order to understand why certain steps were taken. A literature study was done to investigate what is already written about the subject, expert interviews were done to get more inside knowledge about the procedure concerning the sale of the fortress, a site analysis was done to get an overview of the buildings present and to get the 'vibe' and 'feeling' of the site. Different cases were analysed in the case study analysis and ideas from this analysis are worked out with the help of sketches and impression for the specific location of Fort Honswijk. In the evaluation all the gathered information was judged and valued in order to come up with the design criteria.

- Literature search

In the literature search research has been done into specific subjects, which can function as the basis for answering the research questions. The aim is to create a basis on which assumptions and future design criteria can be based. "Literature reviews are an integral part of academic papers, but are also a useful component of any integral design project, to collect and synthesize research on a given topic." (Martin & Hanington 2012) Figure 2.4 shows how the search was build up. First a random search was done, to find all kinds of information about the topic. From this random search, the search was futher specified into specific topics, these are highlighted in the word-web (Figure 2.4). These topics have guided the literature search.

- Expert interviews

During the project I was involved in the process of redeveloping Fort Honswijk by Michel Ronden, Kees van der Velden en Jan Vrielink from Dienst Landelijk Gebied. They kept me up-to-date about the phase of the

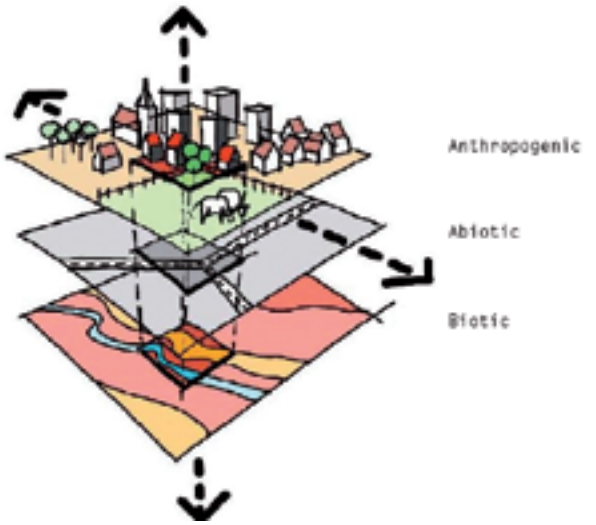


2.4 Word-web as starting point for the literature search

process the project was in and I was invited to meetings and an information-day. I had in-depth interviews with these people to get more inside information about the project, they know exactly what the process of sale is going to be like and what parties are involved.

- Site analysis

The landscape can be divided into three layers: the abiotic, the biotic and the anthropogenic layer. (Figure 2.5) These layers are analysed in order to come up with the characteristics of the landscape. These three layers influence the shape of the landscape. The layers will be separated so the structure of the landscape will become clear. It gives an understanding of the landscape processes that influence its appearance. (Vrijlandt 2006)



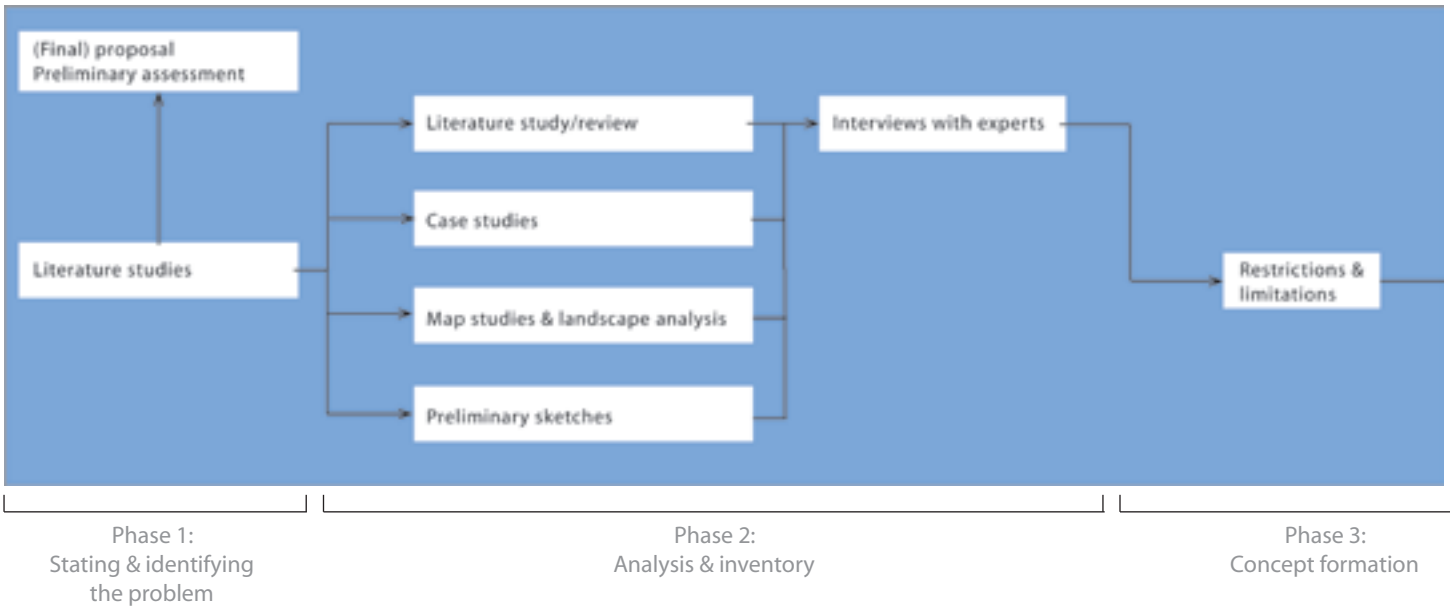
2.5 The layer-model
(http://www.soilpedia.nl/Bikiwiki%20afbeeldingen/Ondergrondse%20ordening/koppeling%20boven%20en%20ondergrond.JPG)

- Case study analysis

Cases that are analysed are places that have been redeveloped. These include other tower fortresses (of the Dutch Waterline and in other countries), other cultural heritage sites and other distinctive projects of redevelopment or adaptive reuse. This analysis is done because I wanted to learn certain aspects from other cases, like what is possible with vulnerable heritage buildings and how to give a building a new function but not detract from the ancient original building, to imply this knowledge in a new design for Fort Honswijk.

- Sketches and impressions

With the help of sketches and impressions the design principles for Fort Honswijk were formulated. The principles worked out in sketches and impression are derived from the literature search and case study analysis. This method, research by design, is done to test certain ideas on their ability to suit the specific location of Fort Honswijk.



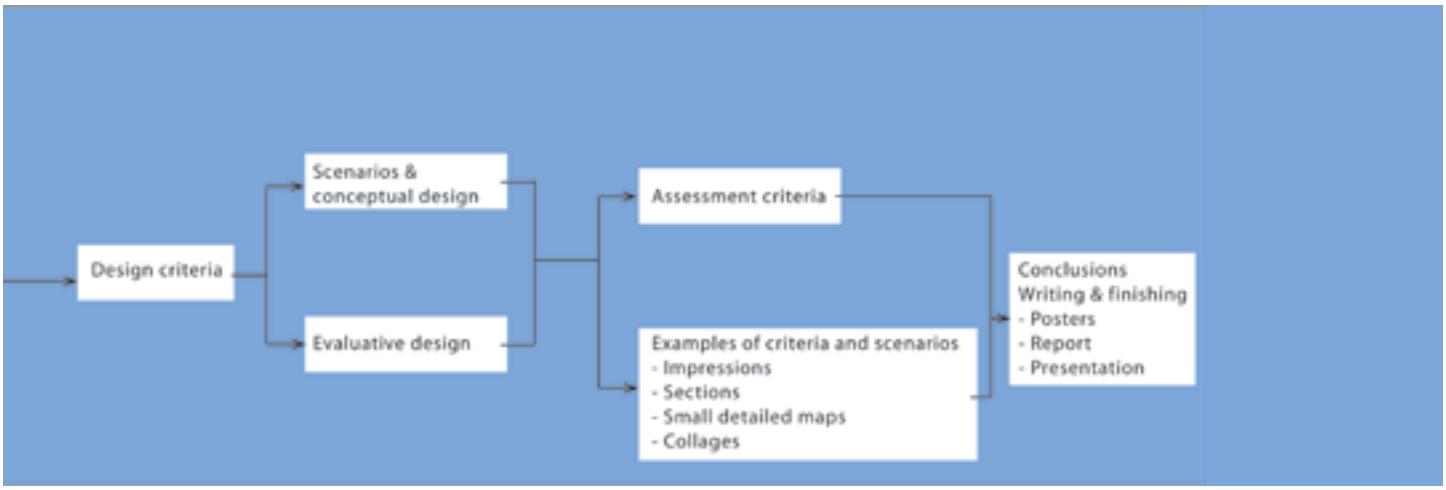
- Evaluation

In the evaluation all the information gathered before is weighted and conclusions are drawn. The evaluation includes information from the literature search, the case studies, the research by design and the landscape analysis. The design opportunities are evaluated and from this evaluation conclusions can be drawn about what is and what is not possible when making a new design for Fort Honswijk.

Figure 2.6 shows the different phases in the research in which the different procedures are incorporated.

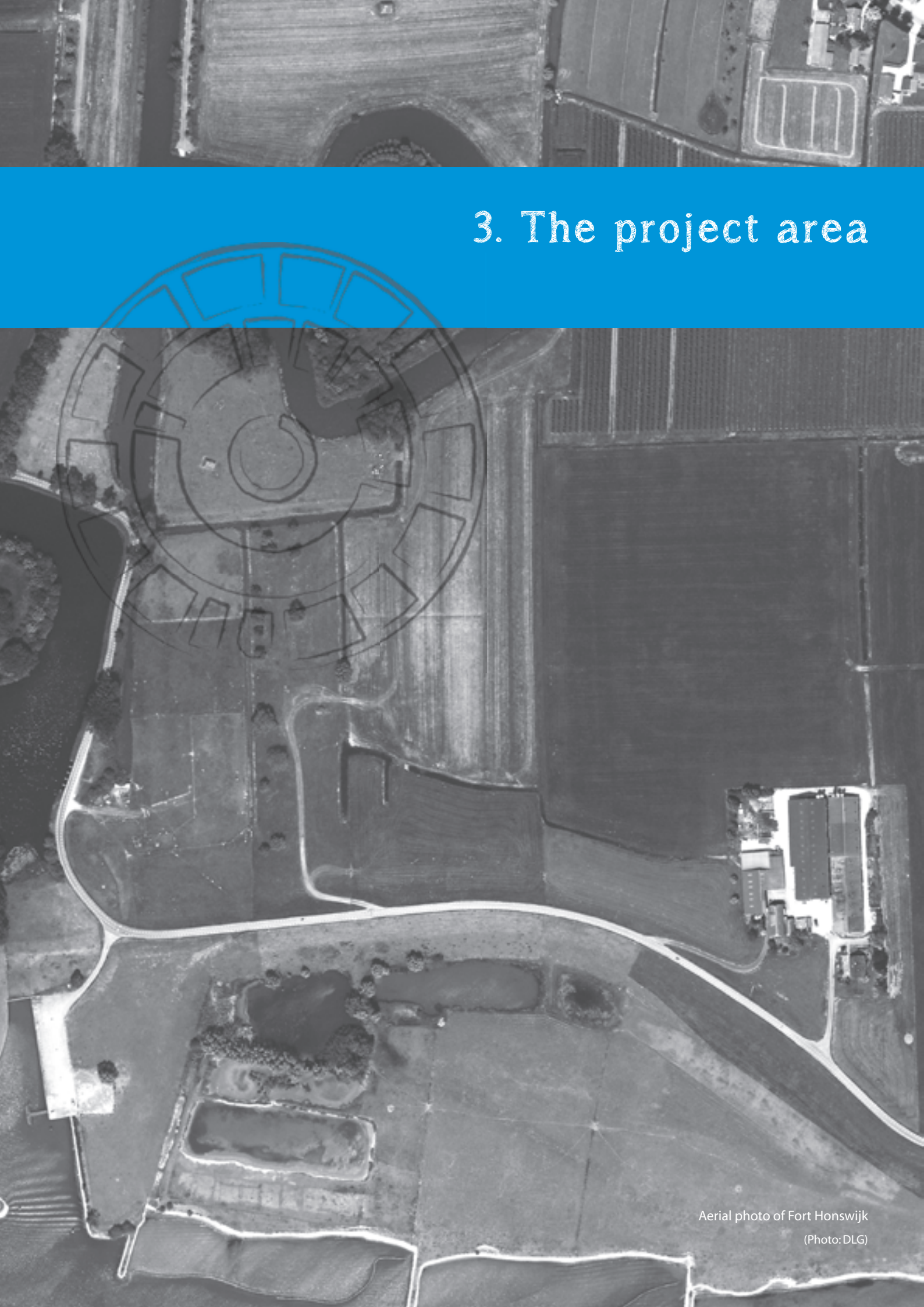
This chapter about the research itself explained that the goal of the research of this thesis is "to gain knowledge and understanding of how cultural heritage and the reuse of old buildings and sites is dealt with and to develop an approach of how to redesign such unique sites by the use of an exemplary case: Fort Honswijk". This goal can be divided into two aims: (1) to develop an approach to redesign cultural heritage objects, like Fort Honswijk and (2) to develop design criteria which should be taken into consideration when deciding what should be the best future function of a cultural heritage object, like Fort Honswijk. To achieve these aims, a research question was formulated: "What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?". To give an answer to this research question, several sub questions were formulated. An overview was given of the different methods which will be used to give an answer to these questions.

In the next chapter an introduction will be given to the main topic: Fort Honswijk.



2.6 Research schedule with six different phases

3. The project area



Aerial photo of Fort Honswijk

(Photo: DLG)

1629
Waterline of Utrecht (Zuiderzee - Lek)

1573
Inundation around the city of Alkmaar

1672
Introduction of the waterline Zuiderzee - Merwede (approaching of the French troops from Louis XIV)

1574
Inundation around the city of Leiden

1672
7000 French soldiers crossed the frozen river at Woerden

1500 1600 1700 18

OLD

The Waterline operating

1870 French-German war
(many shortcomings came to light)

1914-1918 First World War

1939-1940 Second World War

History of the Dutch

Timeline

1815
Start of the building of a new defense system with Utrecht as the centre

1841
Start of the building of Fort Honswijk

1871
New Dutch Waterline

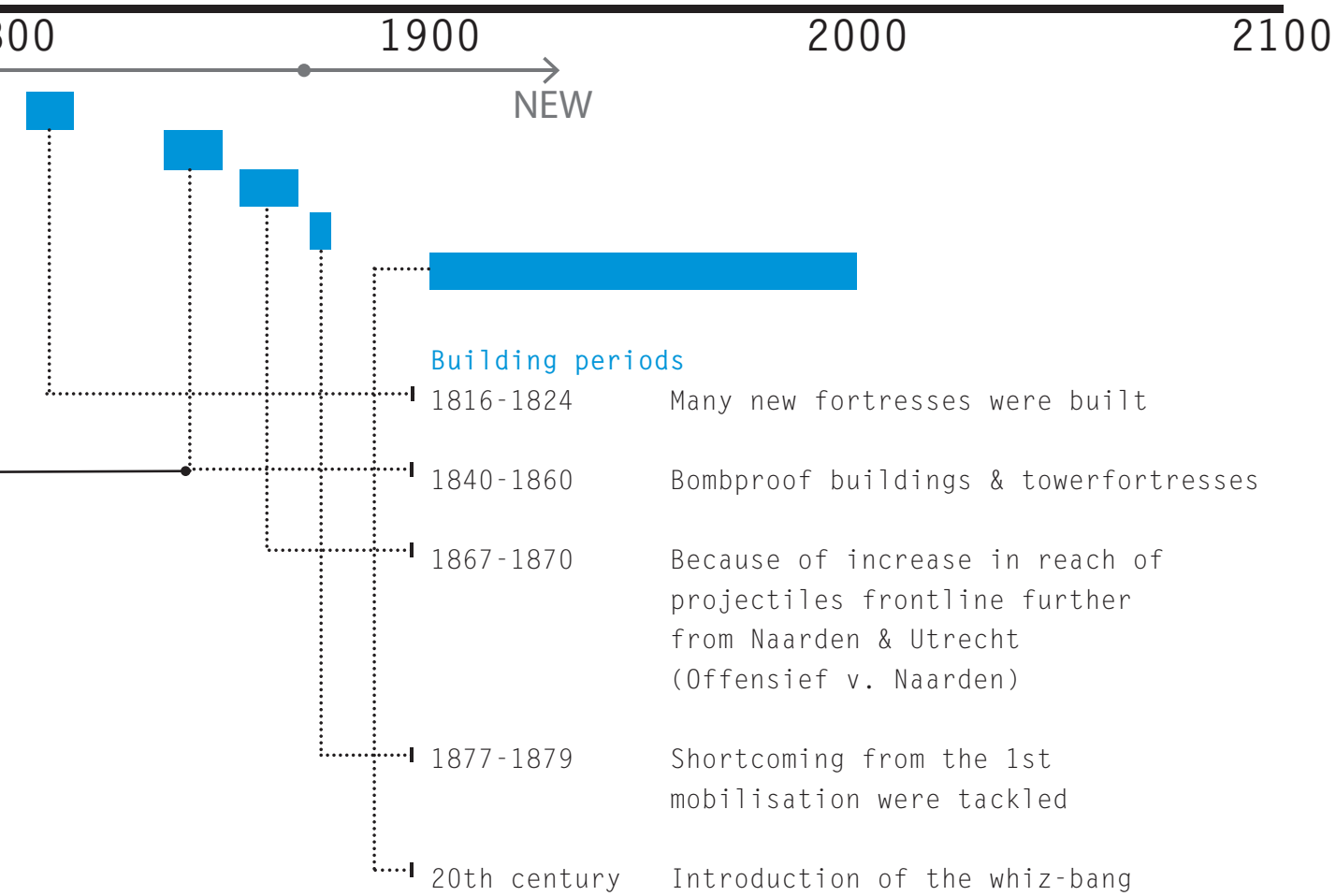
1874
Fortification Act

1995
The Dutch Waterline is nominated as World Heritage by UNESCO

2005
Listed as a National Landscape

2008
Pact van Rijnauwen

2009
Listed as a National Monument (Rijksmonument)



Waterline

Building periods

1816-1824	Many new fortresses were built
1840-1860	Bombproof buildings & towerfortresses
1867-1870	Because of increase in reach of projectiles frontline further from Naarden & Utrecht (Offensief v. Naarden)
1877-1879	Shortcoming from the 1st mobilisation were tackled
20th century	Introduction of the whiz-bang outdated defense works strengthened with concrete shelters & bunkers

3. The project area

In this chapter an introduction will be given about the project area itself. It will start with the history, to be able to place the fortress and its appearance in context.

3.1 History of defence in the Netherlands

Fort Honswijk is part of the New Dutch Waterline. In this paragraph more information will be given about this waterline and its history. But the paragraph starts with other mechanisms that were used in the Netherlands for defence.

The inhabitants of the area we call 'The Netherlands' nowadays, have defended themselves with the help of castles, fortified cities, (water)lines, fortresses, bunkers etc. against the attacks of enemy troops and other unwanted intruders.
The oldest defence line in the Netherlands is the Roman limes. The word 'limes' (the Latin word for 'border') means the northern border of the Roman Empire, which was located from the North Sea along the rivers Rhine and Danube to the Black Sea. This border was constructed in 47 AD and functioned until 274 AD. The limes consisted of a belt of defence towers, camps for the auxiliaries (castella) and bases for legions (castra). On the Dutch territory two pathways can be distinguished; the first one from the settlement Lugdunum Batavorum (at the current town Katwijk) to Carvium (at the current Bijlandse Waard at Lobith). The second pathway was from the city Forum Hadriani (the current Voorburg) via Nijmegen to Maastricht. (Figure 3.1)

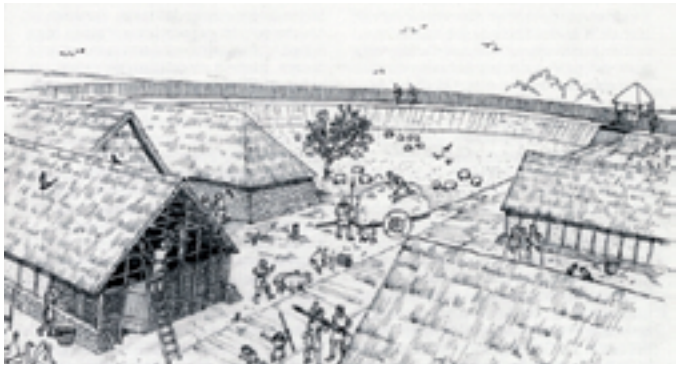
The Roman troops left the Dutch territory around 400 AD. After that it took many centuries before new defence works were constructed. The first known are the so-called 'ringwalburgen'. (Figure 3.2 & 3.3) These were constructed during the early Middle Ages (500-1050 AD) on many locations as (temporary) refuge during external attacks. These round or semicircular earthworks consisted of 2-4 meter high ramparts surrounded by one or more dry or wet canals. Known 'ringwalburgen' are the Hunneschans at the Veluwe and on the Grebbeberg near Rhenen. Also along the Zeeland coast these earthworks were built, as a

3.1 The Roman Limes

(Adapted from De Bosatlas van de geschiedeniscanon, Noordhoff Atlasproducties, Groningen, 2008)

protection against the Vikings in the 9th century.
In the 9th and 10th century, the first castles were built. This were wooden towers on a landscaped hill surrounded by a canal. Known examples are the motte castles (NL: mottekastelen) from the High Middle Ages (1000-1250 AD). Later the wooden constructions were replaced by stone houses or residential towers with thick walls, surrounded by a wet or dry canal. Most of these medieval castles were inhabited by a lord with his family and servants. These castles had to protect the inhabitants from attacks of small armies consisting of a few knights or 10-50 farmers. Also larger castles were built with turrets and ring walls. These castles were built for counts and dukes, who ruled large areas, like Holland, Zeeland, Gelre and Brabant.
Other important medieval defence works are 'landweren' (Figure 3.4). Between 1200-1500 more than 100 'landweren' were constructed in the Netherlands, varying in length from 100 meter to tens of kilometres. The 'landweren' were used to protect villages and hamlets from enemy troops. Besides that, they were used for toll collection. After 1500 the 'landweren' lost their function and they were no longer maintained.

During the Late Middle Ages flight sconces (NL: vluchtschansen) (Figure 3.5) were constructed as a place where villagers and farmers could withdraw with their cattle in case of war or other danger. Also during the Eighty Years' War many flight sconces were constructed. Cities were initially surrounded by wooden palisades. During the 13th and 14th century these palisades were replaced by stone walls. These stone walls could resist assault weapons like a battering ram (NL: stormram) and a catapult. But with the invention of gunpowder and the development of the canon in the 15th century, these stone wall did no longer provide protection against attacks. Italian fortress builders were about to break down the towers and lower and strengthen the walls with soil. This made the canon less effective as an attack weapon and more effective as a defence weapon.
Also the bastion was introduced (Figure 3.8); a pentagonal earthen or stone expansion of a defence work from which the adjacent walls could be covered with defensive fire. Italian cities were strengthened with bastion from this period on. Under the reign of Charles V (1500-1558) many cities in the south and east

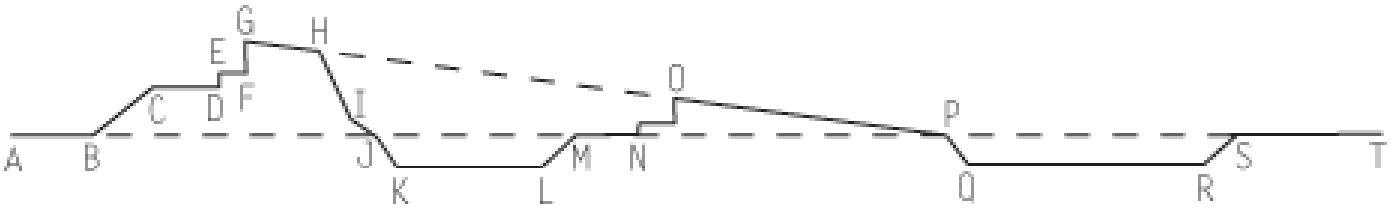


3.2 A 'ringwalburg' which surrounds a village
(Archv)

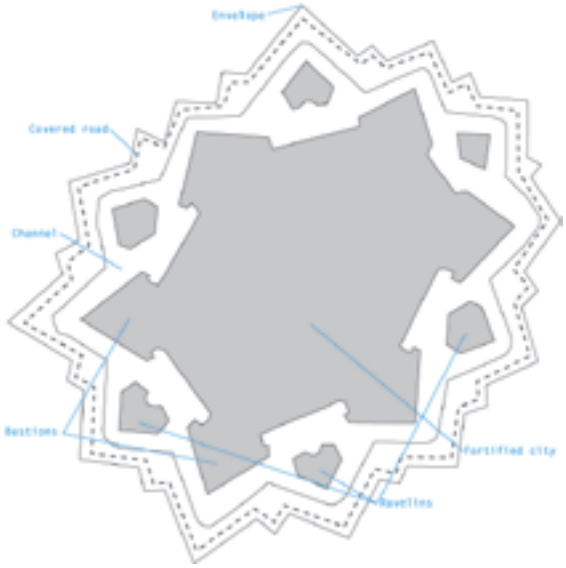
3.3 A 'ringwalburg' as how it can be found nowadays
(Paul Voorhaar)

3.4 A 'landweer' near Allardsoog
(Wikipedia)

3.5 A remnant of a flight scone
(Mart Gommers)



	(EN)	(NL)
AJ	main wall	hoofdwal
AB	terre square	terreplein
BC	inner slope	binnentalud
CD	hallway in the wall	walgang
EF	banket	banket
FI	parapet	borstwering
GH	plongee	plongée
HI	outer slope	buitentalud
IJ	bank	berm
JK	escarp	escarp
JM	(main)channel	(hoofd)gracht
LM	counterscarp	contrescarp
MN	covered road	gedekte (of bedekte) weg
OP	esplanade	glacis
PS	counterscarp channel	contrescarp-gracht
ST	ground level	maaiveld



3.6 A map of a fortress with names of the different elements

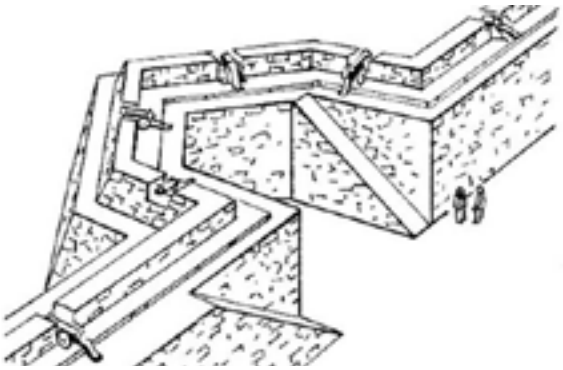
3.7 A section of a fortress

(Adapted from Boosten et al. 2012)

of the Netherland were also provided with a bastion. On the west coast Fort Rammekens, near Vlissingen, was built according to this system. During the Eighty Years' War (1568-1648) in the north of the Netherlands fortified cities were strengthened in order to keep the Spanish outside. Led by the fortress builder Andriaen Antoniszoon (1527-1607) a new fortification system was developed, later known as the 'Oud Nederlands Vestingstelsel' (EN: Old Dutch Defence System). The benefit of this system was that it suited the circumstances of the watery Dutch landscape better. This system was applied during the 17th century also in other parts of Europe. During the Eigthy Years' War, Prince Maurits (1567-1625) ordered to transform many cities (like Groningen, Deventer, Nijmegen, Zaltbommel and Breda) to the 'Oud Nederlands Vestingstelsel'. New elements were added, like an extra ring of defence works, a covered road around the main canal and an extra canal with earthworks. This was often surrounded by a wide strip of soil with an inclined plane (glacis).

When the Spanish troops entered the Veluwe in 1629, Frederik Hendrik ordered to construct a temporary waterline along the Utrechtse Vecht and the Vaartse Rijn. This was the precursor of the Old Dutch Waterline. The first waterline to be constructed was the West-Brabantse Waterlinie in 1628. This waterline was located between the fortified cities Bergen op Zoom and Steenbergen. In the 17th century was experimented with the construction of the Ijssellinie. This waterline turned out not to function very well, because the water level of the river Ijssel was to low for successful inundations. After the Republic of the Netherlands came into war with France, England and dioceses of Cologne and Münster, it was decided to construct a more permanent waterline. Many fortified cities (Muiden, Naarden, Woerden, Oudewater and Gorinchem) were included in this new defence line, later called the Old Dutch Waterline. The line was relocated to the east several times, but the city of Utrecht remained outside the line.

Along with the construction and improvement of



3.8 A bastion
(Schoolplaten)

the Dutch Waterline, Prince William III wanted to strengthen the fortified cities. In 1695, soldier and fortress builder Menno van Coehoorn was appointed as Inspector-General of the Fortifications (NL: inspecteur-generaal der Fortificatiën). He designed a new type of fortress, later known as the 'Nieuw Nederlands Vestingstelsel' (EN: New Dutch Fortification System). This system included bigger and stronger bastions. Cities that undergone these changes were Breda, 's Hertogenbosch and Nijmegen. Around many cities also defence works were constructed, with lunettes and crescent-shaped strongholds.

Because of the continuing threat, a second waterline was constructed in the second half of the 18th century, in the Gelderse Valley, between the Zuiderzee at Spakenburg and the Rhine at Rhenen. This waterline was called the Grebbelinie. In 1811 general Cornelis Krayenhoff suggested to Napoleon to replace the Dutch Waterline by a new one between Naarden and Gorinchem which included the city of Utrecht. The plan was carried out from 1815 and resulted in the New Dutch Waterline.
(Boosten et al. 2012)

3.2 The Dutch Waterline

The Dutch Waterline (Hollandse Waterlinie) is a series of water based defences conceived in the early 17th century. Combined with natural bodies of water, it could be used to transform the economic heartland of the Dutch Republic almost into an island. After the defeat of Napoleon in 1815, the waterline needed modernisation, so the New Dutch Waterline was realised. This contains fortifications, batteries and inundation fields. After WW II, the Waterline lost its function and was almost forgotten.
Nowadays more and more projects are arising to put emphasis on elements of the Dutch Waterline. Some fortifications are made into tourist attractions, but others are still ageing and grown with plants. (Hollandse Waterlinie 2012)

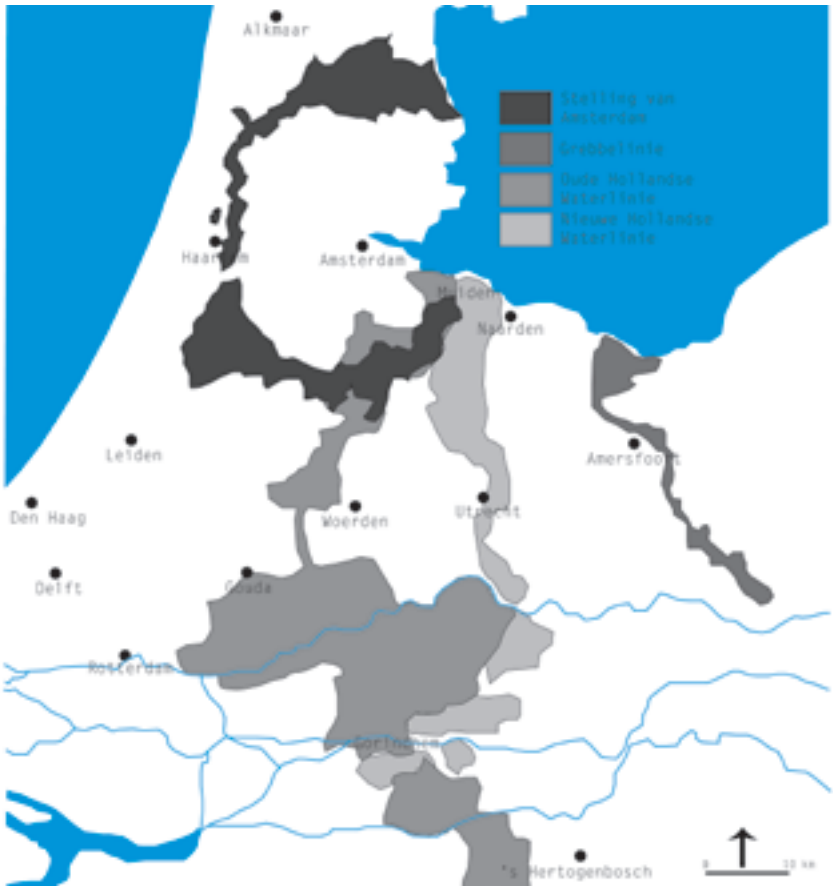
The concept of a waterline dates back to 1589 when Prince Maurits was instructed to investigate how the young Republic of the Seven United Netherlands could be defended at the most efficient way. By using the geographic circumstances in an optimal way, a defence line could be constructed. At the location where the elevated part of the Netherlands changes in the lower located polderarea it is easy to let the land flood by using locks and removing dikes. (Rijksdienst voor het Cultureel Erfgoed 2013)

The Old Dutch Waterline

In the 17th and 18th century the Old Dutch Waterline protected Holland. After the try-outs of inundating Alkmaar (1573), Leiden (1574) and the Waterline of Utrecht (1629), inundation turned out to be an effective way of defence. The principle of inundation was after that implemented from the Zuiderzee to Merwede in 'Rampjaar 1672' to prevent the French troops from Louis XIV from conquering Holland. Utrecht was not included in the Waterline because this city was already conquered by the French. 7000 French soldiers crossed the frozen river at Woerden in december 1672. After they plundered Zwammerdam they retreated because of the thaw. (Wikipedia 2012)

The New Dutch Waterline

The New Dutch Waterline is a 85 km long defence line in the landscape from the IJmeer to the Biesbosch. The width varies from several hundreds of metres near Utrecht to more than 10 kilometres at the Vijfheerenlanden. The Waterline was constructed since 1814 and is improved and adjusted since then. After WWII the New Dutch Waterline lost its main function. The last time adjustments took place was in 1962. The New Dutch Waterline is an improved and more extensive version of the Old.



3.9 Other waterlines in the Netherlands

(Adapted from Will 2002)

The basis for this improved version was laid in the French period in 1796-1797 by the manager of the 'Dutch Fortresses' (NL: Nederlandse Fortificatiën) C.R.T. Krayenhoff. In his 'Memorie betreffende de eerste of capitale Waterlinie' he states that the line should be replaced to the east to include the city of Utrecht, not only because Utrecht was a known garrison town but also because in that case the enemy could not tap water from the water-obstacle. His proposals shaped what was later called the New Dutch Waterline. In 1811 his plans were approved by Napoleon in 'La ligne de Naarden á Gorcum doit donc être considérée comme la vraie ligne de l'Empire'. Because of military and political developments the plan was never worked out further. After the departure of the French, Krayenhoff presented a new nota in which his proposals of 1796 and 1811 were updated. Because of this nota, King Willem I decided in 1815 to construct a new waterline, first called the 'Waterline of Utrecht' (NL: Utrechtse Waterlinie). (Rijksdienst voor het Cultureel Erfgoed 2013)

Five periods can be distinguished in the adjustments of the Dutch Waterline:

1. 1815-1826

During the first construction phase five new fortresses were built on vulnerable accesses around the city of Utrecht. These basic works consisted of earth ramparts, which were located at the centre of the protected road or bank. The fortresses were surrounded by a canal and at the main rampart provided space for the installation of artillery. The shape and size of the fortresses depended on the width of the access and the location of the inundation fields and –materials. On the elevated plain of the Houtense Vlakte four lunettes were build. In the south of the city of Utrecht new fortresses were built at Jutphaas, Vreeswijk en Culemborg to protect the inundation locks. (Rijksdienst voor het Cultureel Erfgoed 2013)

2. 1840-1864

When the Netherlands acknowledged Belgium as an independent state in 1839, reorganisation and

renovation of the defence system was necessary. King Willem II decided to have the defence of the Netherlands more concentrated at one location, with the New Dutch Waterline as the main defence line. The fortifications and defence lines at the country's border had the function to slow the march of the enemy, so that inundations could be realised.
Along the dike-accesses along the rivers new tower-fortresses were build. Also the smaller works were strengthened with bombproof buildings, like guardhouses. What was called 'bombproof' in those days meant that it could withstand the artillery of that time. With the artillery of nowadays, we would not call them bombproof.
In 1853 the Kringenwet was introduced which stated limitations for buildings and planting within a circle of 1000m around a fortress. In 1963 the law was abolished. (Rijksdienst voor het Cultureel Erfgoed 2013)

3. 1867-1872

In 1864 the New Dutch Waterline seemed finished, but during the French-German was many shortcomings came to light. The invention of rifled guns and the use of this weapon made clear that the works of the Waterline were very vulnerable. With this type of artillery, the enemy could shoot further and more precise.
Colonel Kromhout was assigned to structure the organisation of the Waterline. There were to less bombproof shelters for the soldiers and munitions. Moreover, the heavy walls of the tower-fortresses weren't as bombproof as they seemed to be. These vulnerable buildings were protected by a counterscarp. Also many other bombproof guardhouses were strengthened by an earth rampart.
Between 1867 and 1870, 1,5 million gulden was invested in the 'Offensief van Naarden'. Because of a larger range of the projectiles, the frontline was moved further away from this cities Utrecht and Naarden. This because the city of Utrecht was a node of roads, but in the 1860s it also became a node of railway tracks. New fortresses were built around this city: Fort Ruigenhoek (Maartensdijk), Fort Voordorp (De Bilt), Fort Rijnauwen (Bunnik) and Fort Fort Vechten (Bunnik). Also improvements were made in the water system; a new inlet-lock was built at Wijk bij Duurstede and at Honswijk the inundation canal was improved. (Rijksdienst voor het Cultureel Erfgoed 2013; Will 2002)

4. 1872-1886

At the beginning of the 1870s the government realised that the defence works suffered from cutbacks during the last 30 years. Because of that, the minister of War presented the 'Vestingwet' of 1874. This law stated that priority should be given to improving and renewing the New Dutch Waterline. Within 8 years, the new activities should be realised.
But the Waterline was only just adapted to the latest requirement when the whiz-bang was introduced. None of the fortresses could withstand this artillery. History repeated: again the fortresses were not up-to-date. The fortresses did not appear to be suitable for the storage of munitions. To avoid the hit-rate, soldiers and munitions should be spread across the landscape. The function of the fortresses changed to an attack-proof infantry support centre. Since then, masking the fortresses with planting played a huge role. In this period many wooden storages were built to protect the artillery from moisture. At the same time, new construction took place. From the north to the south of the Waterline, new fortresses arose to make an ongoing line of defence. After that the construction of fortresses came to an end. Even though the Waterline was considered as being a very strong and up-to-date defence line, the construction of the Stelling van Amsterdam was started in 1883. This defence line functioned as a national réduit; a location where the army and government could retreat as final way of defence.
The necessity and strength of the Waterline was up for discussion at the end of the 19th century. The emphasis was shifted from buildings and works as means of defence to living military forces. (Rijksdienst voor het Cultureel Erfgoed 2013; Will 2002)

5. 20th century

During the 1st and 2nd World War many field fortifications were constructed, like artillery, infantry and munitions-deposits. Also new shelters and bunkers were built between the fortresses in the landscape. (Will 2002)

After the 2nd World War, the Cold War followed. The allied forces founded the North-Atlantic Treaty Organisation NATO (NL: NAVO), of which the Netherlands was a member too. The members of the NATO introduced

a common defence policy again the Soviet-Union. A defence line was constructed along the Rhine from Switzerland to Lobith in the Netherlands. But the western part of the Netherlands was still unprotected in this situation, so the Dutch government decided to extend the Rijnlinie with the IJssellinie. The IJsellinie lost its function in 1964.

According to experts, the New Dutch Waterline is one of the biggest (or maybe the biggest) infrastructural operations in the Netherlands ever. (Will 2002)

Since 2003 the New Dutch Waterline is a so-called 'national project. The goal of this project is to make the Waterline more recognizable, liveable and accessible and to ensure a new future with new functions. Over the past years many ideas have been developed for the New Dutch Waterline, in 'Panorama Krayenhoff' these ideas have been brought together to one overall vision. In this vision the 'Linieland' around Schalkwijk is called 'the pearl of the Waterline' because of its ensemble of fortresses and forbidden circles and the system of inundation works is still very intact. (Enveloppecommissie Linieland 2010)

3.3 Aspects of the Dutch Waterline

In this paragraph several aspect of the Dutch Waterline will be explained in more detail. These aspects include the inundation system and planting on fortresses.

3.3.1 The inundation system

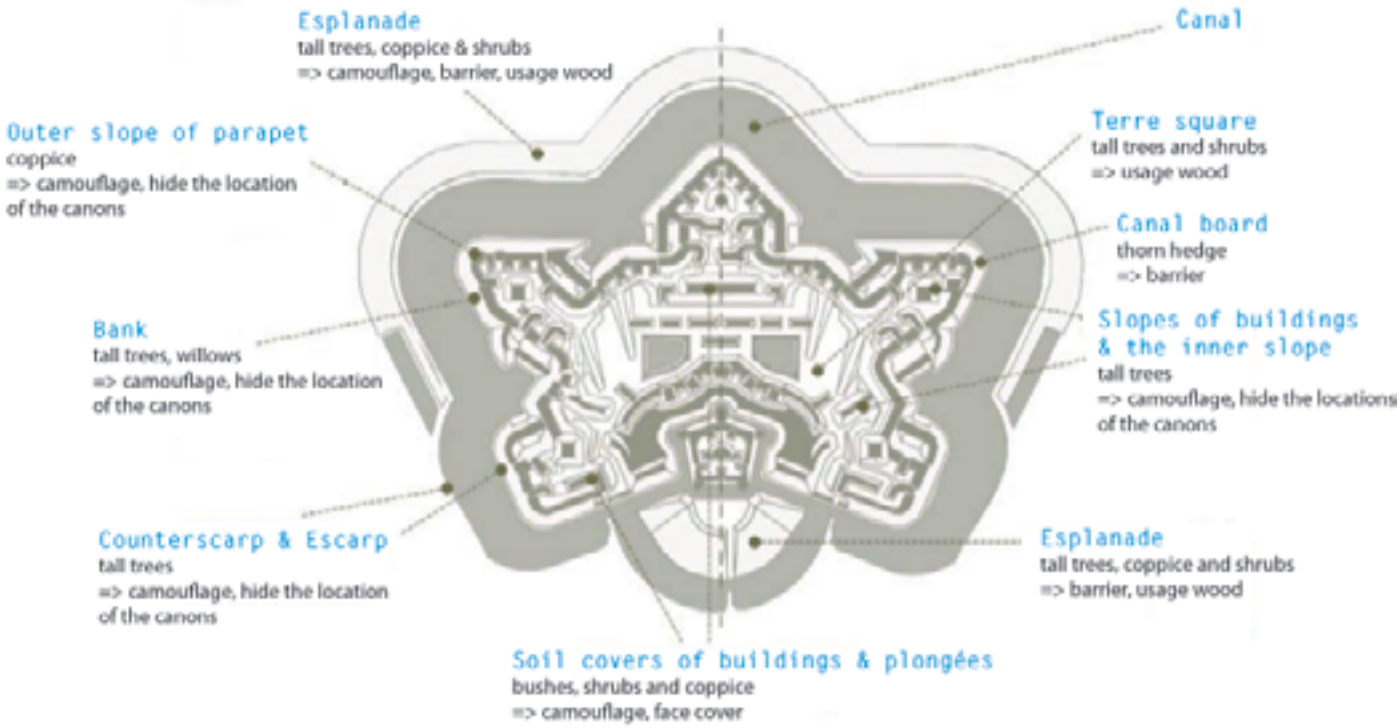
The main goal of the New Dutch Waterline was to defend Holland against enemy troops. This was done with inundation; flooding of land. This water plain was several kilometres wide and dozens of centimetres deep. These plain had such a width that the enemy could not or barely shoot over it and such a depth that it could not be crossed by boat. It was dangerous to cross on a horse or carriage as well, because ditches and trenches were invisible.
A system of canals, inlet points, pumping stations and dams made it possible to flood the inundation fields for 4-12 days, the duration of the flooding depended

3.10 A soldier in an inundation field with a canon
(Hollandse Waterlinie

3.11 Soldiers skating on a frozen inundation field
(Fast Mediamatic)

3.12 Inundation of the surrounding of the city of Naarden
(Mediabank Omgevingseducatie)

3.13 Farmland was inundated during the Second World War
(Spaarnestad Photo)



3.14 Schematic representation of the type of vegetation and their function

(Adapted from Boosten & Jansen 2008)

on the river levels.

The most vulnerable spots in the defence were the so-called accesses; lifted plains, roads, railway tracks, dike and rivers from with the enemy had access through the inundated fields. These accesses were defended with artillery from fortresses and defences.

In 1853 the 'Kringenwet' was adopted to keep the fields of fire around the fortresses open (see table below). Building and planting restrictions in different gradations applied in circles around the fortresses. (Ronden & Van der Velden 2013)

<300m	Only wooden buildings which could be set on fire when there was a threat of war
300-600m	Also buildings with a base up to 50cm of stone and a chimney of stone, the rest of the building should be built of wood
600-1000m	No building restrictions, but when there was a threat of of war, the government was allowed to evacuate

The 'Kringenwet' was never changed until its abolition in 1963. The law had a huge impact on the spatial planning of the landscape of the Waterline. An example is the city of Utrecht; the municipality was not allowed to expand to the east until 1951 because of the location of the double row of fortifications. Around the fortress of Naarden and Weesp, still many wooden buildings can be found which date back to the time of the 'Kringenwet'. (Will 2002)

3.3.2 Planting

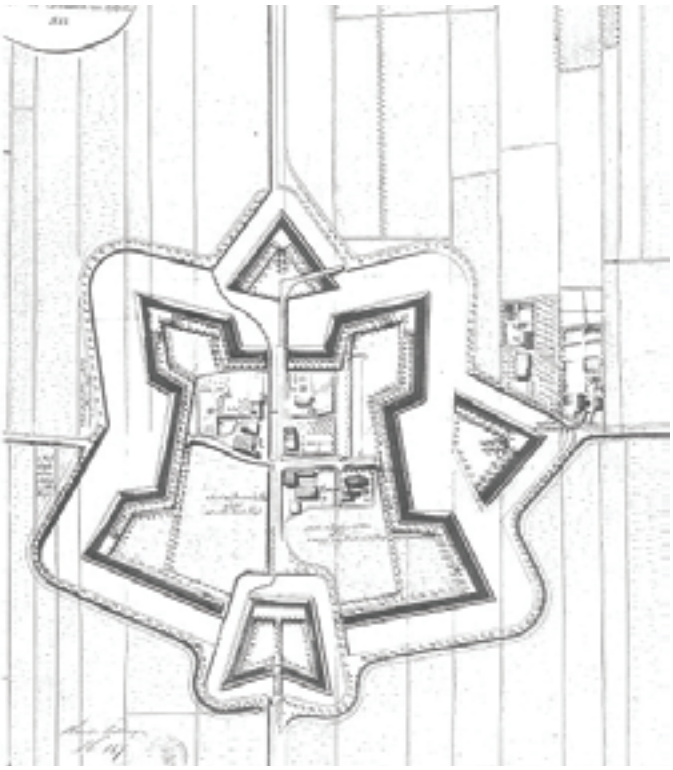
From the late Middle Age, but possibly earlier, planting of trees and bushes was used for the defence of areas, cities and fortresses. First it was used on individual objects in the field, like sconces and fortified cities, but later also on military defence lines like the Grebbelinie and the Dutch Waterline. Through the ages trees and bushes are used as barriers again enemy troops, the supply of use wood and for providing camouflage, coverage or robustness to the fortresses. (Boosten et al. 2012) The terrain around fortresses was adapted to the strategic requirements for optimal defence by having a free field of fire and the strategic locations of hedges and shrubs. The German military engineer Daniel Specklin pleaded already in 1589 to plant junge Hagdornen on fortresses. These hedges of hawthorn formed a barrier on or at the bottom of many fortifications. These hawthorn hedges were in fact the

3.15 Section of planting on a 'landweer'

(Adapted from Boosten et al. 2012)

3.16 A 'verhakking' where trees could be cut to form an obstacle

(Stichting Menno van Coehoorn)



3.17 The design of Fort Blauwkapel (1818) contains a planting plan

(Festungsbauten)

precursor of barbed wire. In the 18th century planting was also recommended as horizon coverage. In the 19th century more attention was paid to planting on fortifications by the Ministry of War. At Fort Vossegat near to the city of Utrecht a military tree nursery was located. These plantings at fortifications had many different functions:

- To camouflage the fortress in the landscape
- To supply use wood (as fuel and for tools)
- To hold the embankments together
- To form an obstacle

(Will 2002)

The high rising planting (mostly trees) on the verges and slopes inside and outside the fortress are meant to mask the fortress. Because of this planting it was hard for the attacker to observe the effect of the artillery fire. De planting should also remove the canons from sight, which were positioned on the fort. This was often done with willow, Canadian poplar and Italian poplar. Also pollard willows on the inside verges were used to mask. During construction of the planting, attention should be paid that the own cannons are not hindered. Preferred were trees with feathery crowns, so own projectiles did not land in the branches, exploded early or were redirected. Within the fortress, planting was constructed behind the canons to make a dark screen, so the canons did not stand out against a light background and a jagged contour is created which fades the contours of the fortress. Preferred for this were trees and bushes with dark leaves, like elms. One wants to avoid that individual trees reach out above the fortress, to avoid that these trees can give away the location of the fortress.

Inside the fortress bushes and shrubbery is planted for camouflage and face cover. A commonly used species, because of its discreet blooms, is the Virginian cherry (Prunus virginiana). Continuous lanes and rows of trees, of for example the native oak, between the different defence works provided additional camouflage. (Boosten & Jansen 2008)

Planting hedges and hedgerows is seen as a valuable alternative for wooden screens and palisades. Living plants are not ruined as quickly as wooden constructions and they need less replacement. Besides that, hedges are not shot as easy as wooden palisades. Hawthorn hedges were planted on the verges along the bank of the canal, as an obstacle. Other species that were used in hedges were blackthorn, furze and locust

trees. Also planting coppice, of for example ash, alder and maple was meant as an obstacle. But also the roots of these trees were obstacles for enemies who tried to dig their way into the fortress.
Not only living plants were used, also the branches and trunks were used as a barrier.
With the invention of the airplane, the camouflage planting lost its function. (Will 2002)

Only a few military objects are still owned by the Ministry of Defence, they functions as storage or as safe working area. In the last twenty years, many objects were passed to Staatsbosbeheer (EN: Forestry Commission), Natuurmonumenten, provincial landscapes or private owners. The planting on the fortresses do not have military value anymore and they were not managed like that for the last decades. The sharp edges between planting units disappeared and they merged to larger units. The planting overgrew en removed the memories of the military past of it. This also resulted in that people could not recognize the planting or the defence works as relicts from the past. Through the passage of time many defence works got cultural historical value. Because of the transition from secret military area to public domain, many objects got recreational value. Also the ecological value increased because plants and animals settled. (Boosten et al. 2012)

Many fortifications have undergone restorations, but relatively recent also the defence lines, like the Grebbelinie, the Old and New Dutch Waterline and the Stelling van Amsterdam, are again placed in the spotlight. Many elements of these defence lines are currently being redeveloped to make them more liveable or to give them a new function. The current trend in managing planting is to develop targeted or to save for decay, to develop ecological values, to preserve cultural history and to attract human activity. During the restorations of the fortified cities and the redevelopment of the defence lines, it is argued to completely remove the existing planting on the assumption that the original situation would be restored. This because one of the most commonly hear assumptions is that defence works were originally bare. But in most cases these works have known an ingenious military planting. (Boosten et al. 2012)

3.18 Fort Honswijk was also called Fort Willem II (Chris Will)

3.4 Fort Honswijk

The complex of Fort Honswijk dates back to the mid-19th century and was built in the years 1841-1848. Its main function was to defend the Lekaccess and one of the larger and a smaller inundation lock. From 1879-1888 renovations took place and the fortress was modernized. In the years before this, an inundation-canal was dug and the Gedekte Gemeenschapsweg was constructed. Fort Honswijk is named after the close by located little neighbourhood Honswijk, but was also known as Fort Willem II.

Fort Honswijk was designed and built as a tower-fortress, with a round tower made of heavy brickwork. Furthermore, a moated, asymmetrical, bastioned earthwork was built in which the tower was located. During modernizations, the upper floor of the tower was removed and a counterscarp was built to protect the tower at the east side. Also bombproof buildings were built, like the gatehouse and a bunker.

At the shore area of the river Lek at the eastside of the fortress dozens of small concrete buildings were built during the years 1900-1918 and 1938-1940. During later years Fort Honswijk was not changed anymore but several buildings were added, but those have a minor defence function.

Around 1985 the inundation lock was demolished because of dike reinforcement. Also the inundation-canal at the eastside of the fortress was muted and two sheds (B & C) were removed.

The fortress is located at a strategic location. The

river Lek and the northern Lek-dike were possible accesses. The fortress is also located at the node of the inundation-canal and the northern Lek-dike. This inundation-canal was important for inundation around the city of Utrecht and the polders around Schalkwijk and was the successor of the small river called the Snel, which had partly the same functions. From the fortress, those waterworks could be managed, while the dike along the west side of the canal functioned as the main defence line until 1914. Fort Honswijk could support Fort Everdingen, which was located at the other side of the Lek. Fort Honswijk itself was supported by Lunet aan de Snel. (Rijksdienst voor het Cultureel Erfgoed 2013)

3.4.1 Value

In the system of the 'Rijksdienst voor Cultureel Erfgoed' value is assigned to object that have monumental value. This value can be divided into different categories; cultural historical value, historical architectonic value, war-historical value and ensemble & situational value. In this paragraph each of these values will be explained.

1. Cultural historical value
The fortress is of cultural and historical value because it is part of the New Dutch Waterline as designed by C.R.T. Krayenhoff and is realised by him, Jan Blanken and Willem Offerhaus. For 125 year the fortress is being reinforced and improved.

2. Historical architectonic value
The fortress is an unique construction as reflection of military-strategic engineering which is based on the system of inundation and defend of accesses (19th and 20th century). The complex is an example of a tower-fortress from 1841-1864 which has been reinforced with earthworks. The complex is located at a very strategic location.

3. War-historical value
The complex is a part of a continuous military defence line between the Zuiderzee and the Biesbosch. This consisted mainly of a coherent system of inundation-fields and fields of fire. This system was complemented by several types of buildings which were used to shut off or defend non-inundatable fields and accesses.

3.19 The location of the different buildings

4. Ensemble and situational value
The fortress is valuable because of its location within the system of the Dutch Waterline and its relationship with the complexes Lunet aan de Snel, Werk aan de Korte Uitweg, the Gedekte Gemeenschapsweg, the inundation-canal, the Werk aan de Groeneweg and Fort Everdingen.
(Rijksdienst voor het Cultureel Erfgoed 2013)

3.4.2. The complex

The complex of Fort Honswijk consist of 13 elements. (Figure 3.19) In this paragraph each of theses elements will be described to get an overview of the variety of buildings and elements on the terrain.

The complex of Fort Honswijk consists of 13 elements:
1. The fortification's earthworks, remnants of shelters, roads and the canal and its banks
2. Tower (I)
3. Counterscarp gallery (K) with postern and depot (L)

4. Shelter with usage storage (C), bombproof building
5. Depot (D), bombproof building
6. Depot (E), bombproof building
7. Depot (F) and depot/bunker (M), bombproof buildings
8. Depot (G), storage, bombproof building
9. Munitions-depot (H), bombproof building
10. Fortguard-house
11. Gatehouse (A)
12. Inundation lock with bridge
13. Remnants inundation lock

3.20 The tower and the counterscarp

1. The fortification's earthworks, remnants of shelters, roads and the canal and its banks

Fortresses were usually constructed on pre-applied earthworks, which functioned as the foundation and prevented the fortress to sink in the wet and soft soil. These earthworks also functioned as a defence wall. During the years, more and more earthworks appeared at shelters, to make them less vulnerable for impacts from enemy fire.

Fortresses used to be surrounded by wet or dry canals to prevent the enemy from approaching the fortress. The fortresses could only be reached by bridge or a narrow land bridge. The canal of Fort Honswijk is special because it is connected on the south side with an inundation-lock with the river Lek and on the east- and north side with the inundation-canal. Only the inundation-lock on the east side of the fortress is still visible in the landscape. Along the outsides of the canals often roads or paths were located, often appearing as a covered road (NL: gedekte weg). These roads or paths could have several functions; public road, maintenance-path, military covered road or exclusive entrance road to the fortress. Outside the wet canal, border posts were located which remarked the area which was controlled by the Ministry of War.

2. Tower (I)

The tower is the centre of Fort Honswijk en was part of the defence of the river acces of the Lek, the northern bank of the Lek and other waterworks.

Towers were built during the 1860s, starting in the Napoleonic Era, but in the Netherlands from the 1840s onwards. The principles of the military engineer J.G.W. Merkes van Gendt were guiding.

In the Netherlands, towers on fortress were usually circular with a diameter of dozens of metres and they were surrounded by a wet canal. Those towers were usually two, three or more storeys high and consisted of heavy brickwork. The idea was that the round shape was resistant to impacts of gunfire, while the defensive power was equal in all directions. On top of the tower and through loopholes artillery could be prepared. Several tower had a cover of soil, which made them to be considered as 'bombproof'.

The invention of artillery with a rifled barrel was the end of the tower-fortresses; they were quite vulnerable, were easy targets and lost their defensive power within several years. As a result, the upper floor was usually removed and earthworks were added. What remained was its function as storage. Other known tower-fortresses are Fort Asperen and Fort Everdingen.

The thickness of the walls of the fortress differed, at the east side the walls are 3 m thick and at the west side those walls are 1 m thick. Originally, there were four storeys, including the basement, but during modernizations the upper floor was removed. Nowadays the tower has a diameter of 45 m and is 12,5 m high. It is the largest tower-fortress in the Netherlands. During the construction of the counterscarp, several heavy iron arches were placed between the tower and the counterscarp.

3. Counterscarp gallery (K) with postern and depot (L)

The counterscarp is covered with an earthwork on the outside. Its function is to protect the tower and the gallery-building from impacts of projectiles. When in 1860-1870 the power of the artillery increased, the towers could not resist the impacts anymore.

3.21 Depot/bunker M
(Ronden & Van der Velden)

3.22 The gatehouse A

Two solutions have been implemented: to lower the height of the towers (to make them less visible in the landscape and less vulnerable) and counterscarps and earthworks were added. Both of these solutions were implemented at Fort Honswijk during the years 1881-1885. Fortresses with a counterscarp are rare.

4. Shelter with usage storage (C), bombproof building

The shelter was built during the years 1878-1882. The shelter was covered with an earthwork to protect it from impacts of projectiles. But this was not enough when technology improved. New techniques that were implemented were reinforcement of brickwork, application of shock-absorbing brickwork systems (the use of arches), gentle slopes and the use of concrete (later ferroconcrete (NL: gewapend beton)).
In the 20th century it was renovated and got a new façade.

5. Depot (D), bombproof building

The depot dates from 1880 and is built from brikke concrete, with a metal door.

6. Depot (E), bombproof building

The depot dates from the period 1878-1882 and looks the same as Depot (D).

7. Depot (F) and depot/bunker (M), bombproof buildings

The depot and the bunker date from the period 1878-1882, respectively 1883. In the 20th century both buildings were renovated with a new brickwork façade.

8. Depot (G), storage, bombproof building

This depot also dates from the period 1878-1882. It is accessible from the counterscarp through a side entrance of the postern. The depot is made of brickwork and was used for the storage of gunpowder and projectiles.

9. Munitions-depot (H), bombproof building

The munitions-depot dates from 1878. It is centrally located on the fort area.

10. Fortguard-house

The fortguard-house functioned as a military service building. Because most fortresses were not occupied by staff when there was no mobilisation or practice, the fortresses had a fortguard-house for who guarded the fortress during those periods. Sometimes these houses also had other functions, like a lockkeepers house.

11. Gatehouse (A)

The gatehouse functioned as the defendable entrance of Fort Honswijk, it could control the in- and outflow of people on the terrain of the fortress. Those gatehouses were also common at castles or city gates. The gatehouse at Fort Honswijk has been built because the use of a bridge was not allowed because of the food defence function of the entrance road to the fortress. The gatehouse was built in 1878.

12. Inundation lock with bridge

The defence mechanism of the New Dutch Waterline was primarily based on controlled flooding of land. This demanded a ingenious system of waterworks, like locks, dams and canals. Many different types of locks were used and sometimes already existing locks were

used, but usually those locks were built only for the inundation system. In the surrounding of Fort Honswijk, three locks were constructed, of which only one is still visible. The lock dates from 1846.

13. Remnants inundation lock

The inundation lock of which only remnants are left, dates from 1845. It is located in the Northern Lekdike (NL: Noordelijke Lekdijk) at the east side of Fort Honswijk. The lock has been closed in 1940 with a concrete wall, later it has been filled up with soil and in 1985 the lock was partly broken down and been included in the dike.

(Rijksdienst voor het Cultureel Erfgoed 2013)

3.5 Policy framework

In this paragraph the policy framework concerned with Fort Honswijk will be described. The main policy is framed by Panorama Krayenhoff and Nota Belvedére.

3.5.1 Panorama Krayenhoff & Nota Belvedére

Panorama Krayenhoff is an integral development vision designed by the Ministry of Economic Affairs, Agriculture and Innovation (nowadays called the Ministry of Economic Affairs). The main goal is to develop the landscape with a practice-based vision and to protect and strengthen the core qualities of the landscape by:

- Making the rural area more accessible
- Recognizing the past and innovations in the landscape
- Paying attention to the green character of the rural area

In the vision, emphasis is put on the Waterline as "(…) *een van de weinige grote, landschappelijke vormen in ons land, die bovendien een sterkste betekenis heeft. Ze is de meest uitgewerkte en daardoor de meest indrukwekkende van een stelsel van nationale verdedigingslinies. Over een lengte van 85 km vormden ze één systeem, met één doel en één beheerder.*" (Stuurgroep Nationaal Project Nieuwe Hollandse Waterlinie 2003)

The necessity of the system has disappeared and with this also the limitations for the surrounding of the Waterline. Limitations to agricultural areas have also disappeared. Allotments which were based on a fast inundation were adapted to the ideal situation for agriculture. Also roads have been broadened and after the abolition of the 'Kringenwet', building took place on the original fields of fire around Utrecht and Gorinchem. A large number of fortifications have been sold and with this the management of the built defence works disappeared. Because of this, some parts of the Waterline are not recognizable anymore. Nowadays there is not one institution which manages all the elements of the Dutch Waterline. Many administrative boundaries run through the Waterline-area, this makes management more difficult. National interest has been replaced by user interest.

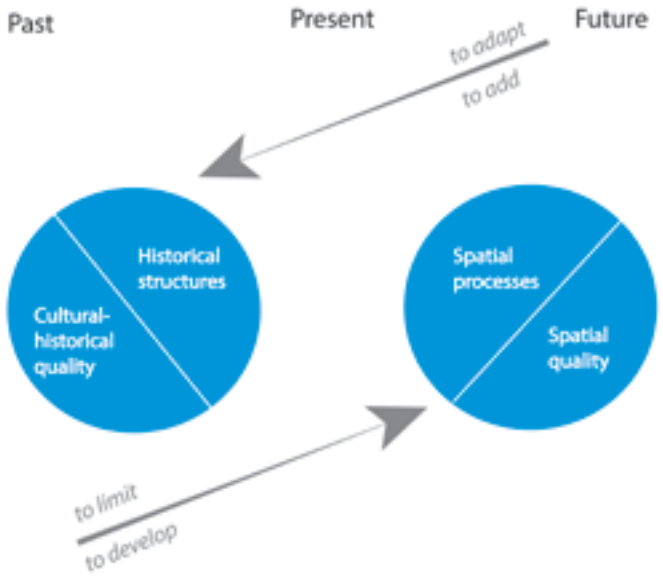
The relevance of the phenomenon of the Dutch Waterline in relation to spatial planning has been put on the agenda since the 1980s by the 'Rijksdienst Monumentenzorg'. The Waterlines were called important elements of the national landscape structure in the 'Nota Landschap 1992'.

In the 'Nota Belvedere' is decided to put the Dutch Waterline on the agenda again. At the same time, the importance of the New Dutch Waterline was addressed in the third architecture nota in which the defence line was one of the ten big projects. With this, it is addressed that the importance of the line cannot only be found its history, but also in its spatial design-quality on national level. Because of this 'Nota Belvedere', the New Dutch Waterline got the status of National Project. This means that the government, provinces, water boards, owners and municipalities are responsible for the project and have to come up with initiatives.

A design contest was launched to visualize five scenarios:

1. Water
2. Landscaped line
3. Recreation and tourism
4. Urban development
5. History

The scenario 'Lijn in Landschap' from Eric Luiten has



3.23 The relation between cultural history and spatial planning

(Adapted from Nota Belvedere 1999)

been chosen as a starting point. The assignment was to make a line perspective, a spatial vision, which is concrete enough to lead to anchorage planning on a national level and provincial level and that a development plan could be made of it. The second assignment was to provide the communication about the importance of the Dutch Waterline. As Eric Luiten said about the project "People knew it was about something important and that there was enough knowledge, but there was no direction". (Min. LNV 2003)

Questions which arose in the project were:

- What is actually the essence of the national project?
- When is the Waterline-project finished?

This resulted in ambitions: "*Als deel van het 'nationale geheugen' draagt de linie bij aan het historische besef en de regionale identiteit, als 'megasingel door de Deltametropool' (een typering die de lezer niet al te letterlijk moet nemen) is de linie een rustige en groene tegenhanger van het stedelijke netwerk en als hydrologische machinerie kan de linie wezenlijk bijdragen aan het gemoderniseerde waterbeheer van de 21ste eeuw.*" (Stuurgroep Nationaal Project Nieuwe Hollandse Waterlinie 2003)

Eight assignments were conceived:

1. The Waterline is in the experience of the Dutch and foreigners a known, coherent area, with some specific attractions
2. Some of the inundation fields will be renovated or secured from future spatial planning
3. Fortifications and water works are renovated and are accessible by foot, bike and car
4. New functions have been given to some fortifications, which contribute to communication, exploitation and management
5. In the rural areas also other developments have been taken place to strengthen the vision and the continuity
6. There is a location (or more locations) where operation of the line can be demonstrated
7. There is an organisation which manages the Dutch Waterline
8. The New Dutch Waterline is included in the list of UNESCO World Heritage

(Min. LNV 2003)

3.5.2 Belvedére

From 1999 until 2009, the Belvedere Policy Document has stimulated the use of cultural history with spatial transitions. The cultural history of the living environment can after all add quality and value to spatial transitions. The Belvedere Policy was an initiative of the four ministries of education, culture and science (OCW); housing, spatial planning and environmental management (VROM); agriculture, nature and fishery (LNV) and traffic and water (V&W). Their goal was to involve cultural heritage in spatial transitions and this is stated in the 'Nota Belvedere'.

Nowadays the Cultural Heritage Agency (Rijksdienst voor het Cultureel Erfgoed) and the foundation for Dutch Heritage (Stichting Erfgoed Nederland) are responsible for further developments in the thinking about heritage. Belvedere has supported ± 425 projects.

The objective of the Belvedere strategy is to stimulate a respectful approach regarding cultural and historic values within spatial developments. This can be accomplished by seeking effective ways to create win-win situations (to use space in such a way that an object of importance is given a place and will contribute to the quality of its newly created surroundings) and not

by burying the past of vetoing changes. According to this approach "cultural heritage has to be regarded as being of vital importance to our society and to each individual citizen." (Projectbureau Belvedere 2009)

The goals of the Belvedere strategy are aimed to be achieved by involving cultural historians early in the planning process and by providing architects, planners and administrators with effective, useable and understandable information. This requires being aware of the importance of others in the planning process as well as a 'give and take' attitude. The main objective is: "*Cultural-historic identity is to be seen as a determining factor in the future spatial design of the Netherlands, for which government policy shall aim to create appropriate conditions*." This objective can be seen in terms of the following subsidiary aims:

1. To recognize, and to maintain the recognisability of, cultural-historic identity in both rural and urban areas, as a quality and basic starting point for further developments.
2. To strengthen and exploit cultural-historic identity and the qualities which go to define such identity, in those areas of the Netherlands which are most valuable in terms of cultural history, the so-called 'Belvedere areas'.
3. To create appropriate conditions for the initiatives of third parties aimed at a thematic strengthening of cultural history.
4. To disseminate knowledge concerning cultural heritage and to promote opportunities whereby cultural history can be used as a source of inspiration in spatial planning and design.
5. To promote cooperation between citizens, organisations, local and regional authorities and government,
6. To improve the practicality and use of existing instruments.

(Summary Nota Belvedere 2009)

Belvedere and the New Dutch Waterline

After the Second World War, the Waterline lost its function. Several fortresses continued to be used as munitions depots and for other military purposes, but the ingenious flooding system fell into disrepair. The Prohibited Areas Act (which was repealed in 1963 and stated that cities and villages could have space to develop in direct vicinity of the forts) radically changed the character of the region. In the city of Utrecht, the new university campus 'De Uithof' was even constructed within the former prohibited Waterline region. But the Waterline remained its geographical significance. Routes have been marked for water sporters, hikers and cyclists, fortresses are deliberately kept in original condition and fortresses are transformed into museums. Nowadays more and more defence works are receiving a new purpose. With increasing attention for the environment, The New Dutch Waterline offers plenty of room for nature, water and recreation. Lots of effort is put in conserving the Dutch Waterline by assigning it modern functions. It was designated as a 'National Project' in the Belvedere Policy Document. This means that "the state, provinces, cities and water boards must work together with citizens, the private sector and civic organisations for the future of the Waterline." (Projectbureau Belvedere 2009) Their motto is 'preservation through development'; the cultural historical value of the Waterline must be considered when planning for the quality of life, work, recreation, water and nature of the region. The goal is to make the Waterline the pride of the Netherlands by 2020, with the view of an unique military past and plenty of space for nature, water and recreation. (Projectbureau Belvedere 2009)

3.5.3 Nota Ruimte

In the 'Nota Ruimte' of 2008 the cabinet set 35 million euros available for the further development of the New Dutch Waterline. The region itself doubled this amount of money to 70 million euros.

In the 'Nota Ruimte' the assignment of Linieland is described as:

'*In Linieland ligt de nadruk op het opheffen van infrastructurele barrières en de recreatieve en landschappelijke inrichting. De groene (zwakke) functie staat in Linieland sterk onder druk. Ook is het tekort aan recreatief uitloopgebied groot*.'

(Enveloppecommissie Linieland 2010)

3.5.4 Results from investigations and workshops

A workshop has been held (Werkatelier Fort Honswijk & Fort Everdingen) to get new ideas for the redevelopment op both fortresses. An important point to tackle was how to cope with the many stakeholders involved? Each of these organisation has made a list of demands and how is it possible to make every party happy with the end product?

In society developments are indicated that substantiate focus on the leisure market. Lifestyle trends on which this choice of focus is based on are:

- Consumerism (the consumer spends more and more time shopping, eating, drinking and enjoying)
- Authenticity and identity (people feel the need to create a self-image, products are used to build up an identity)
- Sustainability (consumers think it is important that cooperations operate in a sustainable environment)
- Health (attention is paid to body and spirit, people are getting older and they want to enjoy life in good health)
- Convenience (besides efforts, the consumer desires more comfort, care and quality)

Trends on the leisure market are:

- Shortbreaks (more often people chose a short stay instead of a far day-trip, during this shortbreak people wish more experience and they spend relatively much money)

Fortresses are objects with a special experiential value already and they can add the possibility for stay)

- Leisure moments (the consumer wants more leisure moments with alternating groups)

Fortresses could offer products for leisure groups (young and old). Also more semi-business stays/day-trips are undertaken. Broadening of target groups can be an opportunity for fortresses.

- Sporting activities and activities in the field of body care and health (Jansen & Stelwagen 2011)

A list of demands was formulated, partly as the end result of the Werkatelier Fort Honswijk & Fort Everdingen, and part of consultations of Dienst Landelijk Gebied and other involved parties. The demands that are already clear are:

- Additional factor

The new function of the fortress must add something to the current situation

- Public

The terrain should be publicly accessible by, for example, a path on the rampart

- No traffic generating effect

The road on the dike cannot handle more traffic than it is handling nowadays on a sunny Sunday

- Separate objects

The fortresses Honswijk & Everdingen will be sold separately and do not need to have a linking function

- 1 buying party

The fortress can be used for many different projects, but it will be sold to one party

- The building map is guiding

The map which shows which buildings should stay, which can be removed and which are most likely to be removed, is guiding

- Parking on the fortress

Parking cars should happen on the fortress itself or the buying party should buy land surrounding the fortress

- Restoration of the rampart around the fortress

The rampart around the fortress must be restored in original shape. But a well-designed entrance in this rampart is possible.

(Van der Velden, personal communication April 26, 2013)

3.24 A wordcloud as the end result of the guiding values

(Based on Jansen & Stelwagen 2011)

3.6 Flora - and fauna restrictions

Legal regulations

On international level, flora and fauna are protection by the 'Habitatrichtlijn'. This European directive is implemented in the Dutch 'Flora- en faunawet'.

The protection of native species governed by the Flora & fauna law (NL: Flora- en faunawet). This law, which came into force on april 1st 2002, replaces the 'Vogelwet', the 'Jachtwet' and a part of the 'Natuurbeschermingswet'. The core of the Flora & fauna law is the duty of care. The Flora- en fauna law protects breeding sites, resting areas, residences and individuals. Residences are protected throughout the year, also during periods when the animals can be found somewhere else in their network. Degradation of residences is only allowed when it meets the following requirements:

- There is no adverse effect on the conservation of the species
- There are no less harmful alternatives available (location, arrangement and method)
- There is a compelling reason with overriding public interest, public safety or protection of flora and fauna
- Always measures should be taken to limit the negative effects as much as possible and killing or injuring individuals is not allowed

(Limpens & Jansen 2007; Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

Artikel 2

1. *Een ieder neemt voldoende zorg in acht voor de in het wild levende dieren en planten, alsmede voor hun directe leefomgeving.*
2. *De zorg, bedoeld in het eerste lid, houdt in ieder geval in dat een ieder die weet of redelijkerwijs kan vermoeden dat door zijn handelen of nalaten nadelige gevolgen voor flora of fauna kunnen worden veroorzaakt, verplicht is dergelijk handelen achterwege te laten voorzover zulks in redelijkheid kan worden gevergd, dan wel alle maatregelen te nemen die redelijkerwijs van hem kunnen worden gevergd teneinde die gevolgen te voorkomen of, voorzover die gevolgen niet kunnen worden voorkomen, deze zoveel mogelijk te beperken of ongedaan te maken.*

Artikel 9

Het is verboden dieren behorende tot een beschermde inheemse soort te doden, te verwonden, te bemachtigen of met het oog daarop op te sporen.

Artikel 10

Het is verboden dieren behorende tot een beschermde inheemse soort opzettelijk te verontrusten.

Artikel 11

Het is verboden nesten, holen of andere voortplantings- of vaste rust- of verblijfplaatsen van dieren behorende tot een beschermde inheemse soort te vernielen, uit te halen, weg te nemen of te verstoren.

3.25 The articles from the Dutch 'Flora- en faunawet' that are applicable to the situation of Fort Honswijk (Min. LNV 1998)

3.6.1 Flora

Two protected species plants were found at Fort Honswijk and Lunet aan de Snel. Furthermore, five species from the Red List were found and nine species from the Orange List of the Province of Utrecht. The table of Figure 3.27 gives an overview of the species found.

The buildings and wall of the fortress of Fort Honswijk are kept free from vegetation. Mowing takes places alongside the buildings and the fence. Large parts of the complex are grown with stinging nettle (NL: Brandnetel), hogweed (NL: Berenklauw) and cow parsley (NL:Fluitenkruid). At some locations planted

3.26 Splendor clock (*Campanula persicifolia*) (Drachtplanten)

Specie (EN)	Specie (NL)	Protected	Red List	Orange List
Ragwort	Bezemkruiskruid			SU
Blood sorrel	Bloedzuring			SU
Eglantine	Egelantier			SU
Common agrimony	Gewone agrimonie		SU	
Gold oats	Goudhaver		SU	
Large angelica	Grote engelwortel			SU
Juniper	Jeneverbes	x*	SU	
Dog's tail grass	Kamgras		SU	
Ivy speedwell	Klimopereprijs			VU
Kenilworth ivy	Muurleeuwenbek			SU
Splendor clock	Prachtklokje	x*		
Petite pearlwort	Tengere vetmuur			SU
Garden spurge	Tuinwolfsmelk			VU
Barley field	Veldgerst		SU	
Bindweed	Zwaluwtong			SU
Swan flower	Zwanebloem	x		

3.26 The species found at Fort Honswijk

(SU: susceptible specie, VU: vulnerable specie, TH: threatened specie, VT: very threatened specie, *: planted)

(Adapted from Van Groen & Sluis 2009)

exotic species can be found, like the oriental plane (NL: Oosterse plataan), the Sweetgum (NL: Amberboom), ripple rose (NL: Rimpelroos), red horsechestnut (NL: Rode paardenkastanje) and a leaved lime. Other trees that grow on the complex are the plane (NL: Plataan), walnut (NL: Walnoot), hornbeam (NL: Haagbeuk), sycamore maple (NL: Gewone esdoorn), common ash (NL: Gewone es), Norwegian maple (NL: Noorse es), poplar tree (NL: Canada populier), silver poplar (NL: Witte abeel), sweet chestnut (NL: Tamme kastanje), silver birch (NL: Ruwe berk), black alder (NL: Zwarte els), sweet cherry (NL: Zoete kers), field elm (NL: Gladde iep), red beech (NL: Rode beuk) and the summer lime tree (NL: Zomerlinde). Frequently occurring shrubs are the elder (NL: Gewone vlier), dog-rose (NL: hondsroos), filbert (NL: hazelaar), holly (NL: hulst), red dogwood (NL: rode kornoelje) and blackthorn (NL: sleedoorn). The south-west side of the fortress consists of a dike/ rampart which is grazed by sheep. Along the bank, species like swam flower and large angelica can be found. (Van Groen & Sluis 2007)

The duty of care is valid for all protected species. During proceedings the following guidelines should be maintained:

- Disturbing proceedings (like cutting down trees and shrubs) should take place outside the breeding season. The breeding season is from March to July.
- All occurring vegetation or soil material can be removed in phases. This gives animals a chance to

3.28 Swan flower (*Butomus umbellatus*)

(NL Natuur)

3.29 Dog-rose (*Rosa canina*)

(Bijenhelpdesk)

move.

- To limit the disturbance of fish and amphibians, proceedings on the water front should take place in the period of August to October, relating to the periods of mating and hibernation.
- New water bodies can be constructed prior to filling up the present water bodies. From these waters the protected amphibians and fish can be catched by damming or lowering the water level.

(Van Groen & Sluis 2007)

3.6.2 Fauna

Bats

Bats are small flying mammals that feed on insects. In the Netherlands, 18 species can be found. Bats are nocturnal animals which appear at dusk to go insect-hunting. Some species catch insects high in the sky or in the open landscape. Other species hunt just above the water, alongside vegetation and even between braches and in bushes. On their way to their food area, bats follow fixed routes along lanes, hedges and forest edges. During spring and autumn, some species exhibit migrating behaviour, where they move hundreds of kilometres. (Nationaal Project Hollandse Waterlinie n.d.)

"The buildings of the former military defence lines provide major hibernacula for bats in the Netherlands, although bat abundances and species richness vary greatly between objects." (De Boer et al. 2013, p502)

Bats are regarded as the biggest risk factor for the redevelopment of vacant military complexes like Honswijk and Everdingen, particularly when realised that especially Honswijk is one of the most important habitats of bats in the New Dutch Waterline. 10-27% of the known Dutch hibernation population hibernates in a location of the New Dutch Waterline. (Limpens & Jansen 2007) But bats should not only be regarded as a limiting factor, they are also a great challenge for the marketing concept and they give the redeveloped location an unique significance and appearance.

To put the fortresses on the market in a responsible way, it is crucial to follow up advises from experts regarding the bat population. (Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

3.30 Year cycle of bats

(Adapted from Nationaal Project Hollandse Waterlinie n.d.)

Both the fortresses Honswijk and Everdingen house a huge amount of bats. The different types of buildings offer a variety of hiding places and climatic conditions. see Appendix 8 & 9 for which species can be found in which buildings during winter and summer). Because of this, many different species are present which each have other needs. The present vegetation is used for foraging, provides shelter during flight and has a buffering effect on the wind keeping the climatic conditions favourable throughout the year. During the whole year bats are present at different location at the fortress. (Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

Habitat selection of bats depends on the characteristics of the landscape surrounding a site, i.e. the environmental context. (De Knegt et al. 2010, 2011)

Both fortresses are an important swarming location during late summer. During swarming male, female and young animals from different colonies gather at known winter quarters. This activity is crucial for the gene flow and also fulfils the function of knowledge transfer, where young animals learn from adults where they can hibernate. At Fort Honswijk the number of swarming bats is estimated to be 3500-4700 and at Fort Everdingen 760-1200. These large amounts make the conservation of the fortresses even more valuable. Both fortress are of great importance as swarming location for 'whiskered bats' (NL: baardvleermuizen, Myotis mystacinus), 'common pipistrelle' (NL: gewone dwergvleermuizen, Pipistrellus pipistrellus) and 'natter's bat' (NL: franjestaarten, Myotis nattereri). (Limpens & Jansen 2007; Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

Besides swarming, the fortresses are also a unique location for large numbers of hibernating animals. This

concerns in particular large numbers of water- and whiskered bats who stay in the tower. Fort Honswijk is of national importance for the number of beard bats, 150 individuals were observed.

During spring and summer Fort Honswijk fulfils a regional function for a colony of water bats in the tower and a colony of common pipistrelle in the modern barracks, especially in barrack B and O. At the terrain also day resting areas and eating places have been found of the 'brown long-eared bat' (NL: grootoorvleermuis, Plecotus auritus).

Bats use many different places as residence. Which location is used depends on the species, the function the bat want it to fulfil and climatic conditions. Often the animals are crouched, but some hang freely on the ceiling and beams. At the fortresses Honswijk and Everdingen, many animals hide away in cracks in the brickwork, air ducts or gunsmoke channels. Sometimes animals are found between doors and frames. These spaces are reached through open windows, doors or shutters, broken windows or open gunsmoke channels. (Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

Generally, a fortress that has not been used for a while, is an attractive location for bats. Elements that are positive for bats are:

- loose masonry
- vacant buildings
- missing shutters, windows and doors
- chimneys and gunsmoke channels that are closed at the top
- cracks in arches
- water in the cellar causes a high humidity

Negative elements for bats are:

- no supervision, so everybody can enter the buildings and cause disturbance
- disturbance caused by human housing in the surrounding
- to many open doors and windows, which causes draft
- when an arch break down, which causes the stable climate to change
- cracks are overgrown with plants which makes them unavailable for bats

Points of attention when restorating and consolidating

- Weigh what really should be done? What is possible on which place? How can this be compensated?
- Make a planning and perform work outside the period when the function for which the space is used, is at issue
- Use shields to prevent negative effects (noise, light, smell)
- Work during summer and autumn in such a way that spaces can be kept open and accessible for bats
- Work in such a way that does not change the climate (high humidity and constant temperature)
- Keep entrance roads for bats on the places where they enter the buildings
- Only repair cracks that are a threat for the stability of the building
- When the use of a space by bats is make impossible, offer an alternative
- When giving a space a new function: keep humans and bats separate
- Have walkways and light outside the swarming-zones
- Bats require an average temperature between 0°C and 10°C for hibernation
- A large volume, thick outer wall, concealed hiding possibilities, thick ground cover and dense vegetation cover on top of the object buffer against climatic variations
- Natural areas are important for undisturbed foraging and summer housing
- Water bodies are important for bats as sources of drinking water, hunting areas or flying routes

(De Boer et al. 2013; Nationaal Project Hollandse Waterlinie n.d.; Thomas & Geiser 1997)

Bats & health

Bats are a protected species. It is not allowed to touch them, because of their protected status. Some species may be the carrier of the European Bat Lyssa Virus (ESBL). This virus makes separation of functions on fortresses important. The entrance to the areas where the bats are should be regulated well, with the help of a management plan and protocols about how to cope with the bats during redevelopment.
(GGD Midden Nederland august 2012)

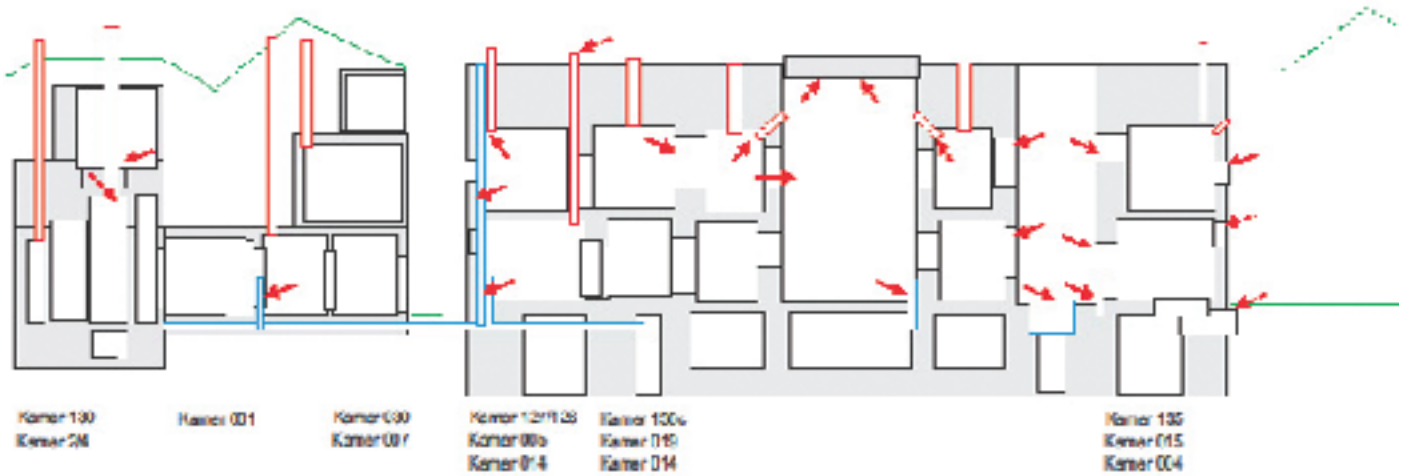
Objects which are not that important for bats can be transformed without exemption, all individuals should, however, have found another place to stay. (Voorbereidingsgroep (ambtelijk) Lekaccess 2012)

Of course it is possible to lay the focus of a future development completely on the housing of bats. Fortresses and other buildings on the fortress-terrain can have different functions for bats (see Appendix 10)

The previous information can be used when making plans for the different buildings. The tables in Appendix 10, 11 and 12 show how important each of those locations can be for housing bats and for which function they are used. These elements can be emphasised when the focus for a certain building is on making the circumstances for bats as good as possible.

Exploitation of fortresses can be divided in three groups: temporary use, limited interventions and permanent interventions.
Temporary use can be divided in two categories when looking at the time of the year they are accessible and the preconditions for this accessibility, which are shown in Appendix 13.

For limited interventions like the use of buildings for storage, attention should be paid to the time of the year the certain locations are accessible (see Appendix 14). This is also the case for more permanent interventions like restoration and repair works.

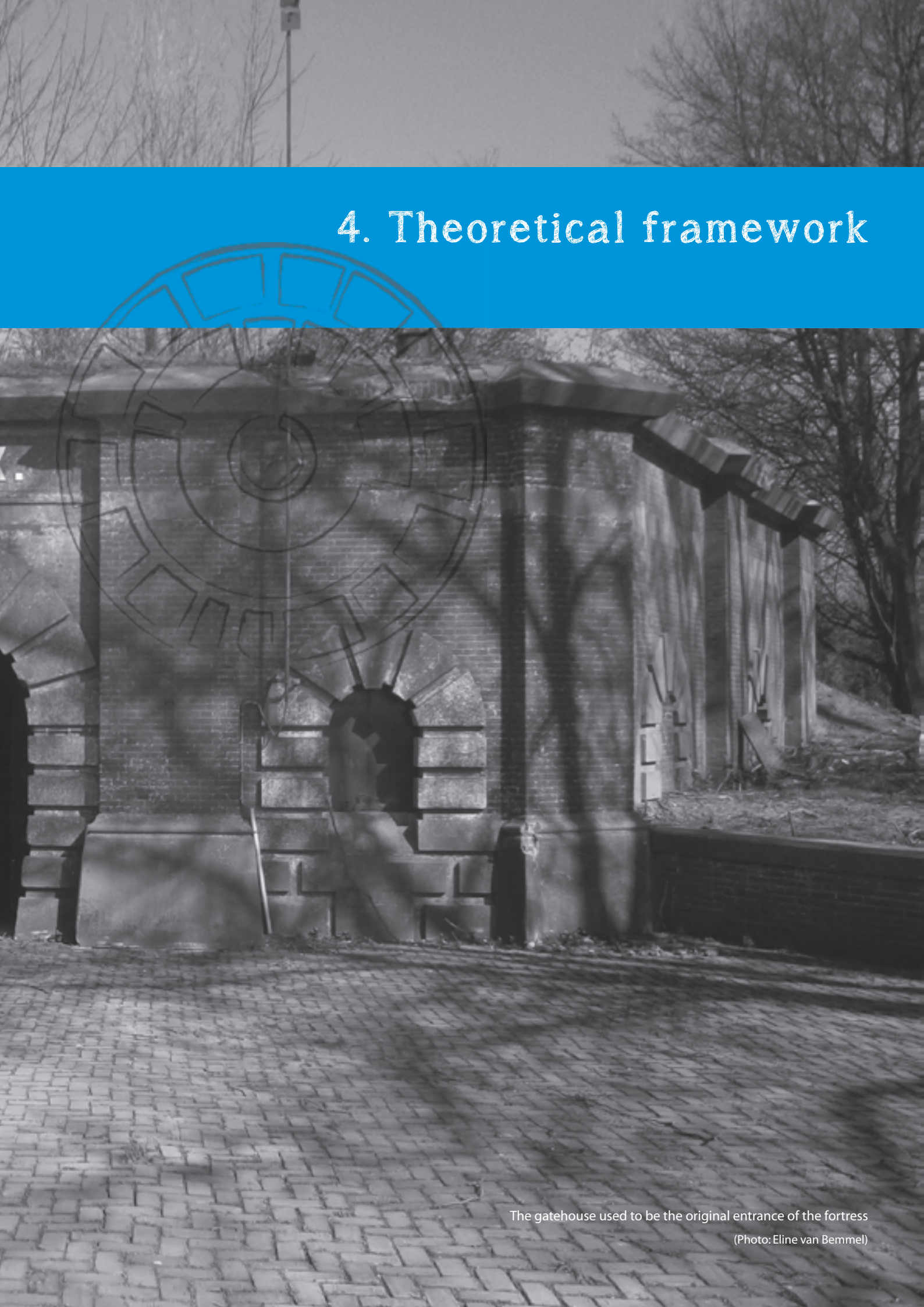


3.31 The current entrances to the different winter locations in the tower and the counterscarp

(Limpens & Vreugdenhil 2009)


HONSWIJK
A

4. Theoretical framework



The gatehouse used to be the original entrance of the fortress

(Photo: Eline van Bemmel)

4. Theoretical framework

The theoretical framework for this thesis will be clarified in this chapter. The topics further elaborated in this framework are the results of the literature search, as mentioned in chapter 2. This chapter starts with the future of culture heritage, what can be found about that in literature and what does the concept itself mean? After that the concepts of adaptive reuse and rezoning will be elaborated. The final paragraph is about sustainable use of fortresses, a topic about which more recent literature is written.

4.1 The future of cultural heritage

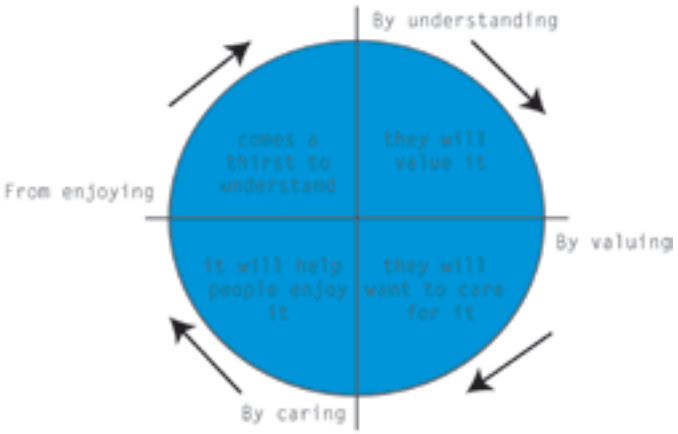
"Cultural heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values. Cultural heritage is often expressed as either tangible of intangible."(ICOMOS, 2002)

As part of human activity, cultural heritage produces tangible representations of the value systems, beliefs, tradition and lifestyles. As an essential part of culture as a whole, cultural heritage contains these visible and tangible traces from antiquity to the recent past. Cultural heritage is a wide concept. It can be distinguished in:

- Built environment (buildings, townscapes, archaeological remains)
- Natural environment (rural landscapes, coasts and shorelines, agricultural heritage)
- Artefacts (books & documents, objects, pictures)

The driving force behind all definitions of cultural heritage is: "it is a human creation intended to inform" (Feather 2006)

Having at one time referred to the monumental remains of cultures, cultural heritage as a concept has gradually come to include new categories. Today, we find that all heritage is not only manifested through tangible forms such as artefacts, buildings or landscapes, but also through intangible forms. Intangible heritage includes voices, values, traditions and oral history. Popularly this is perceived through cuisine, clothing, forms of shelter, traditional skills and technologies, religious ceremonies, performing arts and storytelling. Today, the tangible heritage can be considered as inextricably bound up with intangible heritage.



4.1 The Heritage Cycle gives an idea of how we can make the past our future (Adapted from Thurley 2005)

In the 19th century conscience about the value of heritage was developed, in the 20th century principles of preservation were developed and in the 21st century we continue the implementation of those principles and methods. However, years of wars and destruction destroyed our heritage. (Perkovic n.d.) "The realities of World War Two and the growing number of environmental problems made everyone realise that a ruin can be more than some enchanting reminder of distant cultures." (Desrochers 2000, p35)
"The meaning and importance of our built heritage have been changing continuously over recent years and the politics for preservation have evolved." (Gazaneo 2003, p411)

The economic crisis forces us to be more creative in the search for new means of preserving cultural heritage. The government is less involved and has reduced funding. "The heritage sector will therefore have to continue to show its true worth in terms of responsible management, expert repair work and clever ways of adjusting to the new situation." (Janssen 2012) "It is the best time for analysing the current situation and planning activities to create the pre-conditions for stable development and growth in the future by implementing efficient technologies, especially those which will be better, the best possible for our environment." (Perkovic n.d., p1) An end has come to luxurious restoration and large-scale plans, the future of heritage can be found in the link with bottom-up

initiatives.
The cultural heritage sector has moved away from a museological approach (restoring and conserving landscapes and buildings and returning them to a near-original state) to an approach which focuses more on the future. Giving new functions to heritage is the future, heritage should be regarded as an active component of environmental planning because it can play a role in all kind of developments; cultural, spatial and economic. The government has contributed to this with its Belvedere policy. In the past, the government played a leading and active role in spatial planning and heritage care, but that is not the future. There will be a continuation of decentralisation of government tasks in this field. (Linssen et al. 2009) "Redesignation and redevelopment of cultural heritage will be more than ever affected by economic limitations." (Janssen 2012)

However, the supply of cultural heritage is increasing and will keep increasing because objects are falling into disuse. This will be strengthened by economic and population shrinkage, this means less public support for more objects. This forces the heritage sector to be more flexible, creative and open minded. The sector itself should take the responsibility to seek for financial feasible solutions. Maybe the future can be found in the involvement of local people, a factor forgotten in recent times. In that case, well-informed choices should be made and business people, pressure groups and residents should take a more active role. "By keeping intervention to a minimum and by giving some buildings a temporary function you are at least ensuring that something happens. And sometimes you discover what I call 'the art of doing nothing". (Janssen 2012)

4.2 Adaptive re-use

"Cities need old buildings so badly it is probably impossible for vigorous streets and districts to grow without them. By old buildings I mean not museum-piece old buildings, not old buildings in an excellent and expensive state of rehabilitation – although these make fine ingredients – but also a good lot of plain, ordinary, low-value old buildings." (Jacobs 1961, p. 187)

"It is not the strongest or the most intelligent of the species to survive, it is the one most adaptive to change or most able to adapt to change, that survive."(Darwin)

This thesis project is about reusing Fort Honswijk. This paragraph will introduce this central theme: adaptive re-use. Generally, the most known category of re-use is industrial re-use (Westergasfabriek and the Van Nelle factory), but in recent years military compounds are also re-used. Fort Honswijk is an example of a military re-use project.

Appendix 15 shows a timeline with the different periods in the history of adaptive re-use.

Adaptive re-use is the process of reusing a building or an old site for a purpose other than which it was built or designed for. (Wikipedia 2013) Or: "the process that adapts buildings for new uses while retaining their historic features". (Archinode 2013) According to Brooker & Stone (2004), the term 'adaptive re-use' includes that 'the function is the most obvious change, but other alterations may be made to the building itself such as the circulation route, the orientation, the relationships between spaces; additions may be built and other areas may be demolished'. The Urban Land Institute defines rehabilitation as "a variety of repairs or alterations to an existing building that allow it to serve contemporary uses while preserving features of the past." (Bookout 1990)
The process of adaptive re-use happens when an architectural element loses its viability and purpose,

4.2 The Westergasfabriek
(Wit papier)

but there is of course also a more radical approach; the one of completely replacing the architectural element, in case it has become obsolete. (Popa 2013)

The economic and technological development of society meant that once important and powerful industries, become obsolete. Technology was too old fashioned and new methods of producing were introduced. Time between the introduction of new methods is getting shorter and shorter, because of the fast development of the general level of technology. (Pérez de Arce 1978; Popa 2013; Powell 1999)

The first architectural elements that became obsolete, were medieval fortresses and fortified cities. These had to make place for the booming industrial towns and other industrial expansions. This industrial development created a period of economic prosperity, social reforms and urban redevelopment. Although it created many opportunities, it also created many new social issues to be resolved. The re-use of industrial buildings started a number of years later, when the importance of preserving that specific cultural period was acknowledged. (Popa 2013) Also during the Renaissance period, classical monuments were transformed for new uses and during the French Revolution religious buildings were transformed for industrial functions or military uses. (Linters 2006; Dubois 1998; Cunnington 1988) A theoretical approach towards adaptive re-use was established in the 19th century by Eugène Emmanuel Viollet-le-Duc. (Plevoets & Van Cleempoel n.d.) He recognized adaptive re-use as a way to preserve historic monuments: 'the best way to preserve a building is to find a use for it, and then to satisfy so well the needs dedicated by that use that there will never be any further need to make any further changes in that building.' (Viollet-le-Duc 1990) But these ideas were objected by John Ruskin, who found it 'impossible, as impossible as to raise the dead, to restore anything that has ever been great or beautiful in architecture' and instead he favoured regular care and maintenance instead of restoration. (Ruskin 1849) In the 20th century, Alois Riegl (1928) ascribes the conflicts in theories to the different values their adherence attribute to monuments. He distinguishes different types of values: commemorative values (age-value, international commemorative value and historic value) as opposed to present-day values (use-value, art-value and newness-value) He recognized re-use of historic buildings as an intrinsic part of modern conservation. (Riegl 1928; Plevoets & Van Cleempoel 2011b) Nowadays, the era of the urban re-use and industrial architecture is coming to an end, but the process is not over yet. Because human history is cyclic, history will repeat and new architecture and urban elements will become obsolete and have to be re-used. This can be seen in the present re-use process of military compounds in the Netherlands. (Popa 2013; Ontwikkeling Militaire Terreinen 2013)

4.3 The Van Nelle Factory
(Dyan van Putten)

Adaptive re-use, along with brownfield reclamation, is seen as a key factor in land conservation and the reduction of urban sprawl. It can be regarded as the compromise between demolition and historic preservation. (Wikipedia 2013; Cantell 2005)
Historic buildings help to define the character of our communities by providing a tangible link with the past. (Cantell 2005)
The future of a building is prolonged by retaining most or all of the structural system and as much as possible of other elements, like cladding, glass or interior partitions. Nowadays, the will to extend the life cycle of a building is related to sustainability goals like preservation of virgin materials, energy conservation and sprawl minimization. In many Western cities, massive buildings are left vacant after industrial operations moved to the South or East. Also many old hospitals, military buildings, sanatoriums and office blocks become redundant. Adaptive re-use is a way

to revitalize declining neighbourhoods and urban life. (Archinode 2013; Schilling 2002; Cantell 2005) It came into mainstream architectural idiom during the 1960s and 1970s because of the growing concern for the environment due to the high fuel and material costs. (Cantell 2005; Smith 1976)

The abandonment of one property in a neighbourhood can affect the whole neighbourhood because of a downward spiral; property values in the surrounding of the empty building decline and owners become less willing. (The Pennsylvania Horticultural Society 1995, p. 18)
Sometimes there are several obstacles to overcome when wanting to preserve and revitalize historic buildings, like:

1. Structural problems that create challenges in reusing this unique structures (Blackburn 1983)
2. Financial obstacles; renovating and adapting is too expensive (Cantell 2005; Shipley & Reyburn 2003)
3. Restrictive zoning and codes (Cantell 2005; Shipley et al. 2006)
4. Contamination (Cantell 2005)

However, there are several financial incentives and planning tools available to make reusing historic buildings economically feasible. (Cantell 2005; Shipley et al. 2006) This is an important debate because researchers and policy makers have recognized the desirability of having more residents in downtowns as a catalyst for central business district revitalisation. (Bunting 2000)

Studies have been done after the differences in costs

	Small (<18000 ft²)	Medium (18000-50000 ft²)	Large (>50000 ft²)
Residential	Too numerous	**$144 (€108,92)**	**$231 (€174,72)**
Commercial	**$111 (€83,96)**	**$169 (€127,83)**	**$102 (€77,15)**
Institutional	**$212 (€160,35)**	**$200 (€151,27)**	Insufficient data

(Adapted from Shipley et al. 2006)

Costs of new construction:

	Small (<18000 ft²)	Medium (18000-50000 ft²)	Large (>50000 ft²)
Residential		**$155 (€117,24)**	**$130 (€98,33)**
Commercial	**$95 (€71,85)**	$155 **(€117,24)**	**$165 (€124,80)**
Industrial	**$195 (€147,49)**	**$195 (€147,49)**	

(Adapted from Shipley et al. 2006)

Cost difference between renovation and new building:

	Small (<18000 ft²)	Medium (18000-50000 ft²)	Large (>50000 ft²)
Residential		- 8%	+ 44%
Commercial	+ 15%	+ 8%	- 38%
Industrial	+ 8%	+ 2%	

(Adapted from Shipley et al. 2006)

of renovating and new construction. In the study of Shipley et al. (2006), costs were compared of 23 projects.

Costs per ft2 of renovation (1 ft2 -> 0,0929 m2):
On average, a complete new building rehabilitation costs about 16% less in construction costs and 18% less in construction time than new construction. (Campbell 1996)

Shipley et al (2006) mentions four reasons for success:

1. The spatial qualities of particular buildings
2. Building location and site advantages
3. Return on investment
4. Government assistance

Old buildings can also be used to house archives, like is done in Utah, USA. These old buildings have several advantages: they are often found well within established neighbourhoods, which allows an institution to take advantage of the existing infrastructure. Other advantages are the tax advantage offered by the federal government to private organisations for the renovation of historic buildings and the costs; renovating an old building is less expensive than new construction and includes substantial energy savings. (Haymond 1982)
Some cities have even gone further by making the adaptive re-use of vacant industrial buildings an integral part of their infill development and affordable housing strategies under the rubric of 'smart growth'. (Cantell 2005)

According to Derek Latham (Latham 2000) there are five reasons for implementing adaptive re-use:

1. The building under consideration has archaeological value
2. The building under consideration is a visual amenity or a cultural contribution
3. The building under consideration can make economic sense

Re-use category	Description
Archaeological motives	Architectural evidence for present and future generations
Aesthetical appreciation	- Visual amenity: the subjective enjoyment society experiences from its visual environment, its complexity and richness - Regional and particular character; re-use reinforces local identity - Cultural value: adds to richness, eclecticism and serendipity in built environment
Economic	Asses if cheaper than demolition, long-term energy savings, waste management cost of demolition
Function	Creative programming of existing building
Psychology	Involves the poorly studied psychological experience relative to drastic change vs. gradual evolution of the built environment

Source: (Latham 2000)

4.4 Reasons for implementing re-use

(Latham 2000)

4. The building under consideration has a functional value
5. The building under consideration fills a psychological need

There are four types of benefits of adaptively reusing heritage buildings:

1. Environmental

Adaptive re-use of buildings can play an important role in sustainable development. Environmental benefits are more significant when adaptive re-use involves historic buildings, because these buildings offer much to the landscape, amenity and identity. The retention of the original building's "embodied energy" is one of the main environmental benefits. Embodied energy is defined as the energy consumed by all of the processes associated with the production of a building (from the acquisitions of natural resources to product delivery). By reusing buildings, this energy is retained, making the project more environmentally stable than an entirely new construction.

2. Social

When historic buildings are re-use well, this can have long-term benefits for the communities that value them. Adaptive re-use can restore and maintain the heritage significance of a building and help to ensure its survival. Governments, communities and developers are more and more seeking ways to reduce the environmental, social and economic costs of continued urban development and expansion. The re-use of heritage buildings in established residential areas can provide a community with commercial property and new housing opportunities.

3. Economic

Several financial savings and returns are made from adaptive re-use of buildings. Embodied energy savings from not demolished buildings will only increase with the predicted rise of energy costs in the future. The market appeal of re-used heritage buildings has been popular because of their historic authenticity and originality.

4. Promoting innovation

Because of an increase in development pressures in cities, more heritage is being re-used, which produces excellent examples of creative designs that retain heritage significance. The adaptation of these buildings presents a challenge to architects and designers to find innovative solutions.
(Commonwealth of Australia 2004)

When starting the process of adaptive re-use, it is important to ask the question 'what has this building been?' instead of 'what could this building become?'. This will result in a conversion that does not hide the building's past. (Bunnell 1977)

In literature about adaptive re-use three approaches

can be identified: typological approach, technical approach and strategic approach.
Case studies are often organised according to the building category or building type, the typological approach. The most often used classification is: industrial buildings, religious buildings, (semi-)public buildings, residential buildings, military buildings and commercial buildings. (Cantacuzino 1975; Cunnington 1988; Latham 2000)

Other authors approach building adaptation as a primarily technical question. In these cases attention is paid to what elements need upgrading, like the load bearing structure, the building envelope and the comfort, safety and energy efficiency. (Giebeler et al. 2009; Rabun & Kelso 2009)
The strategic approach focuses on the process and strategies applied for converting significant buildings. (Plevoets & Van Cleempoel 2011a) For example, Robert (1989) presents seven concepts of conversion: (1) building within, (2) building over, (3) building around, (4) building alongside, (5) recycling materials or vestiges, (6) adapting to a new function and (7) building in the style of. Brooker & Stone (2004) defined different design strategies for building re-use: (1) intervention, (2) insertion and (3) installation. In this classification the most important and meaningful factor in adaptive re-use is the original building. Jäger (2010) presents a very similar approach, a classification according to the applied strategy towards the existing fabric: (1) addition, (2) transformation and (3) conversion. Cramer & Breitling (2007) make a distinction between 'design strategies' and 'architectonic expressions' whereby they

<table>
<tr><td colspan="4">Design Strategies</td><td>Architectonic Expressions</td></tr>
<tr><td>Robert 1989</td><td>Brooker & Stone 2004</td><td>Jäger 2010</td><td colspan="2">Cramer & Breitling 2007</td></tr>
<tr><td>Building within</td><td>Insertion</td><td>Transformation</td><td>Modernisation</td><td>Correspondence</td></tr>
<tr><td>Building over</td><td rowspan="4"></td><td rowspan="3">Addition</td><td rowspan="4">Adaptation</td><td rowspan="3">Unification</td></tr>
<tr><td>Building around</td></tr>
<tr><td>Building alongside</td><td rowspan="3">Intervention</td></tr>
<tr><td>Adapting to a new function</td><td>Conversion</td></tr>
<tr><td>Installation</td><td rowspan="3"></td><td>Junction & delineation</td></tr>
<tr><td>Building in the style of</td><td></td><td>Replacement</td><td rowspan="2"></td></tr>
<tr><td>Recycling materials of vestiges</td><td>Corrective maintenance</td></tr>
</table>

4.5 Overview of the different design strategies

(Plevoets & Van Cleempoel 2011a)

describe design strategies as physical interventions and alterations to the building (Figure 4.5). Architectonic expression is described as the aesthetic qualities of the intervention. (Plevoets & Van Cleempoel 2011a)

4.6 Different stages in the development of militairy sites

(Adapted from Weijschede et al. 2006)

4.2.1 Adaptive re-use of military sites

Different stages of development can be recognized when looking at different military sites:
The military function is the first stage in the use of every military site. It differs how long it takes a place to develop into a military place; sometimes tens of years (Dutch Waterline) and sometimes in a few years (Salpa line, see Case Studies). In most cases the military function stopped and the place was abandoned. The fortresses and other relicts were forgotten, but the owner often remained the Ministry of Defence. In most cases, the abandoned stage was followed by the stage of re-use. The abandonment of the place was often the reason to take action and to start a re-use project. The initiative for re-use is often from volunteers. Two types of volunteers can be described; volunteers who have military remembrance or interest and want to tell the story to the next generations and the other types is the 'entrepreneur volunteer'. In other cases the initiative is coming from the local or national government. This was the case for the Dutch Waterline, the government took the initiative to preserve and develop the sites. Generally, initiatives by volunteers are more sustainable when supported by the government.

When looking at the type of organisations, two different ways of organizing can be distinguished; an informal and a formal way. The informal way can be placed at the beginning of stage III, volunteers start to initiate new forms of re-use. When political awareness increases, the organisation often becomes more formal; a governmental organisation will take over. The formal way can be placed later on the line of stage III.

The advantage of a formal organisation is that it can be helpful in the process of fundraising and planning on the long-term. (Weijschede et al. 2006)

Attracting tourism is an activity that all military sites are capable of. The activities vary form visiting a well accessed fortress to visiting a ruin. At the beginning of the re-use stage, many sites do not have a good accessibility. A form of re-use that is often carried out in the beginning are guided trips organized by volunteers. The well-accessed tourist activities are often organized by public organisations. Besides tourism, a public organisation can give some extra dimensions of re-use by coordinating the military site as a whole and use the site for spatial and regional development. (Weijschede et al. 2006)

Often fortresses are overgrown with urban activities, like housing and infrastructure, in the last decades. Fortresses in rural systems should protect a bigger surface than only one city. These rural systems used its natural environment very well. The environment was often part of the system so fortresses were only needed on strategic places. Nowadays this relation with the landscape is still visible. (Weijschede et al. 2006)

The study of Weijschede et al. (2006) also states a list of recommendations when coping with the re-use of military sites:

- The fortifications are a gift from our history, which should be cherished
- Give attention to the way the defence system operated in its regional and European context
- Reinforce the local and regional identity, when making the heritage visible
- The re-use of military heritage is a good way of preserving this heritage
- The possibilities of new use are endless; but every new form should be considered in each local situation
- Local initiatives should be supported by the government

(Weijschede et al. 2006)

4.3 Rezoning

"The key is to remember that a building has a life; one always wants to retain enough of the original to reflect that past." (Candace Schafer in Campbell 1996)

Rezoning is becoming more and more a social task. Recently new numbers were announced, that 7 million m2 of office space is vacant. Also monumental and characteristic churches, former post offices, farms and industrial buildings are vacant. Vacancy is a huge threat for sustainable heritage conservation and it causes decapitalization and the empty buildings are a threat for the liveability of the surrounding. (Rijksdienst voor het Cultureel Erfgoed 2013)

The significance of heritage is very broad. People derive their identity from it, people feel connected to it (because of the stories it raises) and heritage can be an important inspiration for new spatial developments. But when cleverly done, heritage can yield money. (Rijksdienst voor het Cultureel Erfgoed 2013)

After 10 years of Belvedere 'conservation through development' (NL: behoud door ontwikkeling) is a known concept when dealing with cultural heritage. One step further is 'modernization of historic preservation' (NL: Modernisering van de Monumentenzorg; MoMo). The most important legislation is stated in the 'Monumentenwet 1988'. (Rijksdienst voor het Cultureel Erfgoed 2013)

4.3.1 Modernization of historic preservation

The most important goals of the MoMo are to stimulate and support working regionally, to take the importance of cultural heritage into account in spatial planning, to formulate a vision for heritage and to reduce the administrative burden. These goals have been stated in the 'Rijksstructuurvisie Cultureel Erfgoed'.
The modernization of historic preservation has been based on three cornerstones:

1. To take cultural heritage interest into account in spatial planning
2. More powerful and simple regulations
3. To stimulate rezoning

(Rijksdienst voor het Cultureel Erfgoed 2013)

4.3.2 'Monumentenwet 1988'

Legislation and regulations about cultural heritage are stated in the 'Monumentenwet 1988'. It is the most important instrument in the protection of cultural heritage. The law states how monuments can be designated as protected monument. Three types of monuments can be distinguished: built monuments, city-/townscape and archaeological monuments. (Rijksdienst voor het Cultureel Erfgoed 2013)

4.3.3 The Dutch situation

In the Netherlands, the applicant is responsible for the necessary permits and exemptions. To make this easier, since 2010 25 different permits are combined in one environmental permit (NL: omgevingsvergunning).
When activities lead to change of function or external changes of an area, these activities can have a harmful effect on protected plants and animals. That is why the applicant should pay attention to the Flora- and fauna law. When an activity is harmful for plants or animals which are protected by the Flora- and fauna law, the applicant is required to fill the part 'Acts affecting protected animals and plants' (NL: 'Handelingen met gevolgen voor beschermde dieren en planten') of the environmental permit. The municipality will ask the Ministry of Economic Affairs permission for this permit. When the Ministry grants permission, they give a 'Declaration of no objection' (NL: Verklaring van geen bedenkingen(Vvgb)). The municipality will include this declaration in the environmental permit. (Muilwijk 2011)

4.4 Sustainable use of fortresses

"*Sustainable development is in line with the needs of the present without destroying the ability of future generations to fulfil their own needs*" according to the definition of the UN-committee Brundtland in 1987.

4.4.1 Moisture management & ventilation

Because most owners first pay attention to the restoration of their building, they miss the chance to improve the installations that take care of moisture and the climate within the fortresses. Improvements to these systems are necessary to make the fortress suitable for the redevelopment to an office, a restaurant or a museum. Ventilation ducts are present and during restoration it is possible to make them re-useable or to install new ventilation possibilities. A fortress without moisture management is unusable during summer, because the large thermal mass causes such a low inside temperature that moisture will condensate on the walls and materials in the rooms.
Research shows that owners as well as funders (governments) pay too much attention to the architectural restoration. Their reasoning is that then the first step is taken and after that the implementation of the future function will take place. But this reasoning is not right for historic buildings as well as for new buildings. Besides that, the investment in architectural restoration can be ten times the investment in the new installation for moisture management. Many measures that could have been done during the restoration, cannot be done afterwards because this would cause too high costs.
Especially ground covered buildings need a different approach then 'normal' buildings and offices, because the unusual high thermal mass and the minimal solar gain lead to moisture condensation on walls and equipment without measurements. (Bootsveld 2010)

The redevelopment of a fortress or a monument starts with an idea and the ideas of people make or break the chance of an innovative solution. An example is the project 'Crossing the Lines' (more information in the frame on the next page), where research has been done after the possibility to apply sustainable energy in the English Jaywick Martello Tower on the coast of Essex. Because no sources of biomass were present in the surrounding, this option was disregarded. A heat pump was also proved impossible, because the ground around the tower was not owned by the same owner. But its location on the coast of England, with the most hours of sunshine, and the thick walls offered a perfect location for a south-facing sloping surface. But the

option of solar panels was not approved by The English Heritage, this organisation wanted to be involved in the process much earlier, and the cheap and interesting solution was not carried out. (Bootsveld 2012)

Crossing the Lines – Sustainable redevelopment of former defence lines in Northwest Europe

The project focuses on restoring and redeveloping former defence lines created during the Napoleonic era within or outside a number of cities of the NWE (Northwest Europe) region. The underlying philosophy of this project is 'conservation through redevelopment'. To achieve this goal, three partners from Belgium, the Netherlands and the UK will focus on two specific objectives:

1. To develop and implement knowledge on restoration techniques and the use of sustainable energy for fortifications through transnational studies and investment pilots
2. To make investments for opening up of fortification sites to the public and to develop new presentation techniques on visiting opportunities, history and current use of fortifications
3. To strengthen the cooperation between fortifications in NWE, to disseminate the results of this project to relevant stakeholders and to explore the opportunities to develop a strategy for the protection of defence lines all over NWE linking up with the ESDP and the Spatial Vision
4. To make knowledge and information gained in this project available to the general public, other fortifications and partners in the defence lines involved in this project

(European Community Initiative INTERREG 2002)

When using sustainable energy, it is recommended to use different sources. When applying sustainable energy, attention should be paid to:

1. Which sustainable energy sources can be used?
2. How can this generated energy be stored?
3. How can this energy be used most efficiently?
4. How can a sustainable and healthy indoor environment be ensured?

(Monumentaal Advies & Projectmanagement 2011)

Ventilation is a very important aspect. As mentioned before, these fortresses have often very moist indoor climates, which can cause an unhealthy air quality and it can be harmful for the building. Besides that, moist air warms up very difficult and can thus badly be combined with sustainable heating. Good ventilation is essential for good air quality, because of this the way of ventilating should suit the use and the users and it has effect on the use of energy. (Monumentaal Advies & Projectmanagement 2011)

4.4.2 Applicable sources

There are many way sustainable energy can be generated. In this paragraph an indication will be given of types of sources which could possibly be used at a fortress or other cultural heritage objects. These sources can be divided in solar energy, wind energy, heath pumps & geothermal energy, bio-energy, combined heath and power (CHP), energy from moving water, energy from residual heath and accumulation.

4.7 PV cells

(PR web)

1. Solar energy

PV (photovoltaics) cells (electricity) (Figure 4.7)

These cells are assembled with solar panels. Sunlight is converted to DC power (NL: gelijkstroom) and this power can be stored in a battery. The DC power can be converted to AC power (NL: wisselstroom), the most used type of energy.

Solar collectors (Figure 4.8)

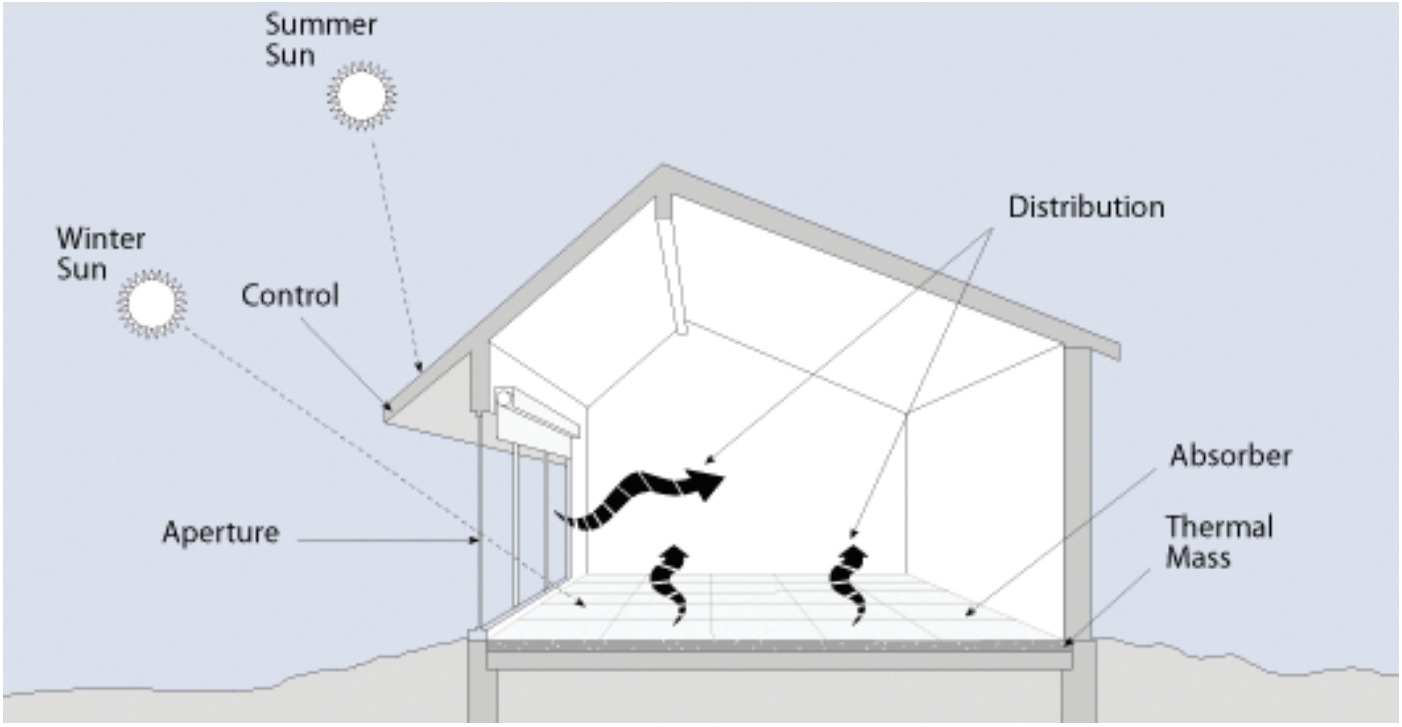
Solar collectors covert sunlight to heat. This heat is transported via a medium(liquid) to a storage or is used right away. This heat can be used for heating, tap water or both.

4.8 Solar collectors

(Saulessiluma)

4.9 Hybrid solar collector

(Futuristic News)



4.10 The five elements needed for passive solar energy

(Ethical Energy)

Hybrid solar collectors (Figure 4.9)

When using hybrid solar collectors, different functions are combined. Some systems combined solar panels and solar collectors, this results that electricity and heat can be generated at the same time. There are also hybrid systems which convert solar heat to gas. This gas is converted to electricity.

Passive solar energy (Figure 4.10)

This type of sustainable energy uses sunlight/-heat directly. No technical installation is needed, but in most cases sunscreens are built for extremely sunny periods. An example of passive solar energy are windows on the south-side of a building, but also an atrium made of glass or a climate façade. This type can only be carried out in combination with a construction plan. (Monumentaal Advies & Projectmanagement 2011)

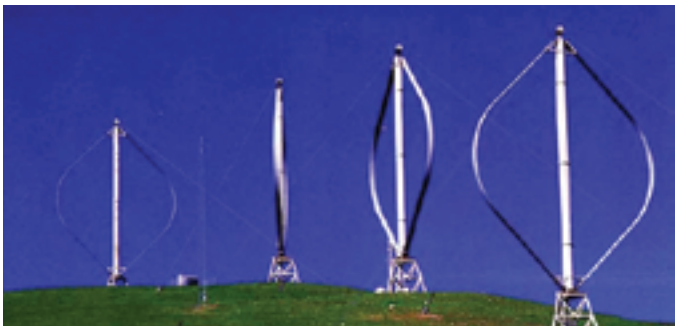
2. Wind energy

Traditional windmills (Figure 4.11)

The traditional windmills will generally be not applicable on or close by fortresses. This because of the noise, disturbing shadow stroke and permits. But there is, however, the possibility to apply smaller mills, but they are less efficient. Windmills can be used to generate electricity, and often the wind blows when the sun does not shine. This makes them an addition to, or alternative for solar energy. Windmills are notable, which makes them able to serve an extra goal as landmark or to carry out the sustainable philosophy to

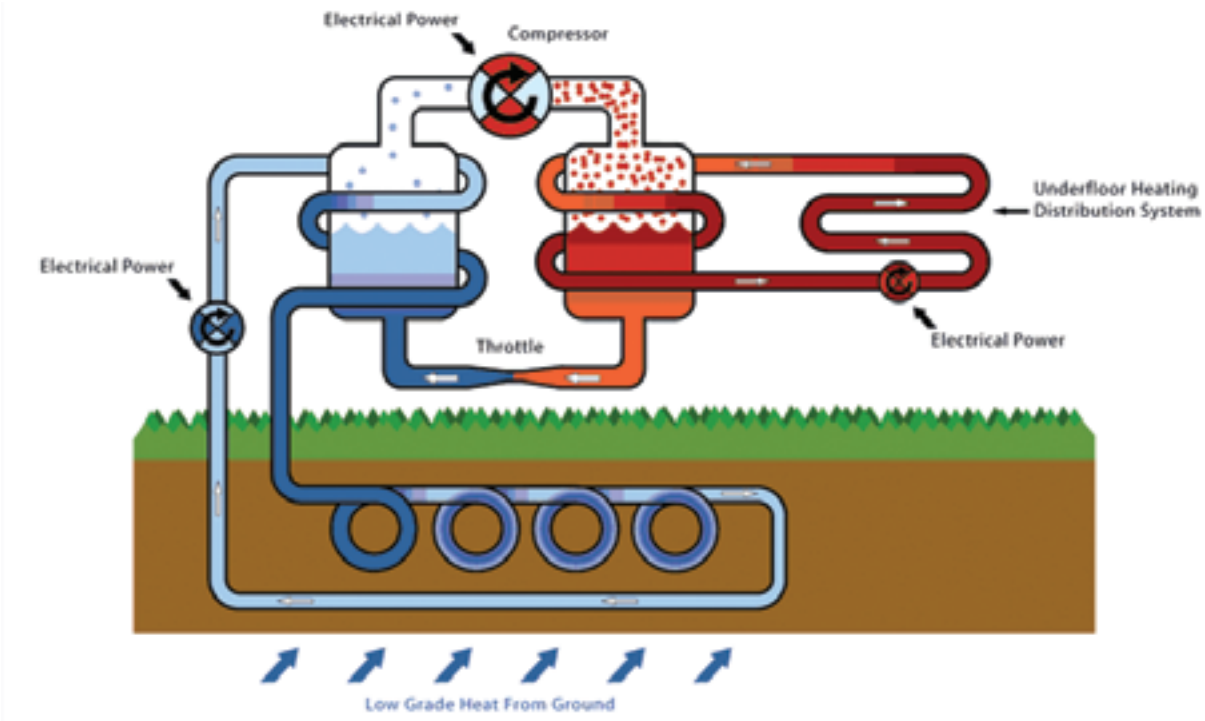
4.11 Windmills

(Annie Green Jeans)



4.12 Vertical wind turbines

(Fiddlers Green)



4.13 How a heath pump works

(Pure Green Energy)

the outside world.

Vertical wind turbines (Figure 4.12)

Vertical wind turbines do not have wings, but they have a vertical axes. Their advantage is that they need less space and they do not need to be directed against the wind, so they are advantageous in situation when the wind direction and wind power fluctuates. Qualities that make them suitable for the application on fortresses:

- They are very compact (they can even be installed in a tree)
- They are very efficient despite of their compact size
- They can be used as a work of art or be included in an object
- They do not need much wind, but they can resist extreme winds
- They are tested very well, because the system is very old and functions under extreme conditions too
- They have a long lifespan (50 years) with low maintenance
- They are available in many different sizes
- They are shaped in such a way that they are safe for humans and animals (also for bats and birds)
- They produce hardly any noise

(Monumentaal Advies & Projectmanagement 2011)

3. Heat pumps & geothermal energy

Heat pumps (Figure 4.13)

Heat pumps are often used to heat up water. To collect this heat, energy is necessary for the use of a pump. The used energy is less than the collected heat. Most heat pumps use electricity, so the best solution would be a combination with a system which generates energy on a sustainable way.

Geothermal energy (Figure 4.14)

Geothermal energy is energy obtained from the heat present in the ground. In almost all types liquid is circulated to 'harvest' the heat. After the collection, the energy is led to a heat pump or directly used for an installation. The created temperatures are not very high and can be used in floor-, wall- or ceiling heating.

- At depth (probe and heat pump)

There are two types of systems: (1) an open system and (2) a closed system. In an open system warm groundwater is pumped and with the use of a heat exchanger releases this heat and it is returned to another point in the soil where the cooled-down water is discharged. In a closed system a heat exchanger is installed in the ground. The collected heat is transported with a pump to a heat pump which increases the temperature to a useable temperature. This is released to a storage medium or to a heating installation. The efficiency depends on the type of soil, the depth and the size.

- At limited depth (geothermal basket)

A recent invention is the geothermal basket. This is a tube shaped like a conical spiral through which a liquid (glycol) flows. The liquid is heated by the heat in the ground and transported to a heat pump. The basket is installed at a depth of 1-5m.

- Just below the surface (horizontal geothermal heat exchanger)

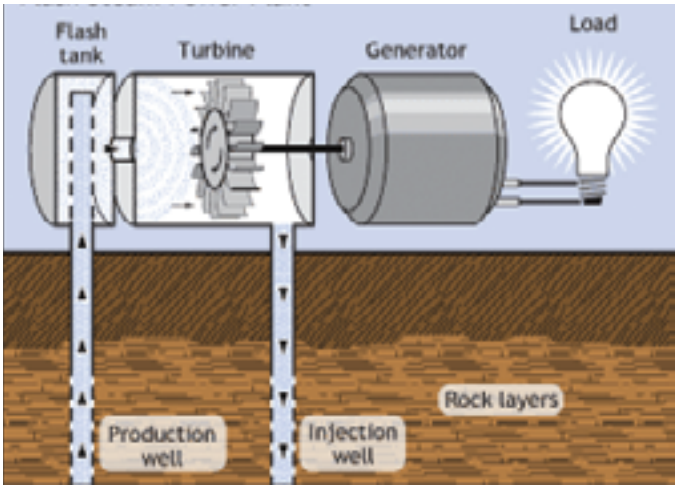
For this system pipelines are installed at a depth of 70-150cm. The necessary surface is the plurality of the surface to be heated. A kind of heating is installed under the surface, a liquid flows through the pipes which heats and is transported to a heat pump. Because of this limited depth, temperature depends on air temperature and its location pertaining to the sun. Effectiveness depends on the soil composition. The most favourable soils are moist and dense.
(Monumentaal Advies & Projectmanagement 2011)

4. Bio energy (Figure 4.15)

Bio energy is energy from biofuels which are extracted from organic material. Biomass is created with the influence of the sun. It is called sustainable bio energy when the supply does not decrease. Examples of bio energy are gasification-, fermentation- and incineration installations. For the use in fortresses, large scale deployment can be possible. Some fortress already use bio energy; wood-burning. (Monumentaal Advies & Projectmanagement 2011)

5. CHP (combined heat and power) (Figure 4.16)

The principle of CHP is to generate electricity as well as heat with the help of a combustion engine. This generate optimal use of energy and prevents losses. When used on a small scale, it is called micro-CHP. A



4.14 How geothermal energy works
(UCSUSA)

4.15 How bio energy works
(Energyplan)

micro-CHP can function on fossil fuels (diesel and natural gas) or by the use of an external combustion engine driven by heat. (Monumentaal Advies & Projectmanagement 2011)

6. Energy from moving water

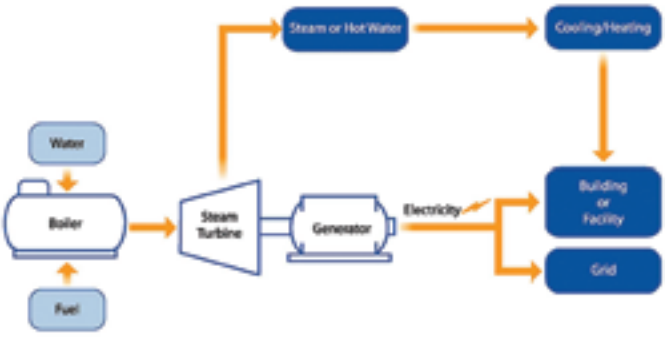
Because some fortresses are located along rivers, energy can be extracted from the constantly moving water. But there are no ready-to-use solutions for small scale implementation yet. (Monumentaal Advies & Projectmanagement 2011)

7. Energy from residual heat

A known example of re-using heat is heat stored in ventilation air. In conventional installations the air in the building is heated and after that transported to the air outside. But WTW-systems (NL: warmte terug win systemen, EN: heat recovery systems) are developed. The existing heat is removed from the airflow with a heat exchanger before it is transported outside. Important for this system is that attention should be paid to the air quality. (Monumentaal Advies & Projectmanagement 2011)

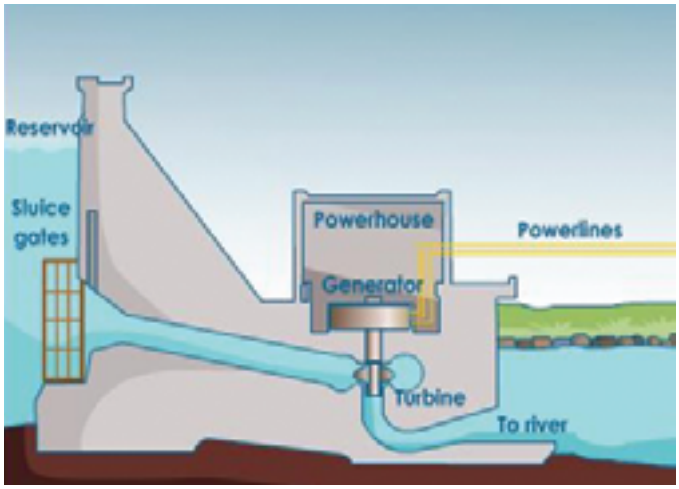
8. Accumulation (the principle of 'Stichting Warm Bouwen')

'Warmbouwen' is a technique which is based on the accumulation of heat in a mass. This stores the stock of heat. This stock can be increased during summer and daytime by solar radiation and activities inside the building. During winter and night this heat can be released to the building. In the brick and the concrete of a fortress much heat can be stored. (Monumentaal Advies & Projectmanagement 2011)



4.16 A CHP installation

(EPA)



4.17 Energy from moving water

(Tutorvista)

5. Analysis

The gallery between the tower and the counterscarp

(Photo: Eline van Bemmel)

5. Analysis

This chapter will give an overview of the different analyses that were done to get a better overview of the project area. These analyses were used as a starting point for making the design. The landscape analysis shows in what larger context the area of the fortress terrain can be placed, the used analysis shows what kind of people are to be expected at the fortress and what type of function are possible. The space analysis shows what spaces are left empty when buildings are removed at the fortress terrain.

5.1 Landscape analysis

Fort Honswijk is located in the area called 'Het Eiland van Schalkwijk' (EN: The Island of Schalkwijk). This area is known as green and open in the south of the town Houten. It is called an 'Island' because the land is almost completely surrounded by water. Because of this unique characteristic, the original qualities have remained almost intact. But these characteristics are under pressure because of current developments. The island has strong landscape- and cultural-historic qualities and originally a strong agricultural identity and land use. The island is known for its fruit cultivation and bushes, but the island also has vast plains of meadow landscape and an unaffected land division structure from the 17th century. Agriculture is the most important factor in the landscape.

A ribbon structure of farms, houses, small businesses and local facilities is located across the landscape of the island. This mix of functions belongs to the village culture and –identity of the small towns Schalkwijk and Tull en 't Waal.

Larger scale

The area of 'Het Eiland van Schalkwijk' is regarded as the counterpart of the urban area surrounding it. The landscape of the island together with the landscape of the Kromme Rijn and the Langbroeksewetering are regarded as typical landscape of the southeast side of Utrecht.

Because of the moderate accessibility and the relatively isolated location, no large urbanization has taken place. The direct surrounding of the island is known for its large urbanization rate. The west side of the island is surrounded by the urban area of Utrecht (Houten, Nieuwegein and Vianen). On the south side

5.1 Location of Fort Honswijk

(Adapted from Google)

of the island, the city of Culemborg and the smaller villages of Hagestein, Everdingen and Beusichem can be found. On the east side, the expanding town of Wijk bij Duurstede is located.

A large part of the island is part of the National Landscape 'Hollandse Waterlinie. A small part of the floodplains belong to the National Landscape 'Rivierengebied'. The National Landscape 'Rivierengebied' is located in the provinces of Gelderland and Utrecht. The river Kromme Rijn, Linge and Lek flow through this area.

The number of entrance roads to the area is limited. From the north (Houten) the entrance roads are located on two bridges across the Amsterdam-Rijnkanaal. From the east and the west, the island is accessible via the provincial road, the dike and a ferry from Culemborg. The railway track Utrecht-'s Hertogenbosch divides the island in two parts. The river Lek and the Amsterdam-Rijnkanaal are part of the total waterway network. The river Lek is also part of the programme 'Ruimte voor de Rivier' (EN: Room for the River). A part of the floodplains of the river Lek belong to the ecological network (NL: ecologische hoofdstructuur, EHS) (Gemeente Houten 2011)

5.1.1 Landscape structure

In the current structure of the landscape the history and genesis of the area can still be found. In this history and genesis, the rivers and agriculture play an important part. The result of different reclamations is a landscape with contrast. These contrasts consist of a variety of large scale and more small scale elements and of wide vistas and more sheltered areas.

The main structures of the landscape are:

- the river Lek, the dike and the floodplains
- the levee parallel to the dike
- the large scale backlands (polders Vuylcop, Schalkwijk and Blokhoven)
- the small scale backlands on the north of Schalkwijk and Tull en 't Waal
- the linear villages (NL: lintdorpen)
- the New Dutch Waterline
- the Amsterdam-Rijnkanaal

5.2 The landscape structure

(Adapted from Houten.nl)

The river Lek, the dike and the floodplains

These elements constitute the south border of the island and are important iconic elements. The dike has a height of ca. 6m and provides a wide view on the river landscape and the varied landscape of the island. The Island of Schalkwijk belongs to the riverlandscape and consists of floodplains, levees and backlands. The floodplains have emerged after the construction of the dikes in the Middle Ages. Before the dikes were built, the landscape was constantly influenced by the river. The levee on which the village of Schalkwijk is located, is a remnant of the old courses of the river. (See Appendix - Figure 1)

The levee

On the levees parallel to the dike an alteration of orchards, groves, brushwood and fields can be found. This planting makes this area sheltered. The block subdivision (NL: blokverkaveling) shape the contours of this planting. The small scale character of these areas is in contrast with the more large scale, open backlands.

The lower backlands

The polders Vuylcop and Blokhoven are the lowermost located backlands of the Island of Schalkwijk. These polders are used by dairy farms and consist of grasslands. Virtually no planting can be found here and because of this these polders are the largest open spaces on the island.

The Schalkwijkse- and Waalse Wetering are the main reclamation axis, from which the wet backlands were taken in use. Along these axis, the current linear

villages of Schalkwijk and Tull en 't Waal can be found. On the levees along the river single farms are located on the dike and along the Achterdijk. The Achterdijk is the transition between the backlands (with in Dutch called the 'copeverkaveling') and the floodplain (with block subdivision).

The higher backlands

The backlands located on the north of the linear village of Schalkwijk are higher in the landscape. These grounds are used for cattle breeding and fruit growing. An alternation can be found of tall tree orchards, grasslands and groves. The land is cultivated by the use of 'copeverkaveling'.

The linear villages Schalkwijk & Tull en 't Waal

The linear development on the island is very characteristic and iconic. The linear villages are visible elements in the open landscape and from these villages there are views on the wide agricultural landscape.

The New Dutch Waterline

The whole system of the Dutch Waterline is characteristic for the island. Fort Honswijk together with the inundation channel, the Gedekte Gemeenschapsweg (a covered road), the inundation fields, fields of fire and other fortresses and bunkers make a special ensemble which is intertwined with the landscape of the Island of Schalkwijk. Like the design of the waterline is known for, it makes optimal use of the geographical circumstances. By opening locks or by stabbing of dikes, the land is flooded with a 40cm layer of water (inundation). The inundation fields are located at the lowest parts of the island.

The Amsterdam-Rijnkanaal

The channel with its lanes of trees is a very notable line in the landscape. The channel was dug between 1934 and 1952. First its width was 58m, but in 1965 this is increased to 100-130m. (Gemeente Houten 2011)

5.1.2 Economic structure

In total 900 jobs and 150 companies can be found on the island. Like in other rural areas, agriculture is an important economic factor. But because of the economic crisis, the condition of this sector is not what it used to be. The result is that the number of agricultural companies decreases. In the last decades a large part of the agriculture fields are sold to project developers or investment companies.

The agriculture of the Island of Schalkwijk consist mostly of dairy farms (±90% of all companies). Fruit farming can be found on the levees and there are some pig farms. The area is very parcelled as a result of the land development project of a few years ago.

Some dairy farms can not expand because of their location close to residential areas. Smell circles make this expansion impossible. Because of this reason farmers stop with their pig farms. The development to less but larger companies is hampered by planning uncertainty and land holdings on the island. Quitting companies keep their land or have sold their land to project developers, which makes it not available or affordable for companies which want to expand.

Besides agriculture, also other business activity can be found on the island. In 2010 this were 100 small companies. There is, especially in Schalkwijk, a large local labour bond. Many jobs are done by locals. (Gemeente Houten 2010)

5.1.3 Social structure

Originally, the Island of Schalkwijk was an agricultural community. The villages of Tull en 't Waal en Schalkwijk have a strong social structure. The inhabitants of the island are concerned and have a common responsibility for the functioning of the village community. People are very active in associations and many events take place. But, like is also the case in other small villages in the Netherlands, the inhabitants are afraid that the social structure and quality of life will change. This because of developments like ageing, individualisation and the increase in mobility. To keep these circumstances the same as they are know, meeting each other is very important. This can be realised by the preservation of local amenities, like the schools, the churches, town halls, clubs, shops and the café. The inhabitants themselves play an important part in this, because the

size and composition of the population determine the support for such facilities. Attention is paid to houses for elderly and young people, to keep them within the community. (Gemeente Houten 2010)

5.1.4 Cultural history

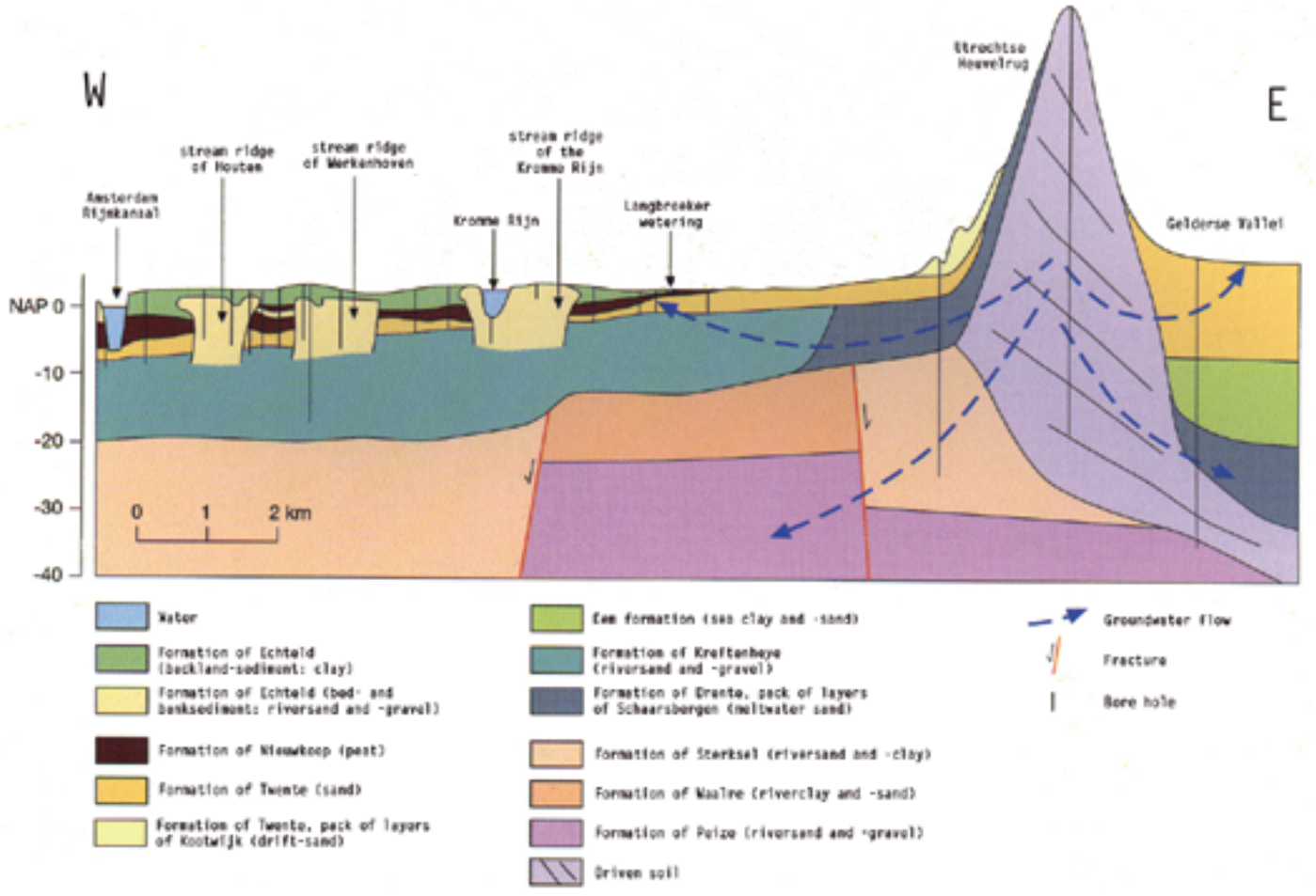
The river landscape

Houten is part of the area which is called the Kromme Rijn-area (NL: Kromme Rijngebied). This geographical element is defined by the city of Utrecht, the hillside (Utrechtse Heuvelrug) and the rivers Lek and Rhine. The area is called after the river Kromme Rijn, a branch of the river Rhine. Since the 1960s many archaeological investigations have take place and many excavations have been done.

About 10000 years ago (at the end of the Pleistocene Era), the Kromme Rijngebied was a undulating 'dekzandlandschap' (a landscape made from blown sand) with not many plants. The rivers were lovated on the south side of the current Lek. As a result of sea level rises and groundwater level rises, marshes appeared and peat formation occurred.

About 8000 years ago this happened in the Kromme Rijn-area. In that same period the rivers lengthened their stream channel more and more in northern direction. The rivers meander through the landscape and took small clay particles, sand and gravel with them. When the water level was high, the river overflowed its banks and these particles were deposited on both sides of the channel. The larger parts sedimented close by the channel which made the levees to build up. Behind these levees the clay and made thick layers of clay, known as 'komklei' (EN: backland-clay). The river shifted regularly. Old channels lost their function and clogged up. This process repeated constantly.

Together with the levees, the clogged channels shape co-called stream ridges, which are slight upraises of



5.3 Section of the river landscape of the area where Fort Honswijk is located

(Adapted from Geoquest)

the landscape. On a few location the residual trench remained as a narrow natural waterway. In particular during the Iron Age and Roman times occupation concentrated on the higher located parts along these residual trench. On the Island of Schalkwijk this occupation can nowadays be found along the Vuylkoopse, Honswijkse and Blokhovense stream ridges.

The vegetation of the river landscape consisted originally of deciduous forests of ash, elm and alder trees. On the backlands alder-ash forests can be found, while the forests on the stream ridges consist of more varied vegetation. Already in Roman times the largest part of the forests on the stream ridges was cut to make the ground suitable for agriculture.
The backlands are, because of their marshy characteristic, not suitable for agriculture. They will have had original vegetation until their reclamation in the 12th century. With the construction of de polder in the 12th century, the water drainage improved, which made the backlands dryer. This process was strengthened during the Middle Ages with the use of watermills. This made it possible to live and work on the lower parts of the landscape. The linear villages Schalkwijk and Tull en 't Waal are located in a lower located backland, which was reclaimed in the 12th century.

When the New Dutch Waterline was constructed, the landscape was again use in an inventive way. The enemy was excluded by flooding the lower parts of the landscape (inundation). On the locations where inundation was not possible, fortresses were built. (Gemeente Houten 2010)

5.1.5 Ecology

The open river landscape of the Island of Schalkwijk contains many special nature values. These nature values have developed in conjunction with the human use of the area.
The floodplains of the Lek house, beside geese, many marsh- and water birds and amphibians like the crested newt (NL: kamsalamander) and the natterjack (NL: rugstreeppad). The slopes of the dike are grown with the so-called riverine vegetation (NL: stroomdalvegetatie), like bluebells (NL: grasklokjes), daisies (NL: margrieten), parsnip (NL: pastinaak) and sometimes the rare field sage (NL: veldsalie).
A bird who lives on the levees is the screech owl (NL: steenuil). On the meadows of the backlands, nests of meadow- and farmland birds can be found. During wintertime, large groups of geese hibernate on the fields, which again attracts raptors.
In the ditches a large population of moor frogs (NL: heikikkers) can be found, and on the ditch banks many (marshy) plants grow.
The New Dutch Waterline is of great importance for bats. Large numbers hibernate in the fortresses and the landscape structure offers a good habitat during summertime.

5.1.6 Map analysis

Several maps were available of the area where Fort Honswijk is located, so a map analysis could be done. The maps can be found in the appendix. The outcomes are enumerated by using bulletpoints. This makes it easy to use the outcomes in the final plan.

Figure 1: Waterways & groundwaterlevels
- The inundation canal is also nowadays an important waterway in the area
- Water is an important factor in the area around Fort Honswijk

Figure 2: Infrastructure
- Cycling routes run along Fort Honswijk
- No main road in the neighbourhood in the surrounding of Fort Honswijk
- No train station or bus stop in the surrounding

Figure 3: Cultural history & archeology
- The area of Fort Honswijk and the inundation canal are protected national monuments
- The dike is a historical line in the landscape
- The area around Fort Honswijk has a high archaeological expectancy
- The subdivision of the landscape has not changed much over the years

Figure 4: Soil

- The soil around Fort Honswijk consists of 'Poldervaaggrond' with heavy and light clay. A Poldervaaggrond is created because of high water levels and is found in coastal areas and the 'Rivierengebied'. A vaaggrond is a mineral soil without clear horizonts. A 'vaaggrond' also does not have a humus-rich top layer. Generally, these soils are relatively young; no soil-forming processes have taken place. (De Bakker 1989)

Figure 5: Geology & geomorpholoy

- Fort Honswijk is surrounded by floodplains and the stream ridge reclamation

Figure 6: Ecology

- A large part of the landscape is under influence of the Dutch Waterline (fortresses and inundation fields)
- Fort Honswijk is a landmark in the area of the floodplains

Figure 7: Ecological vision

- The floodplains around Fort Honswijk are used for nature development
- The area in the north of Fort Honswijk is used to stimulate the management of field margins
- Many nature-friendly banks are stimulated

5.2 User analysis

A user analysis is done when it is necessary to have a target group to make a design for. For the new design of Fort Honswijk there was not one future target group assigned, so an analysis was done to get insight in what kind of people might be interested in visiting the fortress and what functions would be possible.

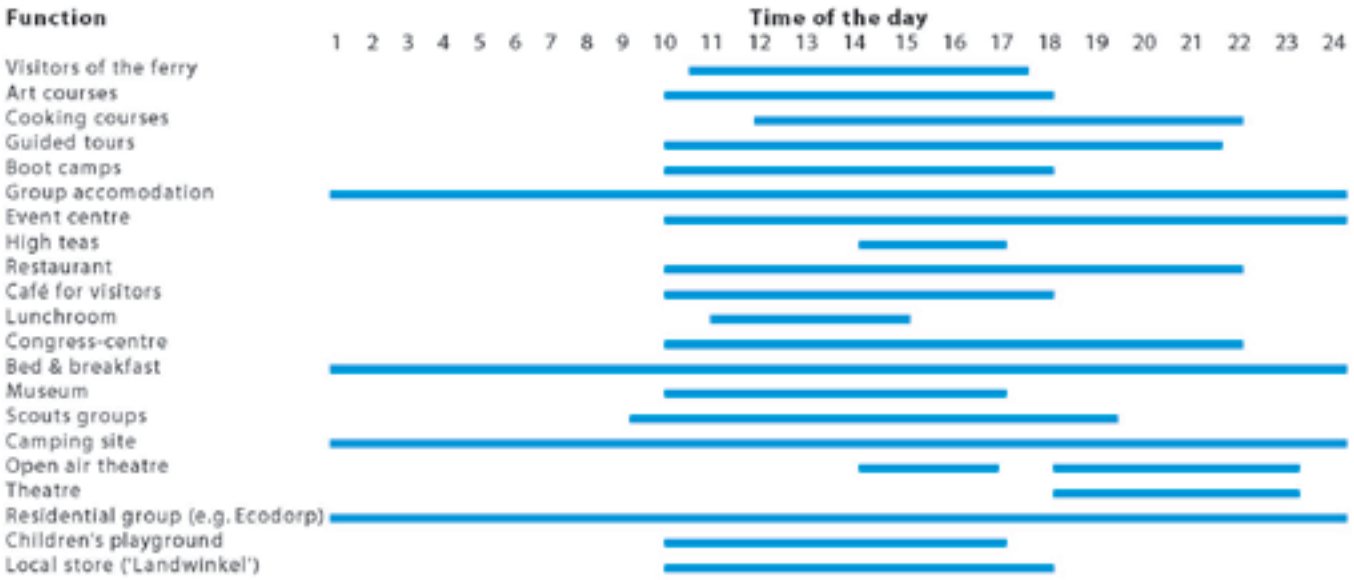
When you want to make optimal use of a location, there are several options:

1. the location has one function which generates all the necessary income within a limited timeframe (like exclusive events and fairs)
2. the location has one function which generates all the income while the location is being used intensively (like an amusement park)
3. the location has several functions which can function at the same time to generate the necessary income (a restaurant and a museum)

To get insigth in what kind of people might visit the location of Fort Honswijk, an analysis was done of possible users (Figure 5.4). This table also includes the interrelated problems which are related to the type of user, for example for elderly people, accessibility is an issue.

Possible users	Needs	Interrelated problems
(People with) children	- benches - safety - attractive play facilities	- to guarantee safety - damage to vulnerable buildings - waste
People interested in history	- provision of information - (guided) tours	- money to finance
Teenagers/young adults	- exciting facilities	- damage to vulnerable buildings - waste
Elderly people	- benches	- accessibility - lack of public transport
Residents (of the surrounding of the fortress)	- no waste - no noise - no extra traffic on the dike - information about the process	- every new function will make the fortress more lively than it is nowadays - keep them involved - many different opinions
Tourists/receptionists	- facilities to rest - possibility of public transport - cycling/walking routes - restaurant/café	- waste - lack of public transport

5.4 Analysis of possible users



5.5 Analysis of time distribution per function per day

5.6 Analysis of time distribution per function per year

With the help of this tableit can be concluded that the fortress is most likely to be very attractive for people interested in (war)history and tourist. But because of its uniqueness it would be nice to attract other targetgroups as well. For example groups of scholars or students. Because of the vulnerability of the buildings, these visits can possibly be guided.

Another analysis was done into what types of use are possible on the terrain and what time-spans they cover. The results of these analyses are visible in Figure 5.5 & 5.6. These tables make clear that some functions are easy to be happening at the same time, for example organising high teas and having an open air theatre. Visitors of both activities will presumably visit the fortress for these functions at different times of the day.

5.3 Space analysis

Besides an analysis of the fortress terrain and its surrounding landscape and a user analysis, an analysis was done into spaces at the fortress. Especially spaces left empty when redundant buildings are removed.

5.7 Map of the buildings with their future destination

(Adapted from DLG)

DLG has made an map which shows which buildings shoudl at least be kept (green), which buidings can be removed (yellow) and which buildings must be removed from the fortress terrain (red) (Figure 5.7). The buildings which should be kept are buildings with monumental value and buildings which are from one of the first building periods. The buildings which should be removed are often from later building periods and do not strengthen the character of the fortress. These buildings often have roofs made of corrugated sheets.

An analysis was done what the effect of these empty spaces would be. This is visible in Figure 5.8. The main conclusion is that the terre square will be one open square again, like it was designed. This square was used as a place for displaying the artillery.

5.8 Analysis of the empty spaces when buildings are removed


VOOR KONING
EN
VADERLAND

6. Case Studies

A small monument to commemorate one year of mobilization during WW1
(Photo: DLG)

6. Case studies

"A case study is a research strategy involving in-depth investigation of single events or instances in context, using multiple sources of research evidence." (Martin & Hanington 2012, p.28)

In the research for finding the best possible future function for Fort Honswijk, a case study was used to get insight in what has been done when redesigning other fortresses of the Dutch Waterline and other heritage sites, or more general: the re-use of (miltary) heritage. The aim is to come up with principles which can be used for the new design of Fort Honswijk. Questions that were guiding this research were: (1) What is the effect on the immediate surrounding?, (2) How is the object situated in the landscape?, (3) How is it visible and in what way is it used?. These questions are important to answer the main question: What circumstances create a successful project?

6.1 Re-use of defence systems in Europe

Suomenlinna (Finland)

History

After numerous defeats in the 18th century and the loss of their eastern fortification, Sweden had no longer supremacy in the Baltic Sea. The building of the bastioned fortress began in 1748 on the archipelago of Suomenlinna. It is built on rocks that tower over the sea and the outline is very irregular. On the six fortified islands, four have 'closed' fortifications whereas the two main islands are protected by a double line of bastions.

Present situation

Suomenlinna is now part of the city of Helsinki, with a population of about 900. There are 300 permanent jobs on the island, with the addition of 200 seasonal workers.

Organisation

The State is the owner of almost all the land. The fortification of Suomenlinna has been classified as historic monument in the 1920's. Since 1991, the whole site belongs to UNESCO's world heritage list.

Development Plans

The preservation, maintenance and development of the fortress has been an objective for years, but the organisation of cultural activities becomes important too. Projects that have been carried out or are on the agenda are to restore apartments, to connect Suomenlinna to the infrastructure network of Helsinki and to create year-round activities on the islands to attract more tourists.
(Weijschede et al. 2006)

Interesting aspects:

- Organisation of cultural activities
- Appartments
- Connection to important infrastructure network
- Year-round activities to attract more tourists

Figure 6.1 shows an impression of Suomenlinna.

Salpa line (Finland)

History

The Salpa line is a fortification chain of almost 1000 kilometres near the eastern border of Finland. It was built during the Moscow peace after the war between the Soviet Union and Finland in 1940-1941. The project was continued in 1944.

Present situation

After the wars, the Salpa line was more or less forgotten. Wooden structures have decomposed, trenches have collaped and buildings are overgrown. The timber reinforced fortifications which have been dug deep into the ground were transformed into historical monuments and tourist attractions.

Organisation

In the 70's and 80's veterans and volunteers asked the Armed Forces for permission to renovate certain parts to serve as museums and tourist attractions. The different museums were later administrated by different municipalities.

Development plans

The goal is to strengthen the national and international visibility of the Salpa line and to create a longer time span for using the fortifications as museums and tourist attractions.
(Weijschede et al. 2006)

Interesting aspects:

- Strengthen national and international visibility
- Create a longer time span

Figure 6.2 shows an impression of Salpa line.

6.1 An impression of Suomenlinna, Finland

(Wikpedia, NBA, Visit Finland, Suomenlinna)

6.2 An impression of Salpa line, Finland

(Salpakeskus, Outdoor, Cartinafinland, Nortfort, Wikipedia)

Komaron (Hungary)

History

During the Napoleon wars in the beginning of the 19th century, Vienna came under fire and the imperial court had to escape. Emperor Ferenc I (Francis I) and the king took refuge in Komaron, in that time feverish haste fortified. In 1809 the Monarch decided to have Komaron built to the greatest fortress system of the area, suitable to hold an army of 200.000 men. The system of forts is situated on opposite banks of the Danube river.

Present situation

The forts have not been attacked in the 20th century and therefore make a suitable location for museums, conference centres, sites for cultural events and art exhibitions, crafts training and memorials. The main attraction will always be the historic character of the forts themselves.

Organisation

The Fort Monostori Centre of Military Culture Monument Real Estate Development is established on the 1st of January 2000 by the Ministry of National Cultural Heritage, the Ministry of Defence and the Treasury Property managing Directorate, together with the local governments.

Development plans

The goal is to turn the fortress system into a European-level cultural/tourist centre, through an expensive renewal process expectedly lasting several years. The number of tourist is expected to rise from 100.000 per year to 1 million per year. The renewed fortress will receive visitors with exceptional festival and exhibition sites, completed with modern hotels, restaurants, shops, riding courses and clubs. Besides public funds, the project is offering opportunities for private investors. (Weijschede et al. 2006)

Interesting aspects:

- European cultural/tourist centre
- Festival & exhibition sites
- Opportunities for private investors

Figure 6.3 shows an impression of Komaron.

6.3 An impression of Komaron, Hungary

(Wikipedia, Donau Radweg. Utazzitthon, Nenad Seguljev)

Rupnik line (Slovenia)

History

The basins of Panonian Plain and the river Po plain (Northern Italy) are connected by the passage between the Alps and the Adriatic Sea called the Ljubljana Gap. The history of controlling it by fortification is almost equally long. The border with the then fascist Italy was in the early 1930's judged by the Yugoslav Military as the most endangered one, that is why, because of the shortness of the border, the building of the strong defences fashioned after French Maginot Line seemed justified and economically viable.

Present situation

At the onset of the war the line was in semi-completed condition. In the German occupation zone the lines was remained intact, but in the Italian zone it was systematically destroyed. After the was the line was overgrown and forgotten. But the first tourism exploitation was organised by a regional tourism organisation. Another initiative by local history and tourism associations was clearly on a much higher level, but has only recently succeeded in securing some funding.

Organisation

The official owner is still the Slovenian Army that was so far cooperative in giving their accordance for alternative use. Their own engagement is limited to an exhibition about the line. The Department of Fortification Studies aims to establish a register of the fortifications heritage, to support as an expert advisory body local initiatives and carry out own initiatives in preservation and presentation of the line.

Development plans

The ideas were up to now more or less fragmented and based on initiatives of local communities.
(Weijschede et al. 2006)

Interesting aspects:

- Local initiatives

Figure 6.4 shows an impression of Rupnik line.

Comparison

Figure 6.5 shows a comparison of the different defence lines mentioned before. These defence lines are compared to the Dutch Waterline. The table shows that

6.4 An impression of Rupnik line, Slovenia
(Slovenia Alps, Traces of War, Slovenia.info)

	Typology building	Single/line/circle	Initiative of re-use	Organisation	Re-use activities	Present relation with landscape
New Dutch Waterline	Bastioned & polygonal fortresses	Line, 85km	National government	National public body	Tourism, urban activities	Strong
Suomenlinna	Bastioned fortress	Circle	National board of antiquities	National public body	Urban activities, culture, restaurants, tourism	Strong
Salpa line	Concrete bunkers, caves, antitank obstacles	Line, 1300km	Volunteers	Local public body	Military tourism, museums	Strong
Komaron	Polygonal fortress	Circle	Local, regional & national government	National government body	Tourism, memorial place	Weak
Rupnik line	Bunkers & casemates	Line, 220km	Local initiative	No formal organisation yet	Tourism	Strong

6.5 Facts about the different defence lines

(Adapted from Weijschede et al. 2006)

most defence lines have a strong connection with the landscape, as well as the New Dutch Waterline. It also shows that most lines have nowadays a function for tourism.

Most interesting aspects that could be used when making a design for Fort Honswijk are to strengthen national (and international) visibility and to make a design for a longer time span. Also the connection to important infrastructure networks is something to take into account and to create year-round activities.

6.2 Re-use of other fortresses of the Dutch Waterline

As a starting point of this thesis an investigation was done into the re-use of other fortresses of the Dutch Waterline. Their present functions are put into categories and the fortresses are categorized. This resulted in the booklet 'Fortresses of the Dutch Waterline - Analysis of original and current function'. In this paragraph an overview will be given of the diffent functions and examples of fortresses will be given.

The conclusion from the analysis of fortresses of the Dutch Waterline is that most fortresses have an ecological function. But because Fort Honswijk can be bought for a euro and all maintenance should be financed by its future function, this is not a very likely future function. Besides the ecological function, many fortresses have an educational function, like a museum or the possibility of guided tours. This is a function that could be possible at Fort Honswijk. The categories that were used in the analysis were:

- Educational function (e.g. museum, lectures)
- Events (e.g. weddings, meetings and gatherings)
- Information point (e.g. tourist office)
- Cultural function (e.g. exhibitions)
- Militairy function
- Ecological function (e.g. nature reserve)
- Residential function (e.g. exclusive housing)
- Overnight-stay (e.g. bed & breakfast)
- Restaurant
- Scouting group
- Shop (e.g. local store)

6.2.1 Examples of fortresses of the Dutch Waterline

Education: Fort de Bilt

Original function

Defence of the Biltsestraatweg.

Current function

Location of the 'memorial centre of the future'. It contains exhibitions about prejudices, refugees, the resistance and the scapegoat phenomenon.

Accessibility

Open Mon-Thu during office hours.

Interesting aspects:

- *Shows a links with the past use of the fortress in its current exhibitions*
- *Unique exhibitions for the Netherlands*

Events: Fort Voordorp

Original function

Defence of the turning banks, inundation locks and the railway track Amsterdam-Utrecht.

Current function

Used as an event centre for weddings, parties and conferences.

Accessibility

Not freely accessible.

Interesting aspects:

- *The extension of the large conference room is done with totally different materials than the fortress is made of, but it fits the kind of shapes already found in the fortress.*
- *Many different rooms with different characters which could be used for different functions*
- *Parking happens at the fortress and is not visible when entering the fortress*

Information point: Vesting Muiden

Original function

Defence of the sea dike, the canal of Naarden and the sea locks.

Current function

In the bombproof barracks the public library and tourist office are housed.

Accessibility

Accessible.

Interesting aspects:

- *Bombproof buildings used as library and tourist office*
- *Because of the location of the tourist office, tourist already enter the fortification*

6.6 Fort de Bilt is used for educational purposes

(Maupertuus)

6.7 Fort Voordorp is used for weddings, parties and conferences

(Meeting Magazine)

6.8 Vesting Muiden is used as a tourist office and houses the library

(Stelling van Amsterdam)

6.9 Fort Werk IV is used as a creative training centre.

(Hollandse Waterlinie)

Cultural function: Het offensief van Naarden

Original function

Five batteries for the protection of the most important entrance roads of Naarden.

Current function

One of the buildings is used as a creative training centre named 'Atelier Vernissage'.

Accessibility

Mon-Sat: 10-17h

Interesting aspects:

- *The uniqueness of the buildings is used for an unique activity*

Military function: Fort Vossegat

Original function

Defence of the acces Kromme Rijn and its banks, the road Utrecht-Bunnik and the inundation lock.

Current function

Part of the 'Kromhoutkazerne' and still has a military function.

Accessibility

Not accessible.

Interesting aspect:

- *Still a militairy function but with a modern surrounding*
- *The fortess has been 'upgraded' with modern materials like cortensteel*

Ecological function: Werk aan de Waalse Wetering

Original function

Defence of the Achterdijk and the non-inundatable strip of land of the Schalkwijkse Wetering. Accompanying Werk aan de Korte Uitweg.

Current function

Viewpoint. Property of Staatsbosbeheer.

Accessibility

Accessible.

Interesting aspects:

- *The height of the building has been used as a strength to make it a viewpoint*
- *Grazing of sheep*

6.10 Fort Vossegat still has a military function

(De Stad Utrecht)

6.11 View from Werk aan de Waalse Wetering

(Eline van Bemmel)

6.12 Living at Fort Steurgat

(Mitula Woningen)

6.13 Werk aan de Bakkerskil

(Hollandse Waterlinie)

Residential function: Fort Steurgat

Original function

Occlusion of Merwede and the dike.

Current function

Exclusive residential island.

Accessibility

Not accessible.

Interesting aspects:

- *Housing is integrated in the earthworks of the fortress*
- *Very exclusive and unique*

Overnight-stay: Werk aan de Bakkerskil

Original function

Occlusion of the Schenkeldijk and protection of the Papsluis.

Current function

The fortress is the location of a bed & breakfast and the patio is opened during the whole year.

Accessibility

Accessible.

Interesting aspects:

- *Unique location to sleep*
- *Open during the whole year*

Restaurant: Fort aan de Nieuwe Steeg

Original function

Defence of the blind curve in the river Linge, the Lingedijk and the levee.

Current function

All kinds of activities regarding geography are organised at the fortress. There is a restaurant, a museum, a labyrinth and a playground.

Accessibility

29/03 - 27/04 : Sat-Sun: 11-17h
28/04 - 01/09: 11-17h
02/09 - 27/10: Sat-Sun: 11-17h

Interesting aspects:

- *The combination of education and playing*
- *The restaurant has a menu of only local products*
- *Parking area in an orchard, hidden from view*

Scouting group: Fort Blauwkapel

Original function

Defence of the node of roads to Hilversum & De Bilt, the node of railway tracks and turning banks.

Current function

Location of scouts group 'Willem de Zwijger'. The eastern part is still property of the ministry of Defence. Visitors can take a walk on the ramparts.

Accessibility

Public area: 24h/day
Recreational area: every day 9-20h

Interesting aspects:

- *Division between publicly accessible area and private area*
- *Ramparts are accessible for visitors to take a walk on*

Shop (local store): Fort bij Jutphaas

Original function

Defence of the acces (the road Jutphaas-Houten) and the non-inundatable strip of land.

Current function

Location of wine-merchant 'Trouvaille'. A guided tour can be combined with wine tasting.

Accessibility

Accessible.

6.14 The terrace of the restaurant of Fort aan de Nieuwe Steeg (SchoolTV)

6.15 Fort Blauwkapel houses a scouting group (Harry Maathuis)

Interesting aspects:

- *The coldness inside the fortress is used as a strength*
- *There is still attention for its past, guided tours are possible*

Things that can be learned and used from this investigation of fortress of the Dutch Waterline is that 'everything is possible'. These fortresses include a very wide range of functions and all of these functions fit their location very well. Aspects that might be usefull for the future design of Fort Honswijk are the possibility of exclusive housing, combination of education and playground and the possibility to make it attractive for tourist and daytrippers by having a restaurant or places to rest.

6.3 Examples of adaptive re-use

In this paragraph examples will be given of adaptive re-use projects internationally, to get an idea of what can be possible when redesigning an used building. Often international projects are more daring than Dutch projects.

Punta Della Dogana Contemporary Art Centre, Venice, Italy.

History

Customs house, located next to Longhena's domed basilica of Santa Maria della Salute and was shut down and left vacant in the 1970s.

Future

Francois Pinault (French billionaire and art collector) won the bid to convert the building into a contemporary art museum. He already owned Palazzo Grassi in Venice. He worked together with Japanese architect Tadao Ando, known for his creative use of natural light and for architecture that follows the natural forms of the landscape.

The building itself is triangular and matching the shape of the island it is on, while the interior has been divided up into long rectangles for a number of different galleries. The façade was restored and all openings were replaced. Skylights were installed and the wooden roof trusses were recovered and restored. The project was finished in June, 2009.

6.16 Fort Jutphaas houses a wine merchant

(Panoramio)

6.17 Punta Della Dogana

(adaptivereuse.info)

6.18 Punta Della Dogana

(adaptivereuse.info)

6.19 Punta Della Dogana

(adaptivereuse.info)

Baptist Temple, Philadelphia, USA.

History

This Victorian Romanesque-revival church was built in 1891 and was the home of Grace Baptist Church. It remained as a church until in the mid-1970s the congregation moved out to a larger building. It was purchased by Temple University in 1974, certified by the Philadelphia Historical Commission in 1984 and designated as a Landmark Building in 2003.

Future

Temple University undertook a renovation after sitting vacant for 30 years. This renovation was performed by RMJM, an international architectural firm that specializes in architecture, sustainable design, urbanism, master planning, interior design and research and development. The firm is committed to the care and improvement of the environment. Nowadays the church is a start-of-the-art performance centre that still has its original character. The theatre provides 1200 seats.

Berkeley County Judical Center, Martinsburg, USA.

History:

This historic complex has undergone numerous adaptations. It was built in phases from 1917-1927 and its first function was as a woollen mill. After the mill was shut down, it was converted into an outlet mall in the 1980s, as shopping destination for locals. But the mall did not succeed, so the complex was converted into a community and technical college.

Future

Nowadays the building consolidates the judicial operations of Berkeley County. Because of its location in downtown, the adaptation needed to respect the original structure and the scale of the surrounding area. A grand public space has been established, a light well was added to bring natural light in through the building and the industrial history is maintained through the original brick exterior walls.

Andel's Hotel Lodz, Lódz, Poland

History

The weaving mill was built in 1852 by textile magnate Izrael Poznanski and is known for its cast iron pillars and red-brick exterior. The complex lost its function in the 1990s.

6.20 Baptist Temple

(adaptivereuse.info)

6.21 Baptist Temple

(adaptivereuse.info)

6.22 Berkely County Judical Centre

(adaptivereuse.info)

6.23 Berkely County Judical Centre

(adaptivereuse.info)

Future

A company from Austria (Warimpex Finanz- und Beteiligungs AG) commissioned the adaptive reuse project. The factory has been transformed into a four-star hotel. The cities strict codes of historic building preservation were followed to honour the tradition of the building. The four-level hotel includes 180 guestrooms and 80 long-stay apartments. The pool of the hotel was created out of a 19th century fire water storage tank.

6.24 Hotel Lodz

(adaptivereuse.info)

6.25 Hotel Lodz

(adaptivereuse.info)

Gasometer City, Vienna, Austria.

History

The gasometers were built between 1896 and 1899, near the Gaswerk Simmering gasworks of the district. The containers were used to help supply Vienna with town gas. The design was the largest in Europe at the time. Due to new technologies and the city's conversions from town gas to coal gas, the gasometers lost their function in 1984. In 1978 they were designated as protected historic landmarks.

Future

Different designers made a design for the four different gasometers. The remodelling and revitalization was completed between 1999 and 2001. Each gasometer was divided into different zones for living, working, entertainment and shopping. The historic exterior walls are conserved. There are about 800 apartments and 70 student apartments.

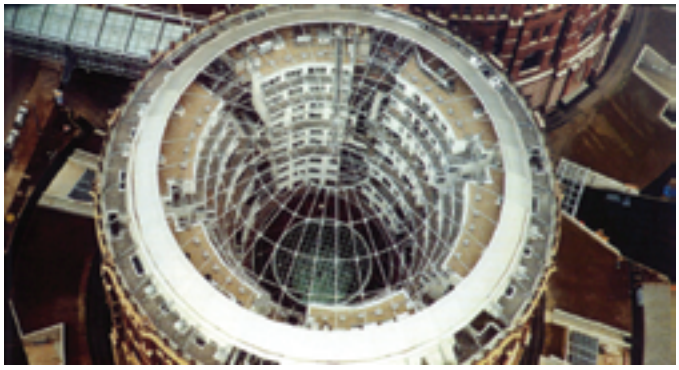
(AdaptiveReuse.info 2013; Archinode 2013)

6.26 Gasometer City

(adaptivereuse.info)

6.4 Examples of rezoning

In this paragraph examples will be given from rezoning projects in the Netherlands. These give an idea of what has been done with used buildings in the Netherlands.



6.27 Gasometer City

(adaptivereuse.info)

Radio Kootwijk

Radio Kootwijk is located in the middle of the largest Natura2000-area in the Netherlands. Because of this, it is an area with very high nature values. Besides the occurrence of many Natura2000-species and habitats, many species are protected by the Flora- and fauna law. This gives limitations to a function. But when taking into account the current values and to steer

the recreation-flows, the developments can take place. (Muilwijk 2011)

In 1920, Julius Luthmann got the assignment to build a hall for the large dynamo of the radio transmitting equipment for long waves. The empty sand drift at Apeldoorn was a good location for a interference-free transmitter. Luthmann was not allowed to used wood or iron, so the building was made of concrete. The design is worked out to the last detail in Art Deco style. The nature area around the transmitter consists of sand drifts and heath lands.

Nowadays the buildings is used for all kinds of activities and the nature area is accessible for public. (Staatsbosbeheer 2013)

Ammunition warehouse complex Donderen

The ammunition warehouse complex Donderen is one of the 53 former military terrains which were owned by the Ministry of Defence. The complex is sold with the intention to transform it to an art estate. The complex of 13ha has been build during the 1960s. During the build is taken into account that the complex would be enlarge some day. For this purpose, 11ha next to the complex was left empty. But this area was never used, only as farmland.
The complex will be used by a care farm and site-specific theatre (theatre inspired by the community and people belonging to the location). A new estate will be build on the front side of the complex and the bunkers on back of the terrain will remain.
(Ontwikkeling Militaire Terreinen 2013)

Ring oven Panningen

Because of the restoration of the ring oven and the development to a multifunctional building, the rest- and residential locations of the common pipistrelle (NL: gewone dwergvleermuis) are disturbed, destroyed and demolished. To ensure the functionality of the rest- and residential locations, some measures had to be taken:

- Bats stays will be realised in new buildings
- A bat basement will be realised in the Heldensche forest
- During the planning of the activities, attention will be paid to the seasonal activities of bats, to prevent

6.28 The building of Radio Kootwijk

(Radio Kootwijk)

6.29 Inside the building of Radio Kootwijk

(Van Laarhoven Catering)

6.30 Ammunition warehouse complex Donderen

(Dagblad van het Noorden

6.31 Theatre at ammunition warehouse complex Donderen

(Van Laarhoven Catering)

disturbance as much as possible

The brick factory is restored and the building is included in a new residential area called 'Ringovenpark'. The former factory is used as an atelier, as a meeting space and for events. (Janssen Bouwen Ontwikkelen 2011)

What can be learned from these rezoning examples is that sometimes buildings do not need to be remodeled to be used for different purposes, sometimes it is good the way it is. But sometimes small changes can make a building possible to be used for many other uses.

6.32 Ring oven Pannerden with its modern extension
(Janssen Bouwen Ontwikkelen)

6.5 Gallery of rezoning and adaptive re-use

In this paragraph an impression will be given of other rezoning and adaptive re-use projects to get an idea of what kind of projects have been done.

From cement factory to exclusive loft (France)

6.33 The use of rough materials refers to its past
(Lanvert du Decor)

6.34 Rooms with much light
(Lanvert du Decor)

From zeppelin hangar to indoor tropical island (Bremen, Germany)

6.35 The hangar
(Bless this Stuff)

6.36 Several swimming pools can be found in the hangar
(Lowara)

From power station to museum (Tate Modern, London UK)

6.37 Tate Modern
(London This Weekend)

6.38 Inside the Tate Modern
(Trip Holidays)

From chapel to appartment building (Utrecht, The Netherlands)

6.39 Large open spaces
(ZECC Architects)

6.40 Its previous function can be found back in the new design
(ZECC Architects)

6.6 Re-use of other fortresses

The previous paragraphs showed how all kinds of locations can be re-used. In this paragraph the current use of other fortresses will be analysed. As an example are taken the Martello Towers and Maunsell forts. The Mortello towers are a good example because it is a system of multiple fortresses, like the Dutch Waterline. The Maunsell forts are an example of what happens when nothing is done with fortresses.

It was hard to find foreign examples of fortresses which have been re-used and are economically viable. Many fortresses, castles and other buildings abroad are re-used, but not many are economically viable. This result is also confirmed by Maurizio Purcaro, who works for 'Projectbureau Nieuwe Hollandse Waterlinie' (in the book 'Economisch hergebruik van forten' by Provincie Noord-Holland). Many examples from many countries can be found of fortresses that are renovated elegantly, but most of these renovations are financed by the government. Moreover, these fortress are often transformed into museums, where a flow of public money makes exploitation possible. (Provincie Noord-Holland 2006)

The location of the fortress is very important in the search for a future use. Some functions require an immediate vicinity of customers or visitors, while in other cases this does not matter. (Provincie Noord-Holland 2006)
Doing business in a fortress means using the possibilities, but also overcoming limitations like lighting, airflow, temperature and humidity. This means that often rebuilding is necessary. (Provincie Noord-Holland 2006)

Martello Towers

The Martello Towers are small defensive fortresses that were built along the coast of England during the 19th century. (Wikipedia 2013)

103 towers were built between 1805 and 1812 to resist a potential invasion by Napoleon. They were 3,96 meters (13 foot) thick on the seaward side, built of brick, 9,14 meters (30 foot) high and were equipped with a cannon on the roof. 29 towers protected Essex and Suffolk and 74 towers protected Kent and Sussex. Nowadays, 45 towers have remained, but many are in ruins or have been converted, only 9 towers remain in their original condition. At Dymchurch and Eastbourne two supporting forts were built. (Ecastles, 2013) In the later half of the 19th century, another phase of fortress-building appeared during the premiership of Lord Palmerston. Those fortresses are called Palmerston Forts, but because they have the same circular shape they are often confused with Martello Towers. (Wikipedia 2013)

The fortresses became obsolete with the introduction of rifled artillery. (Wikipedia 2013)

Inspiration for the Martello Towers came from a round fortress, part of a larger Genovese defence system, at Mortella (Myrtle) Point in Corsica. The designer of this tower was Giovan Giacomo Paleari Fratino and it was completed in 1565. The Corsicans built similar towers at strategic points around the island to protect the coastal villages from North African pirates. In 1794, two British warships unsuccessfully attacked the tower at Mortella Point. After that, the British were impressed by the defensive power of the tower and copied the design. But they got the name wrong and spelled it as 'Martello' instead of 'Mortella'.

Also other governments constructed towers, in Australia, Canada and Sri Lanka. (Wikipedia 2013)

Most Martello Towers are in the hand of private owners nowadays. Their current functions vary from houses to holiday homes to public attractions. Some of the Towers are unused and overgrown. (Ecastles 2013)

6.41 Inside the tower at Aldeburgh, Suffolk

(Landmarktrust)

6.42 The Martello Tower at Aldeburgh, Suffolk

(Landmarktrust)

6.43 Inside the tower at Sutton

(Martello Tower Sutton)

6.44 The Martello Tower at Sutton

(Martello Tower Sutton)

Maunsell Forts

Another type of military fortress along the coast of England, but then in the sea itself, are the Maunsell Forts. These fortresses on poles were constructed during the Second World War to protect London and other settlements along the Thames from the naval and aerial attentions of Nazi Germany. All the fortresses together shot down 22 enemy aircraft and 30 flying bomb, saving hundreds of lives. Many of the fortresses were demolished, but some are left, vacant like silt-walkers in the sea. Once bridges spanned the gaps between each roost, but these have long-since vanished. One of the forts has been used by a pirate radio station, Radio Invicta, but only a large broadcasting mast remains.
The problem, or power of these forts is that they are really isolated. It takes at least an hour by boat. Project Redsand is a charity dedicated to maintaining the structures and it runs boat trips for interested parties. It has started to reconnect the forts. But because lack of financial support, the operations are delayed. (Londonist 2013)

6.45 The Maunsell Forts
(Londonist)

6.46 One of the forts
(Londonist)

This chapter showed all kinds of possibilities for re-using older buildings. The main aspects that could be used in the next step to make a design for Fort Honswijk are:

- *The future design strengthens the national and international visibility of the fortress; so make something unique or add an unique aspect*
- *Make a design for a longer time span*
- *Connect the fortress to important infrastructure to attract more visitors*
- *Organise year-round activities*
- *When designing 'everything is possible' but the design must fit the location*
- *Remodelling is not always necessary, sometimes small adaptations are enough to make the building suitable for other purposes*

Also some possible future functions for Fort Honswijk came out of the analysis in this chapter, like exclusive housing, the combination of education and a playground and making the location attractive for tourists or daytrippers by having a restaurant or a place to rest.

7. Design opportunities

The tower and the counterscarp (left) as seen from the rampart

(Photo: Eline van Bemmel)

7. Design opportunities

This chapter gives an overview of what is necessary to know when making a design for Fort Honswijk. It will also give ideas about how specific elements could be designed best. Finally, it will show a possible design solution for the future of Fort Honswijk, with visualisations and maps.

7.1 Object plans

This paragraph shows what plans have been made already for Fort Honswijk and what the main points of attention were from these plans.

The Foundation Fort Everdingen, Foundation Fort Honswijk and the Foundation Nature Conservation Stelling van Honswijk (NL: Natuurbehoud Stelling van Honswijk) made a vision about the different objects of the Waterline in the area of the Island of Schalkwijk (Eiland van Schalkwijk). Also plans were made for the different objects. For Fort Honswijk these plans were:

- The rough look of the fortress should be maintained because of its landscape value and its importance for the bat population
- The fortress should be respected as stronghold for the many thousands of bats which are housed here
- The tower should be maintained in its original condition by minimal repair, perhaps the cellars should be pumped dry
- Themed tours (nature, engineering or history)
- The counterscarp gets a museological function
- The fortress can serve as a meeting point for war veterans after the Second World War, with a permanent exhibition about the deployment of troops during the post-war period
- Connection with Fort Everdingen by means of a ferry
- Realising a small scale, high quality accommodation and congress possibility, integrated in the north-eastern part of the rampart (overlooking the Blokhovense Polder and the river Lek)
- Restoring the tunnel connection between the fortress and the bank of the river Lek as an exiting entrance for a fortress- and bat tour
- Jetty for water transport (for example from the harbour of Culemborg) and for sailing visitors
- Investigation after the possibilities to restore the inundation lock

(Stichting Fort Honswijk et al. n.d.)

It is clear that some of these points have an overlap with the results from the previous chapters, like the point that connection to important infrastructure is a must-do and in the analysis shown here this can be found in the point about connecting the fortress to Fort Everdingen and having a jetty.

7.2 Possibilities for deployment and activities

In this paragraph will be explained what is possible at the terrain of Fort Honswijk and what is possible with the different buildings. In this respect, attention is payed to the bat population living at the fortress, these bats should not always be seen as a limiting factor but can also be an opportunity.

The tower

The tower of Fort Honswijk is such a unique location for bats that within the current laws and regulation, no deployment is possible. Thousands of bats from different parts of the Netherlands come to the fortress to swarm (and to mate) and hundreds of bats use the location for hibernation. Throughout the year, large numbers of bats are present at the fortress. Functional mitigation is not possible in this situation, because the bats return to the same place each year. Because of this, it can take up to 25 years before all bats have moved. Besides that, the fortress has a unique construction, with a very specific climate, which is hard to imitate.

To keep the function as bat shelter intact, it is important to keep the green zone around the counterscarp maintained because of its buffering capacity against the wind. Also attention should be paid to lighting, because this can have disruptive effect. When lightning is needed, it is only possible under the arch structure between the tower and the counterscarp.

During daytime, there is a possibility to enter the roof from the outside, for example from depot G across the roof of the counterscarp (with a bridge). This allows that no facilities need to be made on the inside of the fortress. Guided tours are possible from the mid-

April to mid-July, when the rooms where important bat residences are located are not entered.

The counterscarp, depot G and lock circle

Several winter quarters and swarming location can be found in the counterscarp. But the counterscarp is a less important location in comparison to the tower, so under certain conditions deployment or activities are possible. This can be realised on the simplest way to close the last three rooms on the south-side (which are occupied by bats). These rooms should warm up during late summer and winter, they also should be exposed to loud noises or light when it is dark outside. When the counterscarp is used, attention should be paid to the fact that it is closely located to the tower, which can cause disturbance easily. This compact positioning also causes limitations during renovation and rebuilding.

In depot G and the lock circle several winter- and summer quarters are located. Like the counterscarp, these location is not very important for the conservation of the species and development is possible. When the depot and lock circles are used for other purposes, locations for bats should be compensated elsewhere. Phasing the deployment can limit the impact, for example by only allowing visitors during spring and summer.

A point of attention for the development of the counterscarp, depot G and the lock circle are the entrance roads used by bats. When rooms are used for other purposes, they could lock off the entrance roads of other rooms. Residences can also be affected by air flow, this can be prevented by closing the gaps in the wall during autumn and winter.

When one of the objects mentioned above gets a different function, there are possibilities to house the bats from those objects in the tower. The circumstances in the tower can be improved for bats, for example by closing the shutters to prevent light coming in and to make the water cellar more accessible.

Other buildings

Depot O & B are used by a maternity group of bats. These groups can be relocated. The other buildings are not used by bats, so they can immediately be used for other purposes.

Planting and green areas

The dense green areas on the fortress are used by bats for foraging. The areas which are sheltered from the wind are used as flight route to the foraging areas, winter residences and swarming locations. Changes in these green areas can thus have huge effects for the bats.

Thinning out the green areas is possible on a small scale, however in the surrounding of the winter residences the green areas should remain dense because of its buffering capacity on the wind. Also in the surrounding of the tower carefulness is important, because shelter is necessary for swarming.

7.3 Design assignments

All limiting factors mentioned before and in other chapters should not always be seen as such, but can also be an opportunity or a challenge for design. In this paragraph a possibilty for a design for Fort Honswijk will be explained and shown with maps and impressions. This is one of the possibilities of what could be a possible future function for the fortress, of course it is the task of future buyers to come up with a design that (1) generates enough money in order to finance the maintenance and (2) fits the location best.

From the analysis and assignment from DLG three points of attention in the design could be recognized; a new main entrance, a pedestrian entrance (Personal Communication 2013, Gijs Salemans) and parking at the fortress terrain (Figure 7.1).
These design assigments should always be in the back of the head when working on the design because it are the main challenges to be solved.

The main entrance

The list of demands of DLG mentions that the rampart around the fortress should be restored. It is also visible on the building map that the building which is now positioned near the gate should be removed. That is why a new entrance should be designed. The gatehouse used to be the main entrance to the fortress

7.1 Design assignments

7.2 This is what the main entrance looks like nowadays

(Steven van Valen)

7.3 The location of the pedestrian entrance

(DLG)

7.4 The gatehouse will function as the main entrance in the future

(DLG)

7.5 Nowadays parking often happens alongside the entrance road

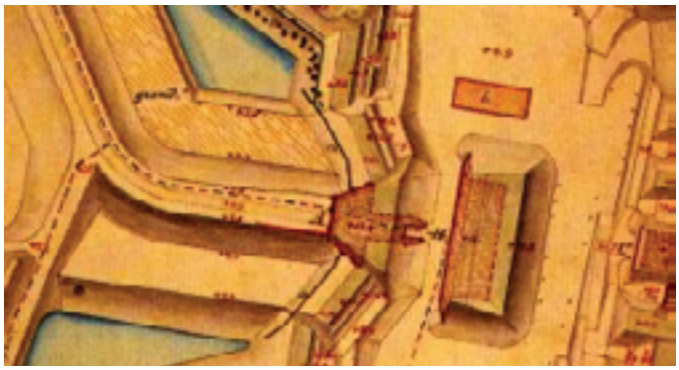
(Google)

when it was still in use. Also old maps show that in former times the rampart used to be attached to the gatehouse (Figure 7.6).

This entrance through the gatehouse is very narrow and only accessible for pedestrians (Figure 7.7). In an interview with the fire brigade became clear that there must be an entrance through which emergency services can enter the terrain, otherwise many functions are not possible anymore (Personal Communication 2013, Gijs Salemans). This extra entrance may also be the entrance for people living at the fortress in the future. So a gap must be made in the rampart to be able to enter the terrain. Of course this gap can be made in many ways. A maquette was made to test the different possibilities. Four of these options are shown below.

Option 1

This shows an extra entrance road which just starts before the gatehouse. There is a bend in the road where it enters the rampart so give the visitors the experience of really entering someting and it makes sure that the gap is hidden from sight for people entering through the gatehouse. The terrain is entered at the side of the



7.6 Old map on which the rampart and the gatehouse are visible (Hollandse Waterlinie)

7.7 The narrow entrance of the gatehouse (Eline van Bemmel)

7.8 Option 1: A bend in the section through the rampart

7.9 Option 2: Bend on the other side

7.10 Option 3: Very long extra entrance

7.11 Option 4: Section with height difference

main attractions, like the tower.

+ Immediate attention for the main attractions
+ Gap in the rampart not visible for pedestrians
- Maybe hard to enter when there is an emergency situation

Option 2

In Option 2 the terrain in entered in the same way as described in Option 1; with a bended gap through the rampart. But this time the entrance is at the north side of the gatehouse, which make visitors see the rest of the terrain first before they reach the main attractions.

+ The visitors sees more of the terrain than only the main attractions
+ Entrance not visible for pedestrians
- No private parts of the terrain possible

Option 3

Option 3 shows that the extra entrance road starts a long distance before the gatehouse. This is done to really make clear that it is an extra, added entrance, not an entrance that belongs to the original situation. The road goes in a straight through the rampart.

+ Really clear that it is an extra, added entrance
- Construction of the road takes a lot of surface
- Entrance is visible for pedestrians
- Not a very small intervention

Option 4

Option 4 shows that the extra entrance is located at the south side of the gatehouse, in the direction of the main attractions. This entrance is not just a gap in the rampart, but a gap with a slope, so that when you enter through this gap, you really experience it when you pass the rampart.

+ The slope ensures that the visitor experiences going over the rampart
+ Entrance not visible for pedestrians
+ Also a nice entrance for cyclists
+ The private part in the north stays private
- People living at the fortress should drive around builing H to come to their parking lot

It can be concluded from the pros en cons that Option 1 and 4 are very much alike, only Option 4 includes a slope. These options take the least space and thus harm the original situation the least. But the aspect of 'really being sure that it is an extra, added entrance' is something that makes the interventions in the current situation more clear for whoever visits the fortress.

Pedestrian entrance

As said before, for the future of Fort Honswijk, it is necessary to add an extra entrance. This because of safety reasons, to have an extra escape route. Another reason became clear from an investigation of the routes where possible future visitors will come from (Figure 7.12). This pedestrian entrance will be located at the east side of the fortress, near the dock of the 'Liniepontje'. As will be explained in the next point that this is a good location for a parking lot, people visiting the fortress by car can enter the terrain through the pedestrian entrance as well. In the future scenario of this thesis this entrance will be designed as a passageway (Bx) through building G. These buildings are already present in the current situation and only

7.12 Why a pedestrian entrance is necessary

7.13 A pull ferry as a way to enter the fortress as a pedestrian

(Henk v.d. A)

7.14 A water passage as a way to enter the fortress

(Ken Lee)

this passage should be made clear and will have to comply with current safety standards. There is also the possibility to give the aspect of 'water' more attention in the design of this extra entrance. This can be realised by not making this entrance on the soil body what used to be the inundation lock, but through the water. Figure 7.13 and 7.14 show two options for this type of entrance.

Parking at the fortress terrain

As said before, the list of demand of DLG includes the point that parking should take place at the fortress terrain. An analysis showed that there are not much locations at the fortress terrain itself where this could take place, without harming the character of the fortress. The booklet 'Parkeren bij de Forten' made by this author commissioned by DLG, shows that there are many possibilities to park near or on a fortress, but none of these solutions are really suitable for Fort Honswijk. Figure 7.15 and 7.16 show two possibe options for parking at a fortress; a parking lot with the character of the Dutch Waterline (tank barriers and barriers) and parking at a nearby orchard, hidden from sight. The option to park in a nearby orchard can only be realised near Fort Honswijk if the original orchard which used to be located at the fields in the north of the fortress, is replanted. For the scenario of this thesis, the most suitable option will be to make the parking lot near the dock of the 'Liniepontje' a bit larger and to have visitors park here. Of course inhabitants of fortress can park near their houses at the fortress terrain (see the plan).

7.4 Scenarios

From the analysis of all fortresses of the Dutch Waterline, three clear scenarios can be derived of what could be possible future functions of Fort Honswijk. A collage of these scenarios is shown in Figure 7.18. Scenario 1 represents the option to have events and exhibitions at the fortress; to make it a unique location to organize things. Scenario 2 represents the option to have a restaurant and/or a bed & breakfast at Fort Honswijk. Scenario 3 represents the option to make Fort Honswijk an attraction for groups of schoolkids,

7.15 The parking lot of Fort Vechten, with tank barriers

(Straatbeeld)

7.16 Parking in a orchard at Fort aan de Nieuwe Steeg

(Eline van Bemmel)

7.17 The locations where parking could take place

7.18 Three possible scenarios for the future of Fort Honswijk

tourist and daytrippers. Of course it is clear that these scenarios can be combined and not all are very unique solutions, because these are functions that other fortresses of the Dutch Waterline already have. But it should be seen as a first investigation of what can and what cannot be possible at the location of Fort Honswijk.

7.5 Design principles

Design principles guide the design process. They are the starting point of the actual design. In this paragraph the design principles which were used to design the final plan will be explained.

From east-west to north-south

The main design principle is derived from observations from the field. It is known from literature that there was a clear division between the east- and westside of the Dutch Waterline. The eastside was the area that could be inundated and houses in the first circle were made of wood and the landscape uncluttered to have an overview. The westside was the protected side which consisted of brick buildings and the landscape was filled with bushes and trees. Field observations made clear that nowadays this is almost the other way around. The eastside of the Netherlands is covered with forests and a large part of the westside of the Netherlands is known for its wide views and open landscape (because of its peat soil). This idea inspired the design principle of 'the division'. Not a division of west and east, but lets turn it totally around and have a division of north and south (Figure 7.19). This principle can be used in the final design by having a division of the terrain in order of function or type of users.

A division in function

To continue with the principle mentioned before, a division will be found in the type of function. The north side of the terrain does not have many buildings that should be kept in original state and it has many earth bodies. The fortress terrain can be a unique location for exclusive housing and its best location would be at the north side of the fortress, so that the south side can be used for another function. Because of its unique buildings, it is a shame not to use this side of

7.19 From a east-west division to a north-south division

7.20 A division in function

7.21Division in type of planting

7.22 Attention to the aspect of water

the fortress as a museum or something else with an educational function.

Division in type of planting

Because of this previous mentioned division of the fortress terrain, it would be nice that this an also be recognized in the type of planting. Nowadays the planting at the fortress is far from the original situation, it is a bit overgrown. But this overgrowth can be used as coverage for the housing project at the north side of the fortress. So its logical to keep the planting the way it is at that side. At the south side new plans will be made and attention will be payed to the original situation and history of the fortress. To further emphasize this, this planting could be brought back into its original situation; with some trees and a new planted hawthorn hedge.

Attention to the aspect of water: WATERline

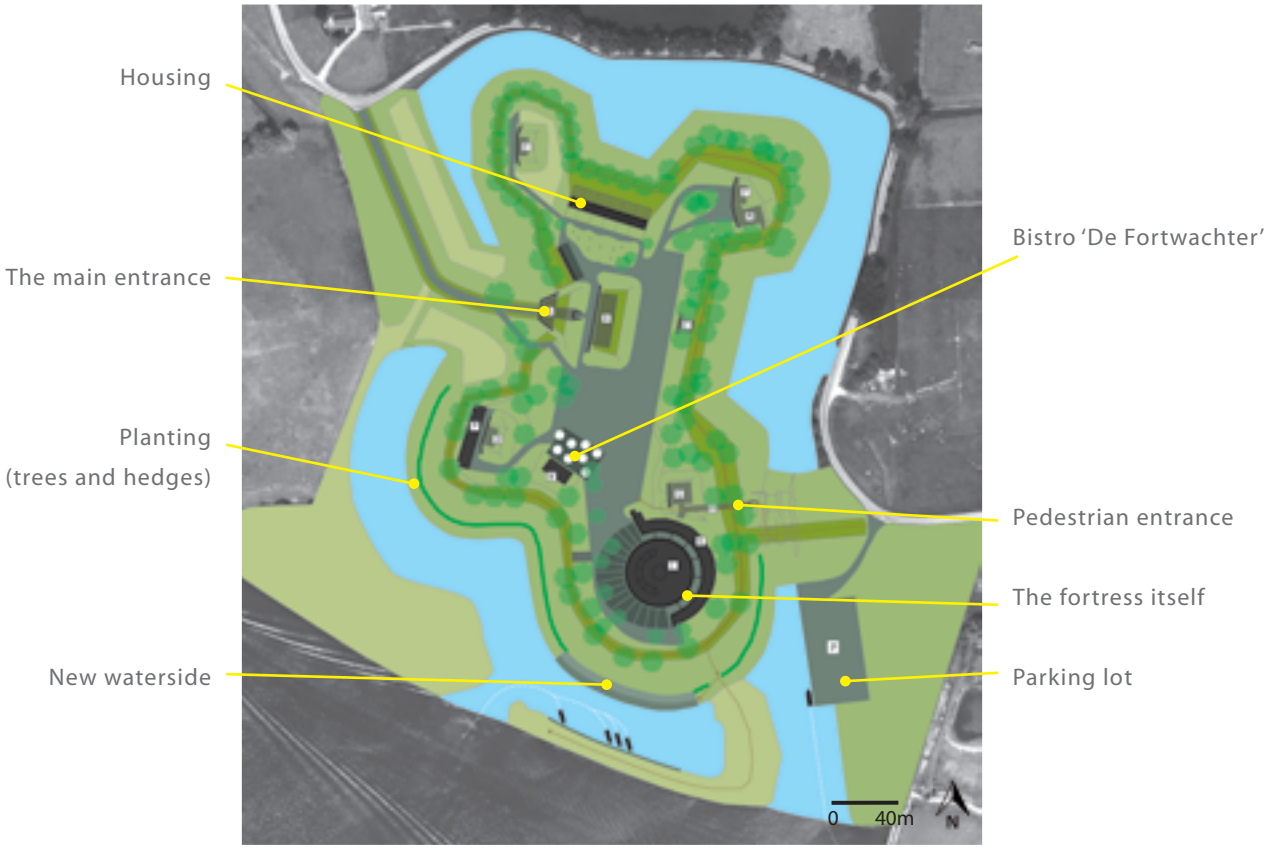
But now of the main aspects of the Dutch Waterline is still left out of the design: the aspect of water. This can be realised by having a possibilty to reach the water when you are visiting the fortress. This can be done by having a jetty and making a possibility to go across the rampart to reach the waterside. It is a shame to leave the unique location of the fortress alongside the river Lek outside of the design. This design principle wants to direct attention to the water.

The design principles from this paragraph and all information from previous chapters are combined in one plan. This plan can be found in the next paragraph.

7.6 The plan

This design for Fort Honswijk can be regarded as the main product of this thesis. The design is an example of what Fort Honswijk could look like in the future. The design takes into account all important aspects mentioned in previous chapters. The design consists of different elements, which will be further explained in this paragraph. This can be regarded as an analysis of the design.

Figure 7.23 shows the different elements of the design and Figure 7.24 shows the design itself.



7.23 Design elements

7.24 The design

7.6.1 Elements of the design

In this paragraph the most important aspects of the design will be explained. These are the planting, the tower, the bistro, the new waterside and the housing project.

Planting

Planting is something that played already an important role when the Dutch Waterline was operating. It was used as a barrier and to hide artillery from sight. So in this new design, on the south-side this planting will almost be brought back to its original situation, with hawthorn hedges. This will make the fortress to be visible from the river Lek again, because the rampart is not that high to hide the whole fortress. Some trees on the rampart will stay where there are, because in that way the strengthen the location of the rampart and its not the ambition to totally bring the situation back to its original state.

The hawthorn hedges on the south-side of the fortress will accentuate the shape of the island and at the same time form a separation between the fortress island and the water. The planting on the north-side of the fortress will provide privacy for the inhabitants living there. At the same time the difference in planting density will cause the route on the rampart to be a varied one.

The tower

The tower is the main attraction of the fortress. This because of it military history and its future function as a information centre about the Dutch Waterline and its function as home of many bats. The terre square in front of the tower remains almost the way it is, but because of the removal of some buildings, this square becomes wider, like the original situation after it was built. This square can function as a gathering point for the start of guided tours and as a site to organize activities on. The guided tours to see bats can take place during specific times of the year, but the guided tours about the fortress can take place during the whole year, when no rooms are entered where bats are present.

The tower itself will get an extra element: a bat-room. In this room the day and night rhythm of a small bat population will be switched, so they can be watched on the hunt during daytime. This will make the fortress more attractive to visit during daytime, for tourists and groups of scholars.

7.25 The north-side of Fort Honswijk as seen from outside

(De Warmloper)

7.26 The trees and hawthorn hedges

7.27 Not much planting is visible on this aerial photo

(Stichting Menno van Coehoorn)

7.28 The tower and the terre square

7.29 Bistro 'De Fortwachter'

To draw more attention to the tower and to really make it the focus of interest, the pavement around the tower has been changed. As can be seen in the design and Figure 7.28 a circular pattern has been added, this pattern will be realised with smaller bricks stones. This will give the surface more signage and it will make people interested in what there is to see.

Bistro 'De Fortwachter'

To make the fortress a nice place to stop during a cycling or hiking route and to make it more attractive as an attraction, the home of the ford guard will be transformed into a bistro restaurant. This restaurant will serve local products, because the surrounding of the fortress is known for its agriculture and cattle breeding. This also suits the current trend to eat more local food.

The terrace of the bistro will be made of the same small bricks which are used around the tower. This to give it a delineation compared to the rest of the terrain. The terrace is surrounded with tank barriers, to give it a military look.

7.30 People watching bats in the bat-room

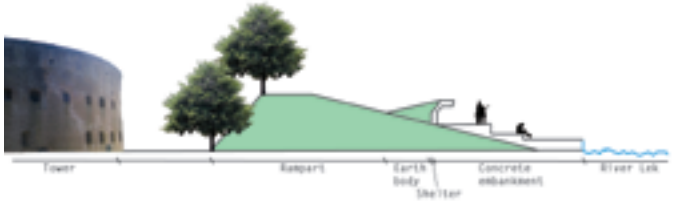
Waterside

As derived from the design principles, a connection to the water should be made. This can be many in many ways, but for this situation it would be nice to get the character of the Dutch Waterline (concrete and soil-covered buildings) back. A large part of the waterside is planted ith hawthorn hedges, as mentioned before. Furthermore, a concrete embankment will be constructed, on which recreationalists can take a rest and have a picknick. This can also be used to fish on. To give the place some shelter, a soil-covered wall will be installed (Figure 7.33 & 7.34), which will give shelter from the sun (and rain). The location of the embankment is a great one to take a rest, because the view on the river Lek is very special.

7.31 The little harbour alongside the river Lek

Housing

Because the project has to generate money for the maintenance of the fortress and this cannot be financed alone by having a bistro on the site and organizing guided tours, an additional factor should be added. The northern part of the island can be characterised by its soil-covered buildings, so the idea was to integrate housing in these earth bodies. This



7.32 Impressionistic section of what the embankment wil look like

7.33 Impression of what the soil-covered shelter will look like

(Centre For Creative Land Recycling)

7.34 Impression of what the soil-covered shelter will look like

(510 Families)

7.35 Housing is integrated in the rampart'

7.36 Very sustainable housing with solar panels on the roofs

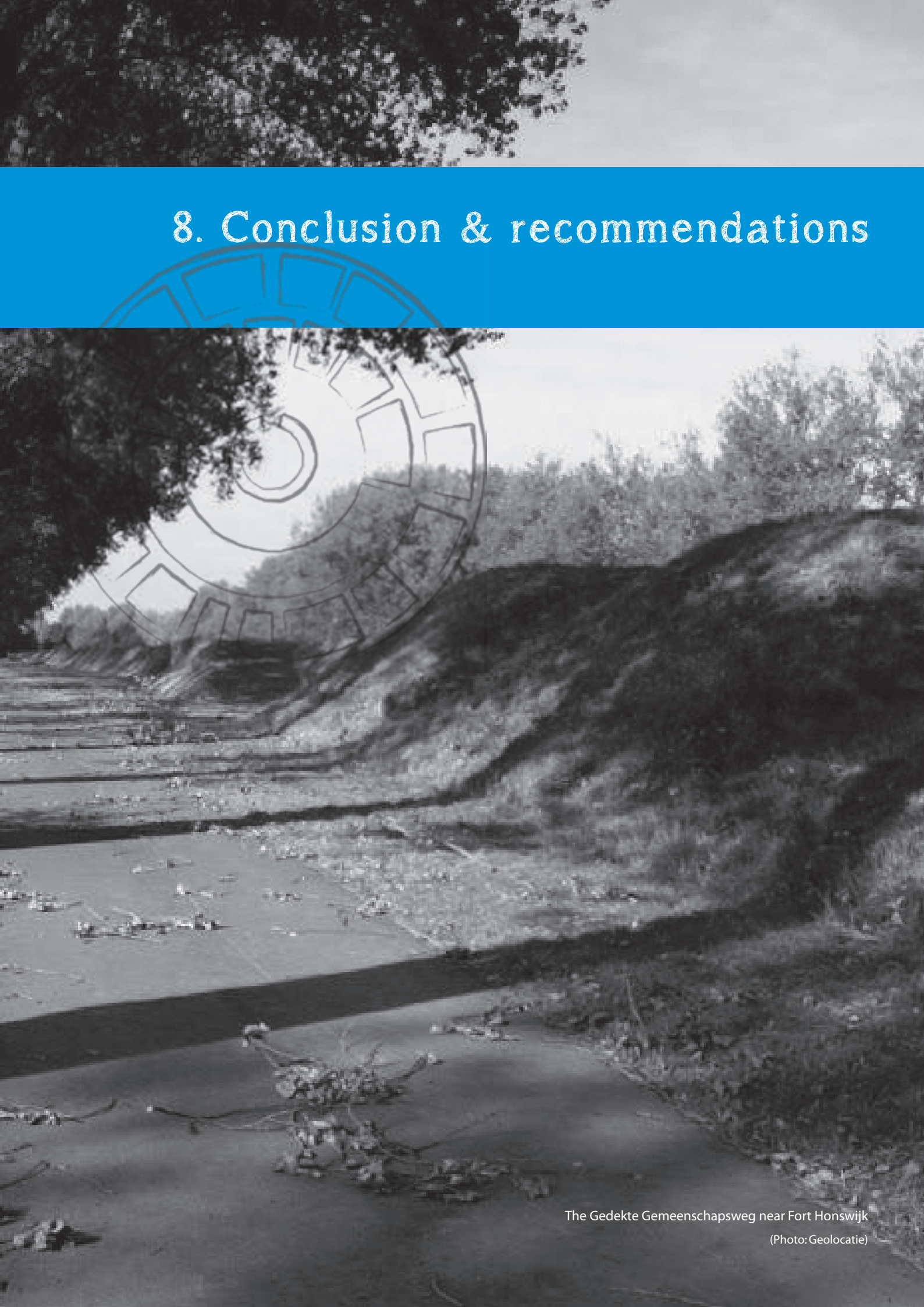
(Soullife)

idea is used more often and these houses are called earthhouses. These houses are often very sustainable because there is not much heath-loss and the houses stay cool during summertime. Often these houses are made even more sustainable by adding solar panel of special water recycling systems. The idea of solar panels is something that could easiliy be added to the earthhouses that will be constructed at Fort Honswijk. There is room for 6 attached houses, each with their own garden in front of the house. A parking lot is also constructed for inhabitants (see the design).
The area where the houses are located is not freely accessible for everyone, only for inhabitants. Visitors of the fortress can however take a walk on the rampart and in that way visit the northern part of the fortress.
The houses and the shelter alongside the river Lek can both partly be made of material of the demolished buildings.

This chapter started with plans that were already made for Fort Honswijk during workshops and meetings. A list of points was the endproduct of this. This list was used as a guideline for the new developments on Fort Honswijk. Possibilities for deployment and activities were investigated and these too were used as guidelines while making the design. The main design assignment was to come up with a future function of Fort Honswijk that (1) generates enough money in order to finance the maintenance and (2) fits the location best. This design assignment was divided into three aspects that needed at least to be redesigned. These three aspects were the results of the list of demands of DLG and and interview with the fire brigade. These three aspects were the main entrance, a pedestrian entrance and parking at the fortress terrain. Scenarios were made to test the possibilities for future function that were the result of the analysis of all other fortresses of the Dutch Waterline. Design principles were made to guide the design process. The main principle was to change its east-west division to a north-south division. This was further elaborated in three other principles: a division in function, in type of planting and to give more attention to the aspect of water in the principle called 'WATERline'. With these design principles the design was made. The design consists of five important elements; planting, the tower, the transformation of the for guard house to a bistro restauarant, the waterside and a housing project.

Of course the design made in this thesis can be used as an example for whoever thinks about giving Fort Honswijk a new future with a new function.

8. Conclusion & recommendations



The Gedekte Gemeenschapsweg near Fort Honswijk

(Photo: Geolocatie)

8. Conclusion & recommendations

The main aim of this thesis is to come up with a design for Fort Honswijk, a fortress which is part of the Dutch Waterline. This design can be used as an example of what can be possible at the fortress by people who want to give the fortress a new function.

8.1 Conclusion

To give this thesis a broader context, the goal has been extended to (1) to develop an approach to redesign cultural heritage objects, like Fort Honswijk and (2) to develop design criteria which should be taken into consideration when deciding what should be the best future function of a cultural heritage object, like Fort Honswijk. To achieve these aims, a main research question was formulated and divided into three sub questions. The main research question is: "What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?" In this conclusion an answer will be given to this questions.

To be able to give an answer to the main research question, three sub questions were formulated to further specify the research. In this thesis an answer is given to these questions, but in this chapter these answers will be summarized.

The Dutch Waterline is a topic which has been on many agenda's the last years. Many projects have been involved with finding a new function for the fortresses and other elements of the Waterline, because just keeping the elements in their original shape is too expensive. An analysis was done of the fortifications of the Dutch Waterline, into their original and current function. The conclusion of this analysis is that almost all fortresses already have a new function, most of them have an ecological function, an educational function or a restaurant or dining. Also an analysis was done into fortresses abroad, most fortresses there now function as a museum or information centre about military history.

Analysis of the terrain, expert interviews and information from DLG made clear that there were three elements which needed to be designed in the first place. These elements were the main entrance, the pedestrian entrance and parking at the fortress terrain. The main entrance needed to be redesigned because the rampart will be restored and thus there is no entrance for cars to enter the fortress terrain. This is solved in the design by making an extra gap in the rampart, so cars of the inhabitants and emergency services can enter the terrain. Pedestrians can enter the terrain through the gatehouse or through the pedestrian entrance, at the east side of the terrain. An extra entrance is made there to make the terrain more safe in case of emergency and to make it better accessible for recreationalist. An analysis of the direction where recreationalist (and thus potential visitors of the fortress) made clear that most recreationalist can from the north, east and south, while the main entrance is at the west-side. An extra entrance at the east-side is thus an opportunity to attract more visitors. The list of demands from DLG included a point that parking should take place at the fortress, but after analysis of the terrain this did not turn out to be the most ideal situation. Parking on small scale can be possible at the fortress, but parking during peaks in visitors (for example during the weekend when the weather is nice) can better take place outside the fortress, not to harm the character of the fortress. A location for this was found at the dock of the 'Liniepontje'. The current parking lot there can be expanded and this is at the same time very close to the pedestrian entrance.

Design principles were made to guide the design process. These design principles were the result of analysis of other fortresses in the Netherlands and abroad and a literature study. From this can be concluded that making a division in type of landscape is a common phenomenon in military history and something that makes sense for the location of Fort Honswijk. This design principle can be applied in the future on other locations. In the case of Fort Honswijk, the terrain was divided into a north and south section. This principles was also applied in the other design principles; a division in function between north and south and a division in type of planting between north and south. The final design principle was to make a connection with the aspect of water, because that played an important role in the history of Fort Honswijk and the Dutch Waterline. Fort Honswijk is located on

an unique location alongside the river Lek, and why not make use of this location? This is done by making a waterside with the character of the Dutch Waterline, with concrete and a soil-covered shelter.

The answer to the main question "What design criteria should be taken into consideration when deciding what is the best possible future function for a cultural heritage object like Fort Honswijk?" is thus to find out what makes the object unique, which is in the case of Fort Honswijk its location alongside the river Lek. Furthermore, the aspect of a division of the terrain can be very well applied to this location because this was used in history as well and makes the terrain more suitable for different functions. The future of Fort Honswijk will most likely include a combination of buyers and a combination of function, because this would generate the most money to finance the maintenance of the fortress.

8.2 Recommendations

The following paragraph provides some recommendations for the field of landscape architecture which are derived in the process of making this master thesis. As one case is used for this thesis it is of course impossible to give a set approach which can be used on all locations, to design all cultural heritage objects in general. Nonetheless, the given design principles and theoretical framework are an investigation of what can be possible at such a site.

Further research could also include more extended analysis of cultural heritage objects in general. Buildings like old castles have also often gotten a new function and it is interesting to investigate the process behind this redesigning.

It would also be interesting to investigate what type of people would be interested in buying the fortress and to make them as the starting point for making the design. Would the design look much different from what it does now? And if there was no list of demands of DLG, would many other functions be possible? And would we really want to close the rampart again or would this just cost extra unnecessary money?

Another recommendation for further research concerns the investigation of possible users. In this thesis an investigation was done of what could be possible future users of the fortress and what are their needs, but it could also be investigated in the field what people might be interested in visiting the fortress and what their needs and wishes are.

Also an analysis could be done into what people living in the surrounding of the fortress would want the fortress to become in the future. Designing could be integrated with the process of participation. According to my opinion this could be very interesting, because at consultation meetings these people already made clear to have a very strong opinion about the future of the fortress. It might thus be interesting to include these opinions in the design process. In this case it would be interesting to find out which future function might have the most public support.

And finally also further research could be done into what future function would generate the most profit. This profit could then be used for the maintenance of the fortress and to further extend the future function of the fortress.

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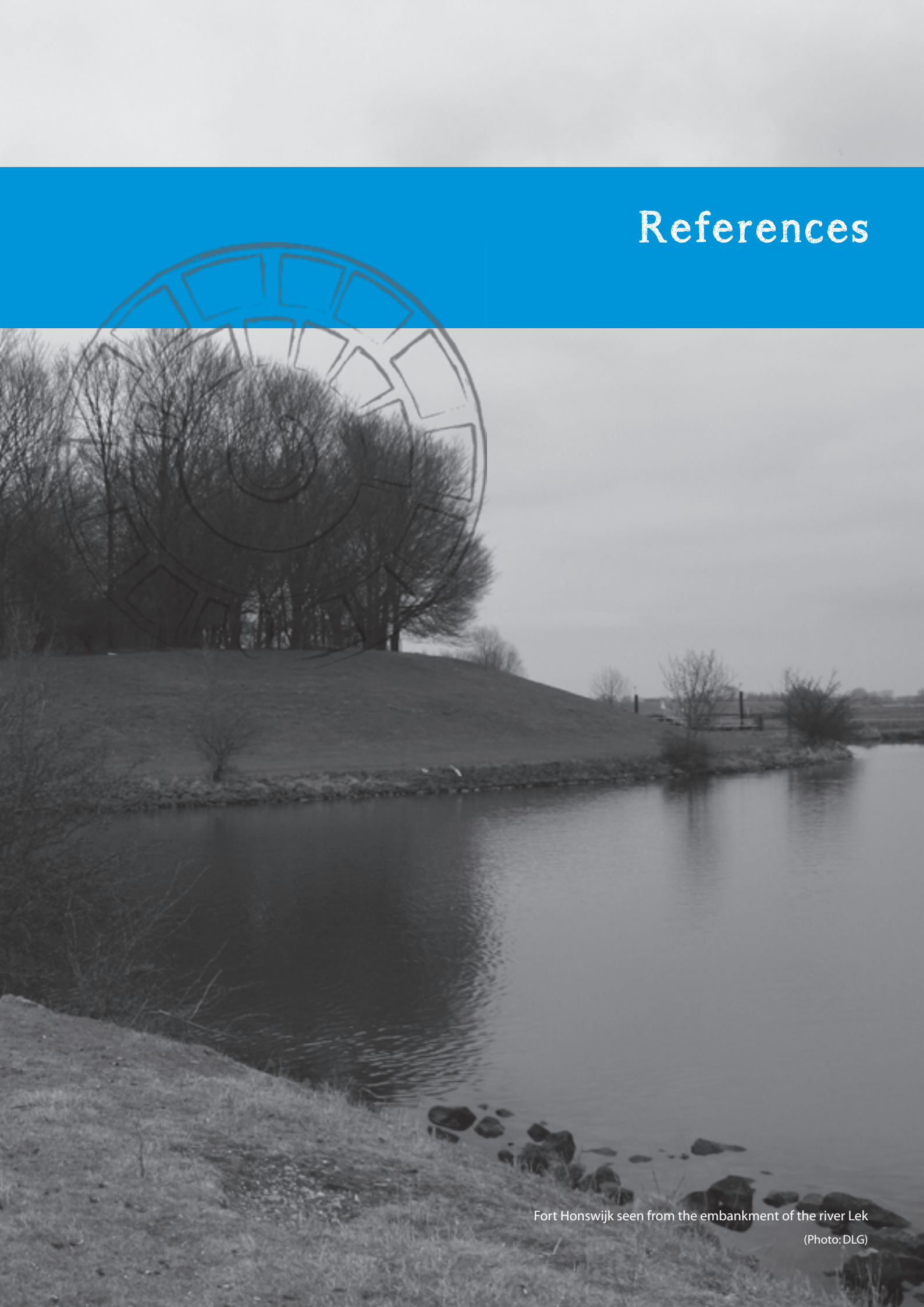

Fort Honswijk seen from the embankment of the river Lek

(Photo: DLG)

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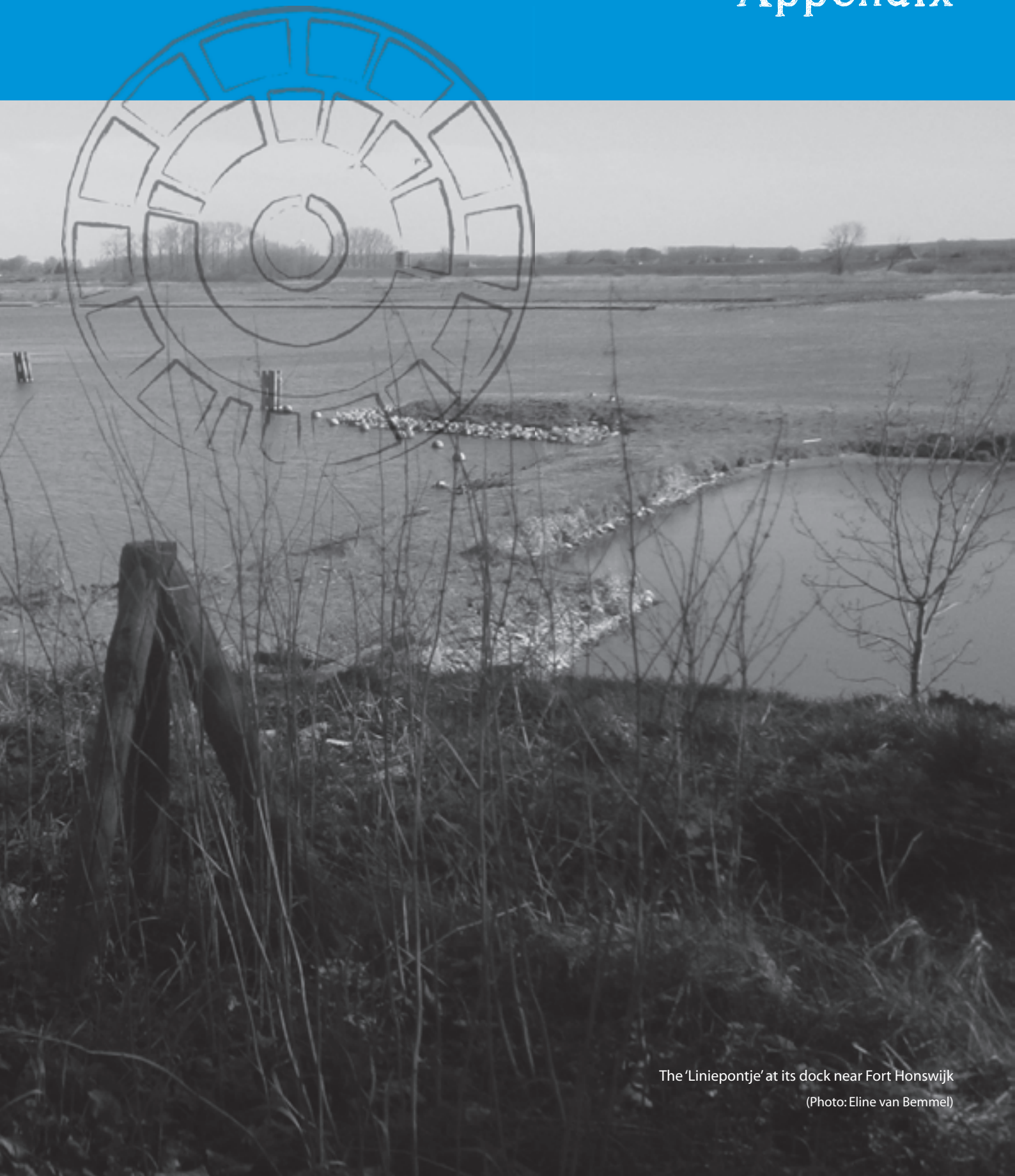
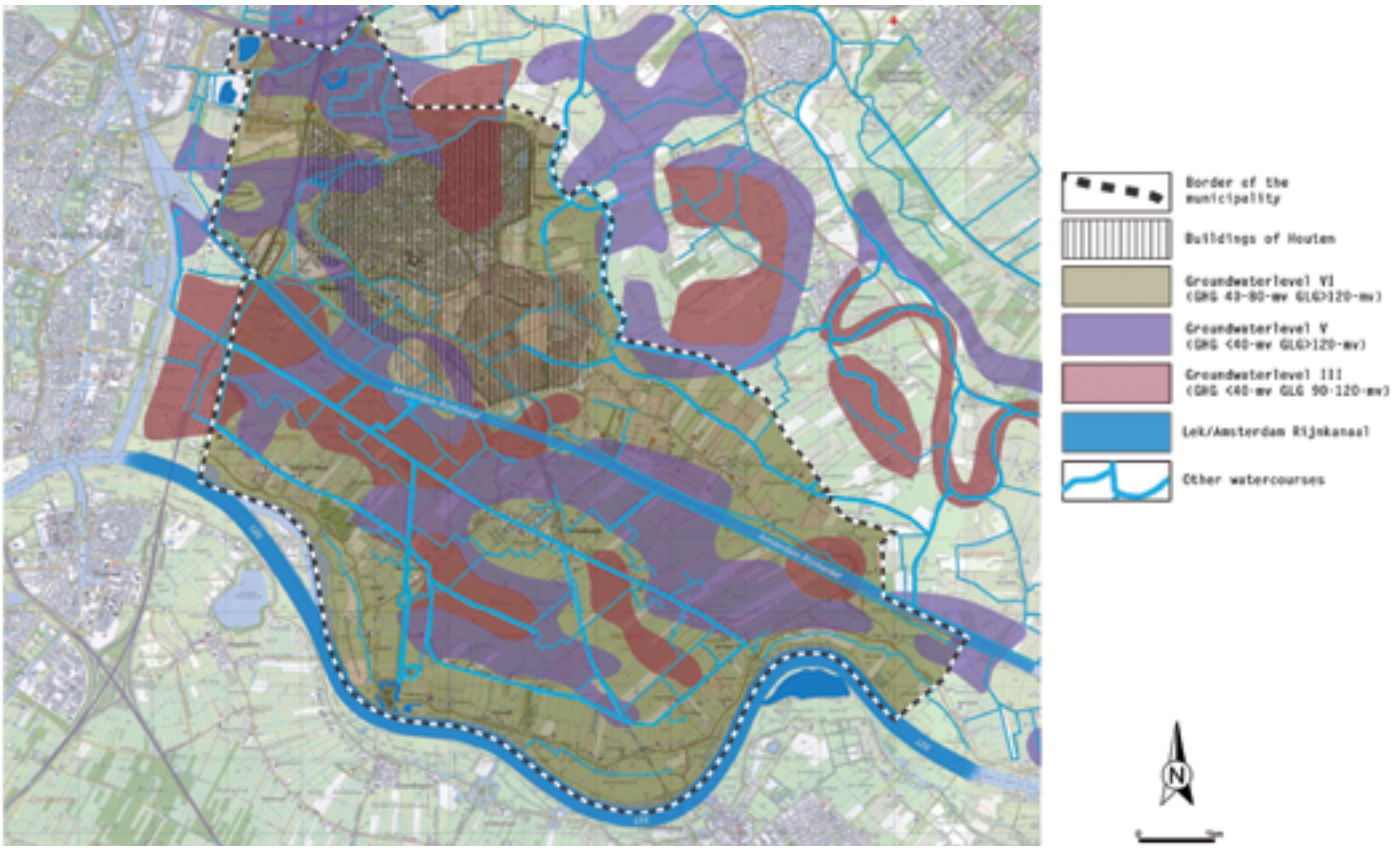
Appendix

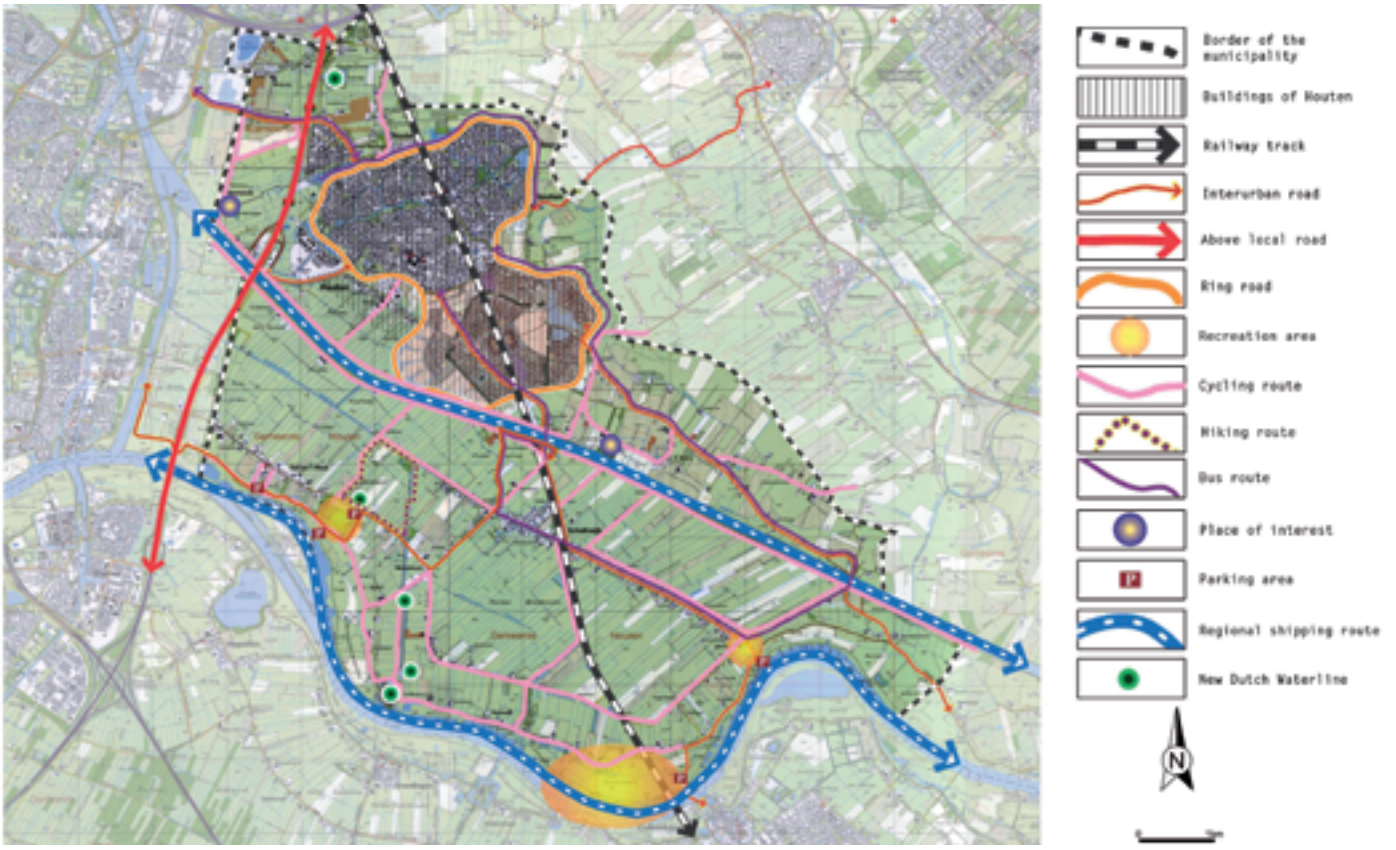


The 'Liniepontje' at its dock near Fort Honswijk
(Photo: Eline van Bemmel)



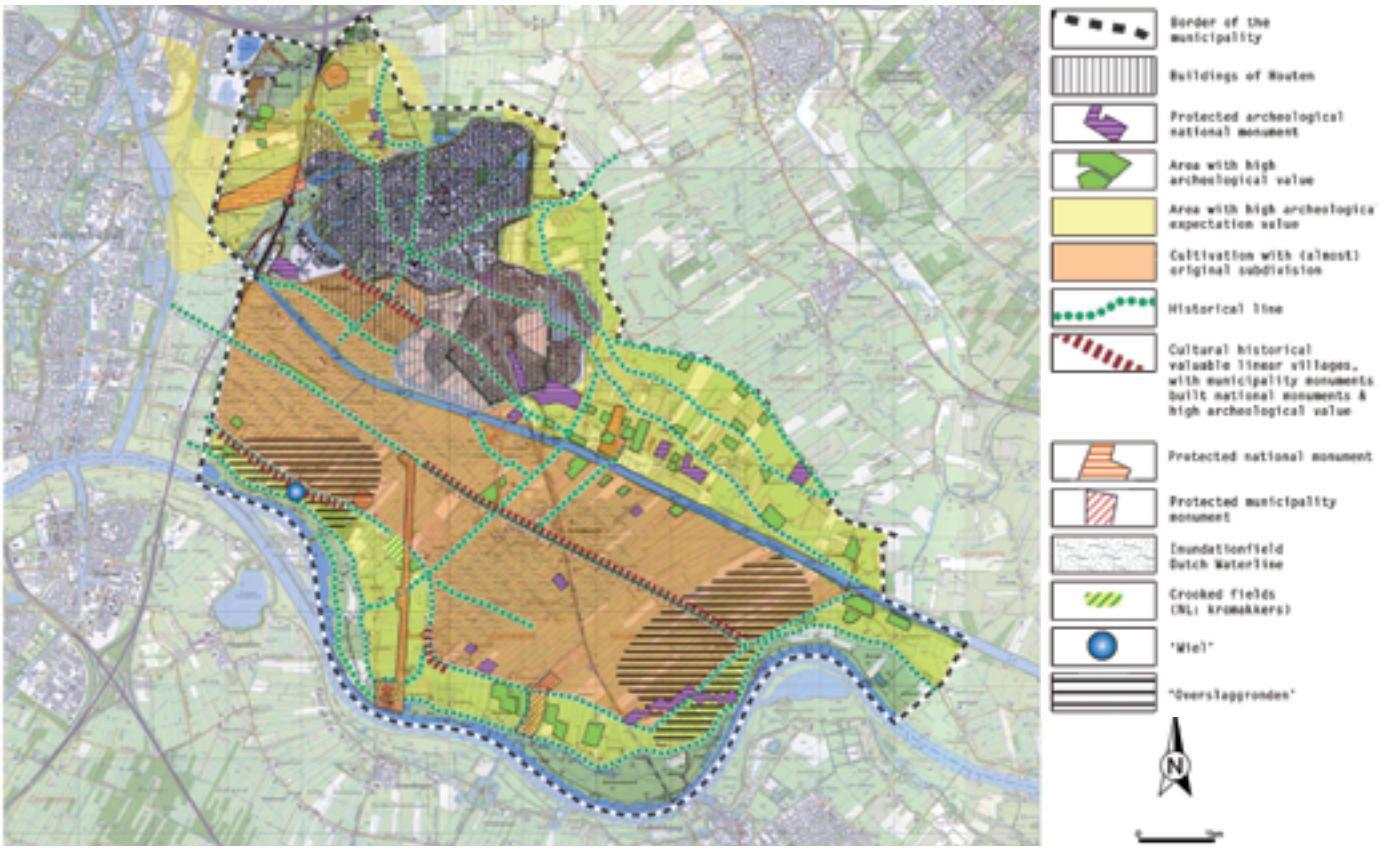
1.Waterways and groundwaterlevels

(Adapted from Houten.nl)



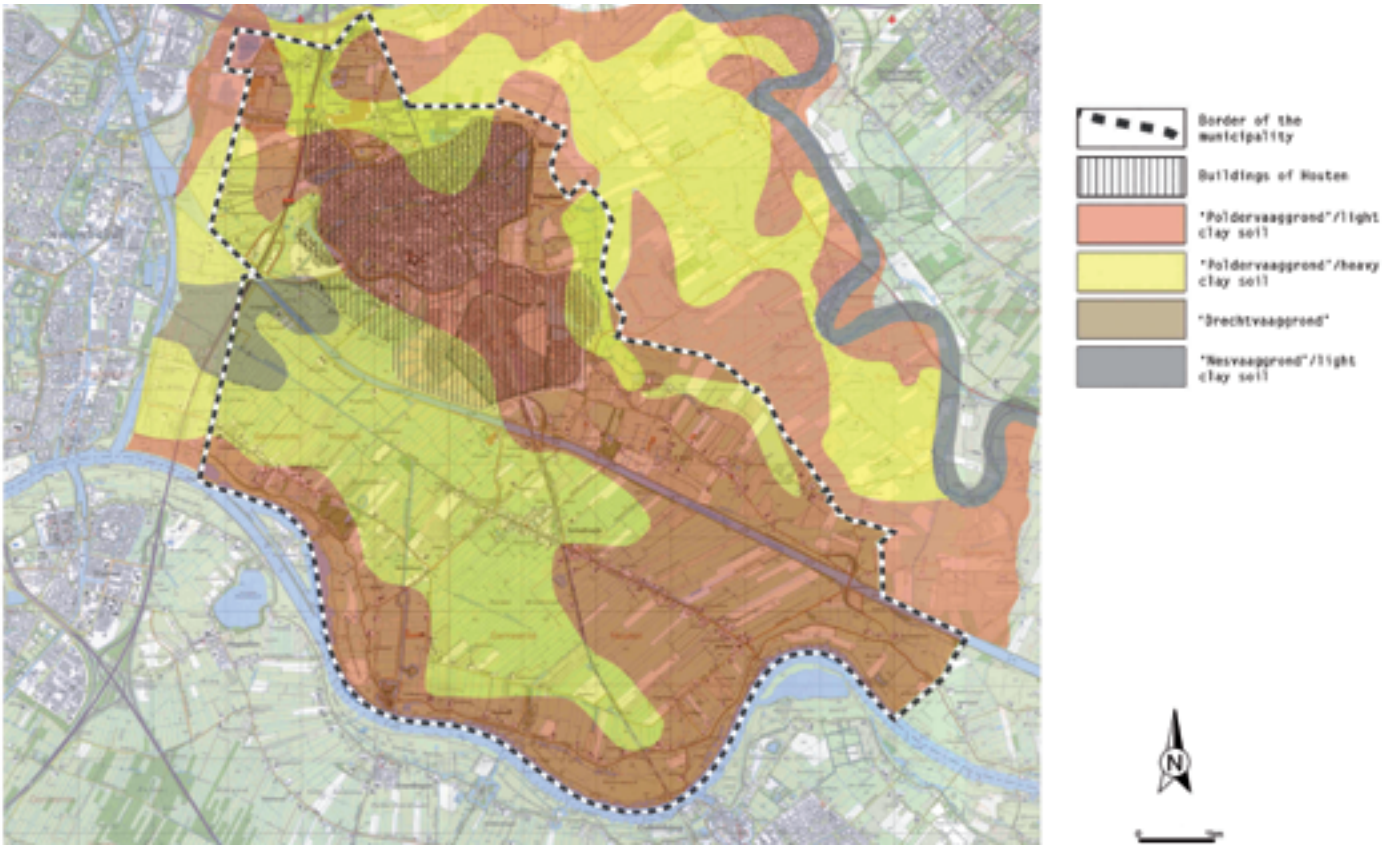
2. Infrastructure

(Adapted from Houten.nl)



3.Cultural history & archeology

(Adapted from Houten.nl)

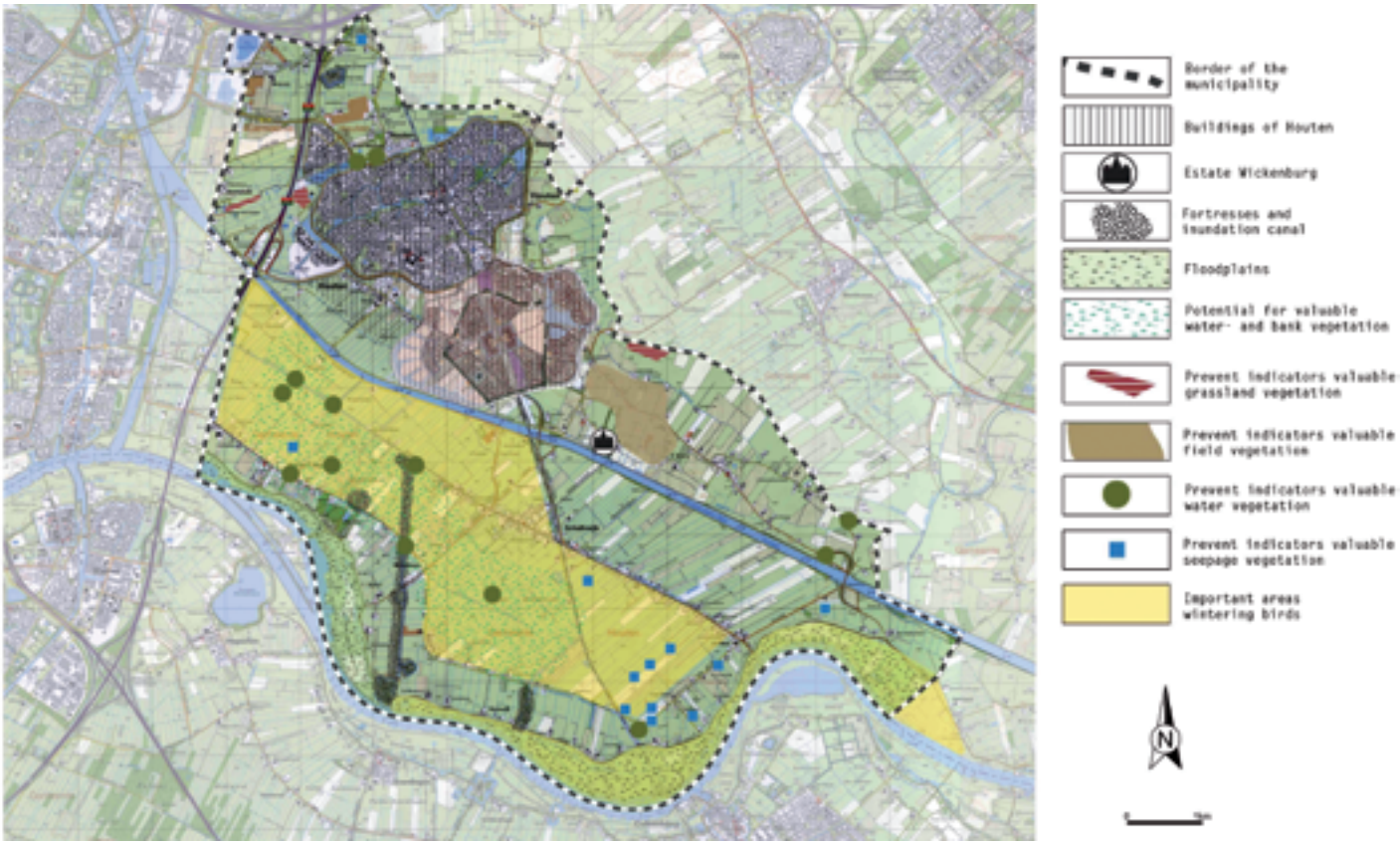


4. Soil

(Adapted from Houten.nl)

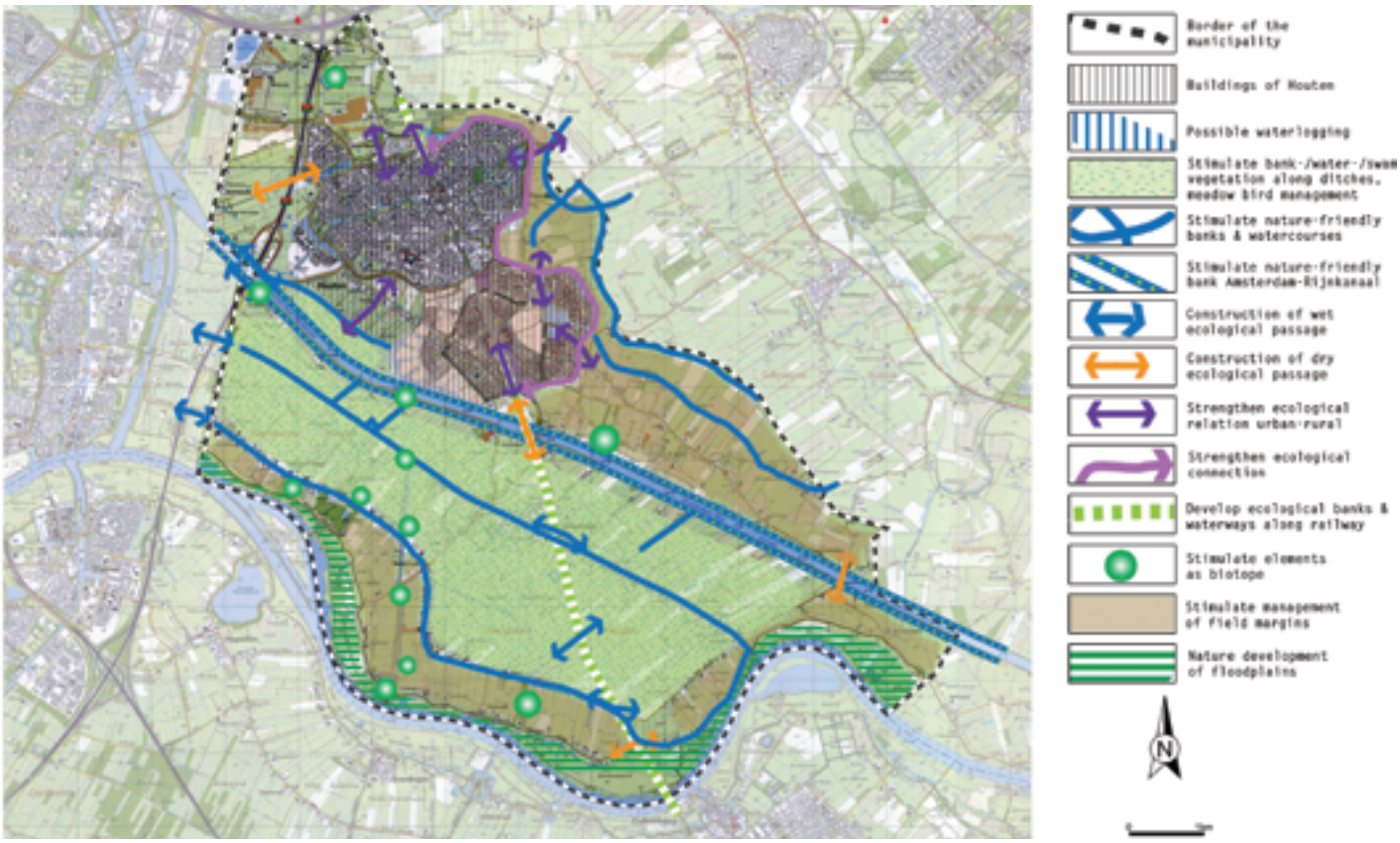
5. Geology & geomorphology

(Adapted from Houten.nl)



6. Ecology

(Adapted from Houten.nl)



7. Ecological vision

(Adapted from Houten.nl)

8. Locations with bats during winter

(Adapted from Jansen, Limpens & Vreugdenhil)

9. Locations with bats during summer

(Adapted from Jansen, Limpens & Vreugdenhil)

X= large amount of bats, x= small amount of bats

Function	Winter residence	Hunting area	Flying route	Summer residence	Swarming location	Mating location	Connection
Soil covered building	X	X		X	X	X	
Towers and bombproof castle towers	X	x		X	X	X	
Wooden barns	x	x		X	x	X	
'Flop houses'		x		X	x	X	
Modern barns							
Uncovered barracks	X	x		X	X	X	
'Fortwachters' house							
Houses	x	x		X	x	X	
Small objects on and outside the fortress-terrain	X	X	X	x	x	x	x?

10. Fortresses and other buildings on the fortress-terrain can have different function for bats

(Adapted from Limpens & Jansen 2007)

Function	Winter residence	Hunting area	Flying route	Summer residence	Swarming location	Mating location	Connection
Trees on and surrounding the fortress	X	X	x	x	x	X	x/X
Trees along the dikes and inundation canal	X	X	X	X	x	X	X

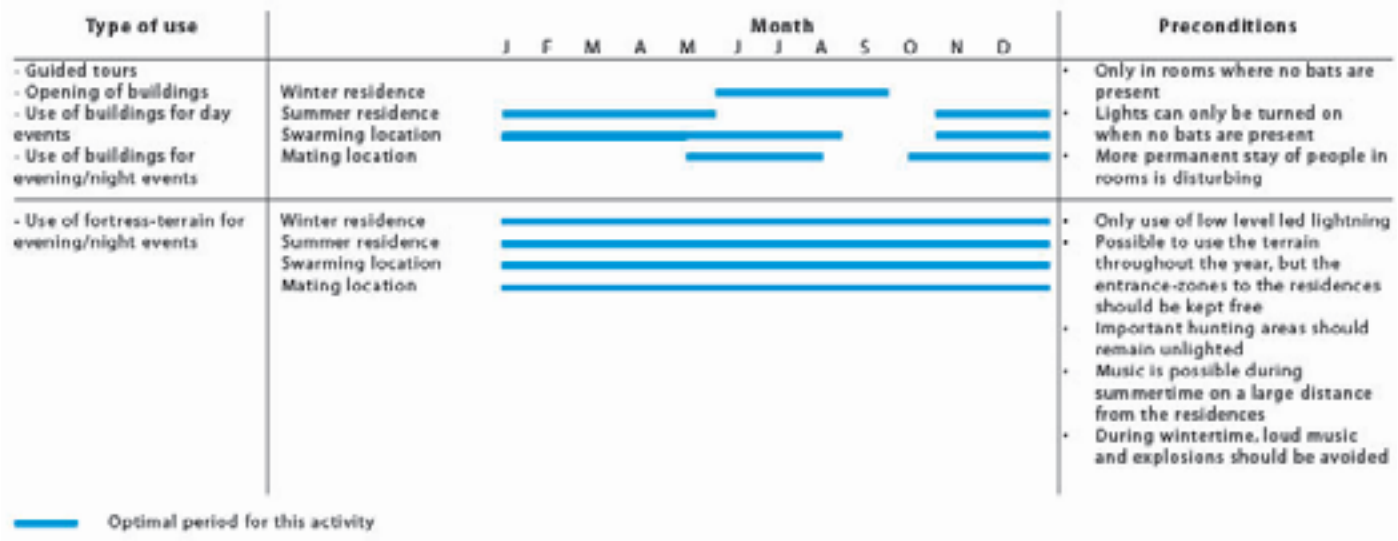
11. The green elements can have different functions for bats

(Adapted from Limpens & Jansen 2007)

Function	Winter residence	Hunting area	Flying route	Summer residence	Swarming location	Mating location	Connection
Fortress- and inundation canals		X	x			X	X

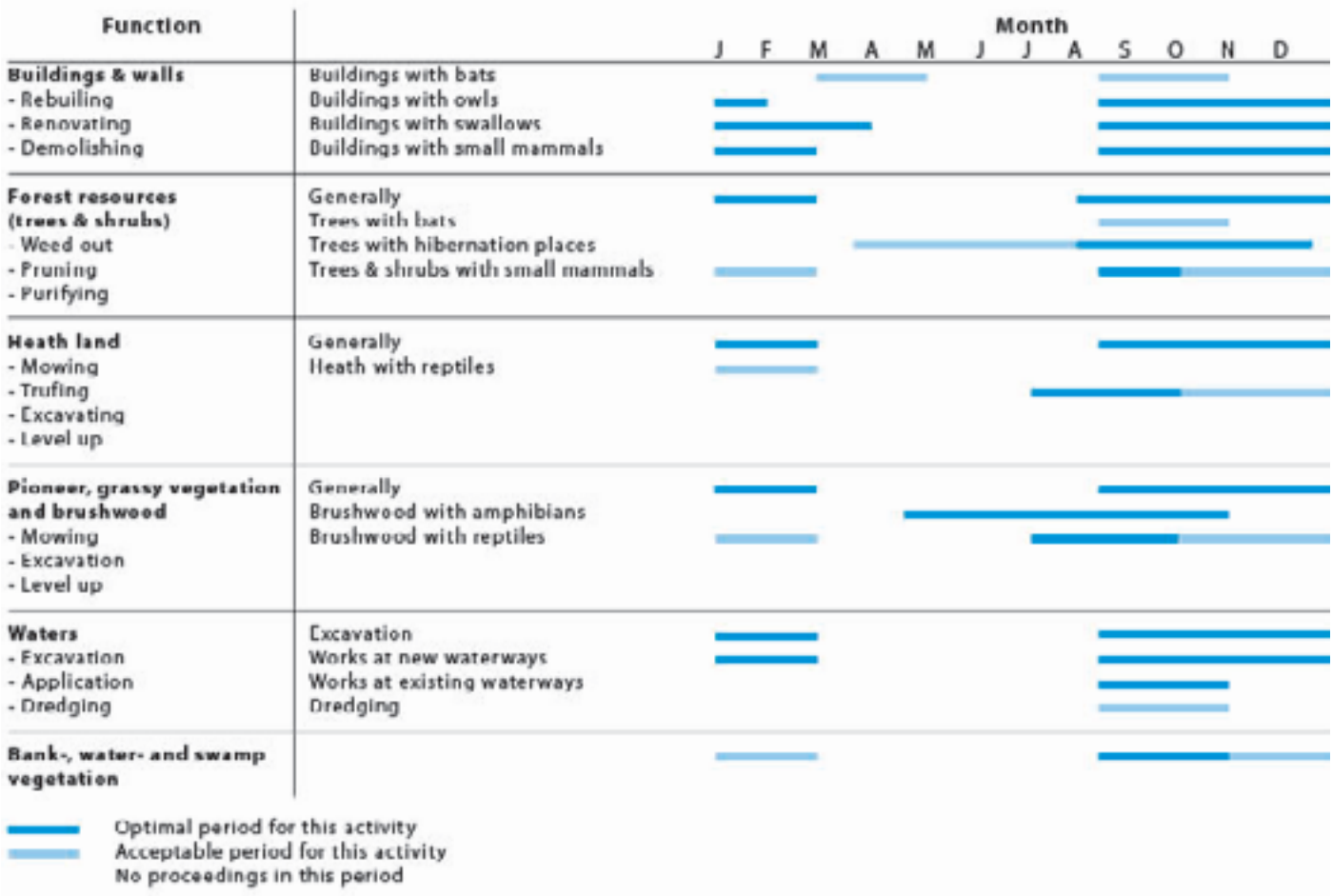
12. The blue elements can have different functions for bats

(Adapted from Limpens & Jansen 2007)



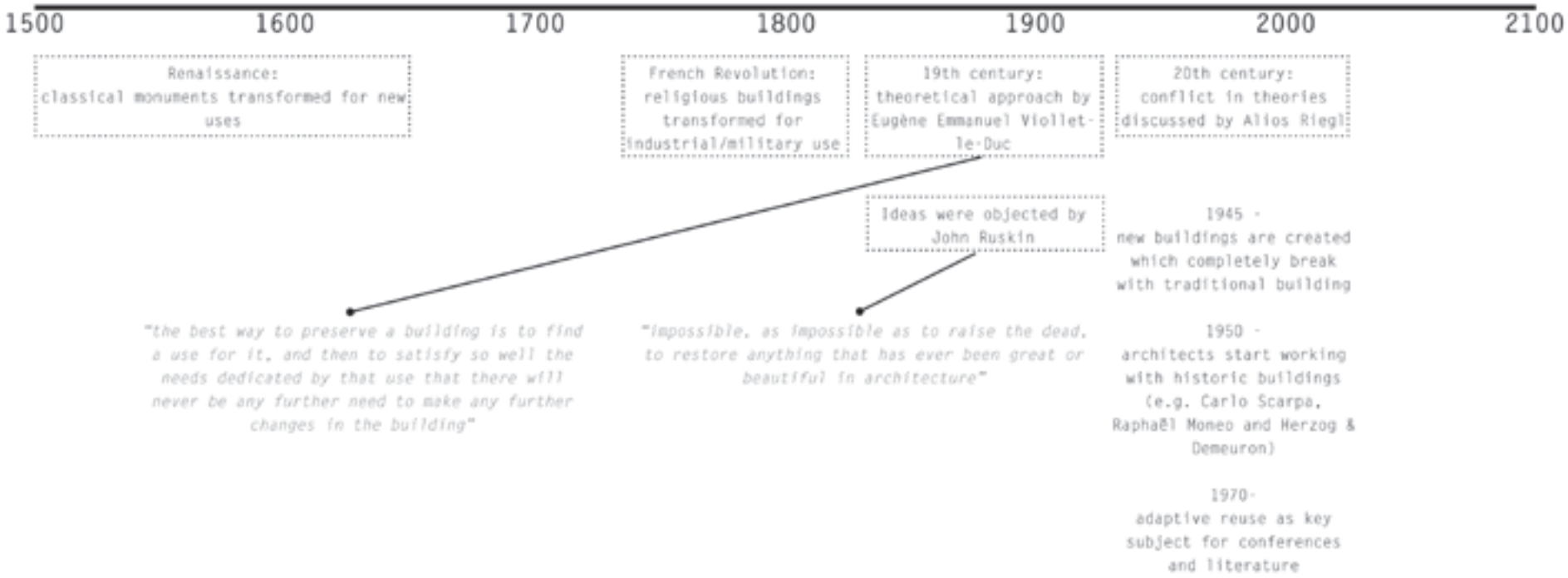
13. Type of use possible for each month

(Adapted from Limpens & Jansen 2007)



14. Proceedings per month

(Adapted from Gemeente Arnhem 2006)



15.Timeline of the different periods in the history of adaptive re-use