

Explorationphase renaturing river Worm

Subtitle - Implementation plans Anselderbeek at Rimburg

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EMFloodResilience

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1 Introduction

1.1 Project background

This design report is a component of the exploratory phase for the redevelopment plan of the border stream “The Worm” on the stretch between the RWZI Rimborg and the Wolfsweg Eygelshoven. For a stretch of several kilometres between Haanrade and Rimborg, the natural stream runs along the border between the Dutch province of Limburg and the German state of North Rhine-Westphalia. Waterschap Limburg manages this cross-border section of the stream. In the 1970s, the Worm was canalized from the NATO depot in Eygelshoven to beyond the border at Rimborg. The purpose was to rapidly drain water with a high level of contamination from mine water. However, this has significantly reduced the ecological value of the stream. The water board now aims to restore the natural system of the stream through reconfiguration measures, thereby complying with the European Water Framework Directive (WFD).

1.2 Summary of the design process

The exploration phase started with a broad inventory and analysis of the current situation and challenges. This process has created an understanding of the current ecological and hydrological conditions, with a closer examination of the challenges related to the objectives of WFD. Furthermore, a vision for an optimally functioning natural stream system has been defined, and some environmental aspects have been further examined. Based on this inventory, the conditions and design principles have been established. In particular, the archaeological (expectation) value and the ownership situation have been determining factors in the design process. Due to the presence of archaeological sites (including the Roman Via Belgica) and high expectation value in large parts of the planning area, the historical meandering course before canalization has been used as a basis. This approach aims to minimize the risk of disturbance and discoveries. In addition, based on the current ownership situation, various design variants have been developed with varying land take:

- In the basic variant A, measures are limited to the land owned by the water board and Wasserverband.
- Variant B involves land take on adjacent parcels on the Dutch side, primarily municipal and provincial lands, as well as some private parcels.
- Variant C involves meandering, extending onto private lands on the German side.
- Lastly, variant D includes not only the meandering from variant C, but also a broader zone for nature development on private lands on the German side.

Using a multi-criteria evaluation framework, the different variants have been assessed. The basic variant scores the lowest, showing insufficient ecological improvement to meet the objectives of the WFD. The other two variants (B and C) score roughly the same. Although the variant with meanders on the German side scores slightly higher, the necessary land acquisition remains too uncertain. Therefore, for now, the variant with meanders on the Dutch side has been chosen as the preferred option for further development into a conceptual design. This consideration is articulated in the report titled "DESIGN NOTE EXPLORATION REDEVELOPMENT WORM" dated XX November 2023, with reference number XXXXX.

1.3 Objective of the report

This design report provides an explanation of the sketch design of the preferred variant and the (environmental) process of the exploration phase, along with considerations for further development in the subsequent detailed planning phase. Additionally, an explanation is provided regarding the ownership situation, necessary acquisition, and the legal framework to facilitate the cross-border implementation of the plan.

1.4 Reader's guide

After the introduction in Chapter 1, this report provides an explanation of how the community has been involved in the project (participation) in Chapter 2. Chapter 3 describes the property situation and the acquisition process to make lands available for the redevelopment. In Chapter 4, the design is outlined, and considerations for further development for implementation purposes are described. Finally, Chapter 5 provides an explanation of the legal framework of the plan.

2 Participation

In the exploration phase, consideration has already been given to the participation process, as also intended in the Environment Act, which will come into effect on the January 1st of 2024.

Consequently, a participation plan has been developed for the exploration of the Worm trajectory between the NATO depot and the German border at the Rimborg Wastewater Treatment Plant (RWZI Rimborg). This plan describes the reason and the planning area for the redevelopment. The primary objective of the exploration is to collaboratively arrive at a feasible and adequate design. Thus, the goal of participation is to involve citizens, stakeholders, and interested parties in the preparation and research. Various parties, including residents, interest groups, businesses, and institutions, are engaged in the planning process to achieve a better result collaboratively.

The initiation of the exploration and participation process was published with a notice of exploration on April 29, 2022. (<https://zoek.officielebekendmakingen.nl/wsb-2022-4907.html>).

2.1 Process

For participation, two tracks have been pursued since spring 2022: the direct and indirect dialogue. Communication through the indirect track primarily took place via the water board's website, newsletters, press releases, etc. The direct dialogue involved 'real' contact with citizens through individual conversations and the organization of three community meetings.

Community Meetings

The first community meeting took place on June 7, 2022, primarily focusing on introducing the project and gathering input. A presentation was given regarding the scope of the project for the redevelopment of the Worm and the approach to addressing water-related issues at the Rimburgerweg. The session also marked the initiation of collecting preferences, ideas, and experiences from those involved. The water board chose to integrate the project for the redevelopment of the Worm with the initiative to address water issues on the Rimburgerweg (part of the Water in Balance program) due to the various intersections.

The second community meeting (on April 1, 2023) was more informative, presenting and discussing various project variants. This session was combined with the water overflow project on Rimburgerweg as well.

The most recent community meeting took place on November 27, 2023, where the conceptual design of the preferred variant was presented by Waterschap Limburg. The purpose of this session was to achieve alignment and consensus. Additional input was gathered for consideration in the next phase (preliminary and final design). This was a separate session and not combined with the water overflow project of the Rimburgerweg. The scope of this project has been expanded, leading to significant overlap between stakeholders, making it impractical to combine both projects on one evening. As a result, the two participation processes have been decoupled, while still seeking substantive alignment.

All wishes, ideas, and suggestions have been ultimately incorporated into the customer requirements file. This file provides justification for each requirement and describes how each can be integrated into the design.

Individual Conversations

Additionally, multiple one-on-one conversations took place with interested individuals and organizations that expressed a desire for such engagement. This includes discussions with a local historian and author of several books on Rimbürg and the Worm, a local naturalist and manager of breeding mounds, Natuurmonumenten, municipalities, and, of course, partners on the German side of the Worm. Following the first community meeting, a meeting was held with the municipality of Landgraaf on June 24, 2022, to discuss the results and actions. On July 22, 2022, various residents shared their experiences with water overflow from the Worm. Furthermore, discussions were held with WBL on August 22, 2022, regarding the future plans for RWZI-Rimbürg.

At the beginning of the new year 2023, a meeting was held on February 3rd with the WVER to discuss flood control measures and follow-up steps. There has been regular contact with the WVER since early 2021, and a joint Interreg subsidy application has also been submitted. Throughout March 2023, discussions took place with various landowners to address land-related matters, as detailed in Chapter 3.

Stakeholders NL

Municipality of Kerkrade
Municipality of Landgraaf
Provincie Limburg
Natuurmonumenten
RAVON
Rijksvastgoeddienst
'T Bakkes Rimbürg
Parcel owners
Neighboring residents
WBL
IVN

Stakeholders DE

Wasserverbandes Eifel-Rur (WVER)
Stadtverwaltung Herzogenrath
Gemeinde Übach-Palenberg
Kreis Heinsberg
Städteregion Aachen

The indirect dialogue primarily takes place online through the website and project site of Waterschap Limburg: (www.waterschaplimburg.nl/herinrichtingworm). There is a significant emphasis on maintaining contact with all stakeholders in the area. To ensure this, the digital information platform 'Met Elkaar' is utilized. This platform gathers information about the area and the project, lists frequently asked questions, and provides a Q&A section for additional information. Interested individuals can also sign up for a digital newsletter on WL's website. This allows every concerned party to stay informed about the latest developments.

Finally, an environmental manager has been appointed to oversee the organization and implementation of the participation plan. They serve as a point of contact for all stakeholders. This individual is mentioned in all correspondence with various parties, on the aforementioned platforms, and is present at community meetings.

2.2 Report and environmental requirements

During the first community meeting, numerous ideas and diverse wishes were gathered. The local community showed great engagement, and there was a wealth of historical knowledge present. Attention was drawn to the possible presence of mine waste and other water and soil contaminations that originated during past mining activities and the meandering course filling process. The risk of explosive remnants of war was also raised. However, most concerns and wishes were related to reducing water overflow and flood protection measures. Points of concern and potential solutions were raised regarding both the overflow from the valley slopes and inundations from the Worm.

Several attendees also emphasized the possibilities of harnessing hydroelectric energy, facilitating nature development, and preventing the spread of invasive species. A widely shared desire was to preserve and expand the existing local recreational opportunities along the Worm into a continuous hiking trail. A point of consideration was emphasized that this expansion should not result in an overwhelming influx of recreational visitors, and precautions should be taken to avoid potential disturbances from loitering youth. Finally, there was a call to ensure proper management and maintenance after the project's completion, ensuring that the redevelopment results in a lasting positive change.

During the second evening, the design variations were discussed, and residents provided their points of concern and ideas for the variant assessment/evaluation. Additionally, there were specific considerations for the further elaboration regarding nature development and water overflow measures.

With the presentation of the preferred variant and the elaboration of the sketch design, the majority of attendees expressed a positive stance toward the plans. There were, in particular, still questions regarding the effects of the redevelopment on groundwater levels, the integration of a potential bridge for a hiking trail, and the possibilities for additional meandering and nature development on the German side.

The municipalities of Landgraaf and Kerkrade

The plans have received a positive response from both municipalities. They are willing to cooperate and contribute to any transfer of required land.

German stakeholders

A positive response has been received from Wasserverband Eifel Rur. Both Waterschap Limburg and the Wasserverband are exploring the same and are seeking ways to apply this design on the German side. To formalize these good intentions into specific agreements, a collaboration agreement was signed on December 20th, 2023.

The plans have also been positively received by the municipalities of Herzogenrath and Übach-Palenberg.

Private Owners/Third Parties

Many of the expressed concerns revolve around water safety and flood protection measures, topics that are not addressed in this project. These matters are incorporated into another project, the 'Eygelshoven Rimbürgerweg project.' Wasserverband is concurrently examining comprehensive flood protection measures for the entire Worm. The measures are outlined in the Worm Masterplan, which is part of the Interreg subsidy EMfloodResilience (EMR228). Further information on this can be found on the 'Met Elkaar' platform.



3 Investigation of available property

3.1 Current situation in relation to design

The current course of the Worm is located on parcels owned by Waterschap Limburg, the municipality of Landgraaf, and the municipality of Kerkrade. On the German side, Wasserverband Eifel-Rur owns the lands of the current course.

In compiling the variants and selecting the preferred option, efforts were made to anticipate the availability of lands or the feasibility of land acquisition as much as possible. In this context, multiple discussions took place with landowners, including both governmental bodies and private individuals. This process provided insights into the possibilities and limitations for the preferred option.

The preferred variant, on the Dutch side, is mainly situated on municipal lands. Additionally, a single plot owned by the Provincie Limburg (south of the RWZI) and parcels owned by Waterschap Limburg itself are utilized. Lastly, measures are planned on three private plots (2 owners). Attachment 1 includes a map depicting the ownership situation and the design.

3.2 Acquisition

For the reconfiguration of the Worm, parcels are required from the following parties:

- Municipality of Landgraaf
- Municipality of Kerkrade
- Provincie Limburg
- Private owners
- Wasserverband Eifel-Rur

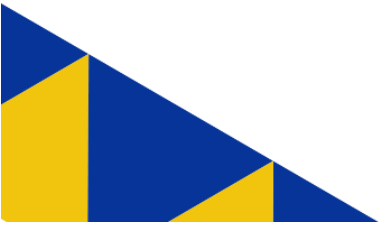
Government authorities


With the exception of private owners, each party has expressed a willingness to cooperate. This means that 85% of the required area is available, making the design feasible and achievable. We aim to acquire more land than strictly necessary for the redevelopment, allowing for exchangeable land to become available in the area.

Private owners

With the private owners (2 in total), exploratory discussions have mainly taken place. The overall stance is positive, but they have expressed a preference for initial exchange rather than outright sale. Once there is clarity about the available exchangeable lands, subsequent discussions will be initiated. The guiding principle here is voluntary land acquisition. Currently, there is an expectation that this approach will be successful.

There is a potential opportunity around a private plot south of the fishing pond. Additional meandering in this area would add value to nature development and Water Framework Directive (WFD) goals. However, further discussions are needed for this specific case.





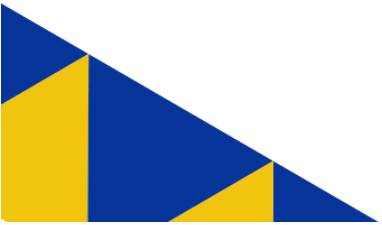
For the remaining plots, the added value of acquisition for the project's objectives is considered too limited, or other functions present obstacles, such as the presence of a fishing pond, valuable nature, buildings, or anticipated archaeological values.

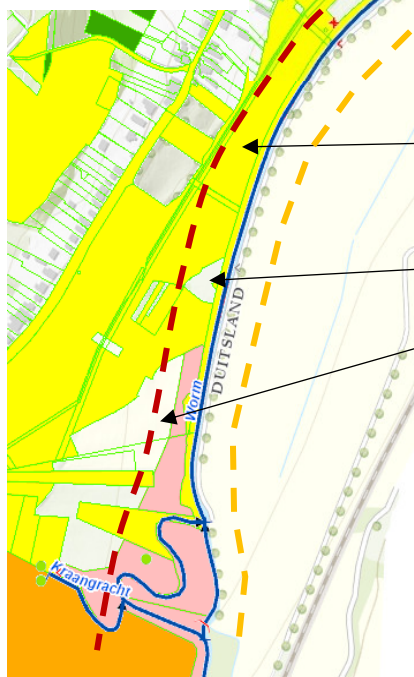
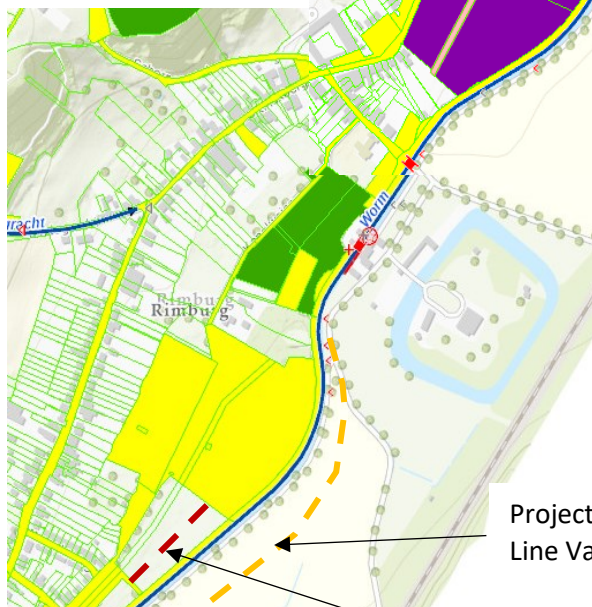
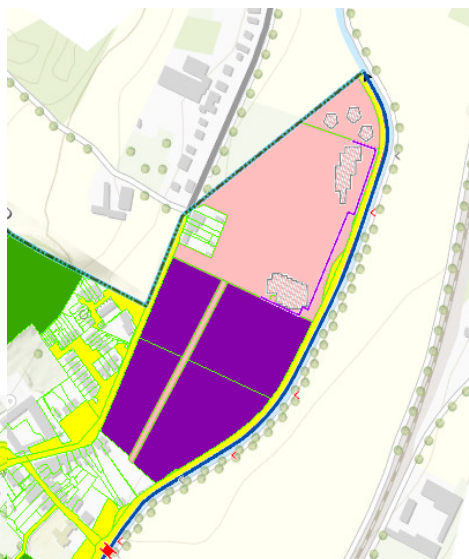
Due to the overlap with the ownership of some private individuals, coordination also takes place with the water overflow project Rimbürgweg to align wishes and needs as comprehensively as possible, maximizing opportunities.

WVER

On the German side, the lands directly along the Worm are owned by WVER. The agreement with WVER is that these lands may be used for the redevelopment. Although this report is based on the preferred variant B, discussions are ongoing to acquire lands on the German side. If these lands can be acquired, variant D becomes possible. However, it is expected that this process will take several more years.

The use of the already-owned lands and the intention for additional land acquisition is documented in the collaboration agreement in Chapter 5.





Project Boundary Indicator
Line Variant D

To be investigated opportunity: Private
landowner

Project Boundary Indicator
Line Variant B

Private landowners

Legend

-  = Municipalities
-  = Provincie Limburg
-  = Waterschap Limburg
-  = Nature organisation
-  = Rijksoverheid



4 Implementation

4.1 Design explanation

The preferred variant has been further developed into a conceptual design with detailed incorporation and refinement of the reconfiguration measures (see Appendix 1).

In the section along the NATO site, there is no space available on the west side to incorporate meandering. The position of the maintenance path and the existing banks will remain unchanged. On the opposite side along the N2000 area, there is a slightly elevated bank with wooded areas and a contiguous wetland forest. The ecological value of this bank and forest zone is significant, and therefore, no meanders are planned on this side either. At the same time, the current summer bed is quite wide, and there are some stone-filled bottom traps within the channel that could pose a barrier to fish. The redevelopment in this section involves redistributing these stones and potentially adding gravel banks and deadwood to achieve micro-meandering and narrowing the summer bed within the current cross-section. Finally, on the German side, within the N2000 area, a maintenance path needs to be incorporated from Finkenrather Strasse towards the north.



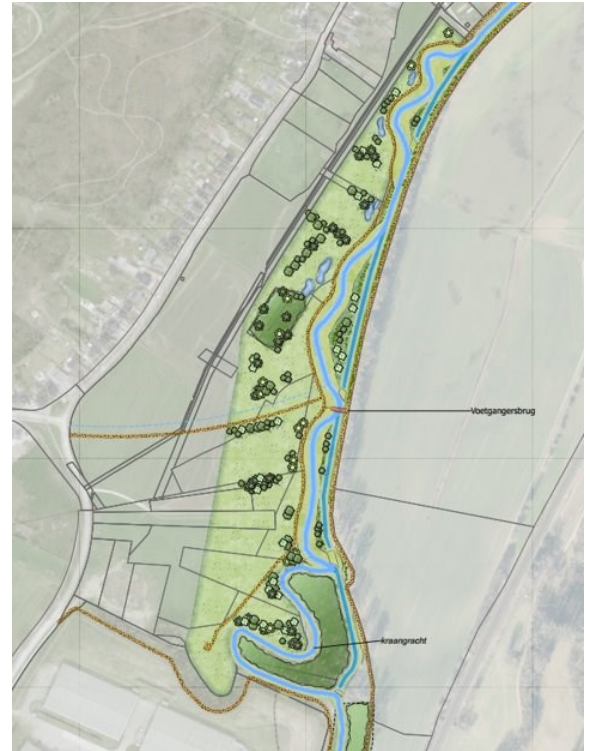
Figure 3.1 Left depicts the current situation with a wide and uniform summer bed and a stone-filled bottom trap, while on the right, the intended situation shows micro-meandering/narrowing of the summer bed achieved through a gravel bank.

At the level of Kraagracht, an old meander still exists, and no spatial interventions in the watercourse are planned. The maintenance path on the west side runs parallel to Kraagracht, connecting to the Rimburgerweg. On the east side, the adjacent N2000 area transitions into agricultural parcels.

To the north of the old meander, new meanders will be added on the Dutch side, inspired by the historical course of the Worm before its canalization. These meanders introduce more variation in flow velocity, water depth, morphology, and bank structure, creating a richer palette of habitats for aquatic plants and animals.



Figure 3.2: Desired image of new meanders with streamside vegetation, gentle shores in the inner bend, and deadwood in the stream.



At the location of the new meanders, the current course will be preserved as a high-water channel. An earth dam in the current course ensures that the majority of the discharge flows into the meandering course, and that the high-water channel only starts to flow with the water level when reaching a certain threshold. To prevent the high-water channel from completely drying up during low flows, a small part of the discharge is always directed through the earth dam into the high-water channel, for example, via a culvert. The earth dams need to be equipped with (stone) lining to prevent erosion.

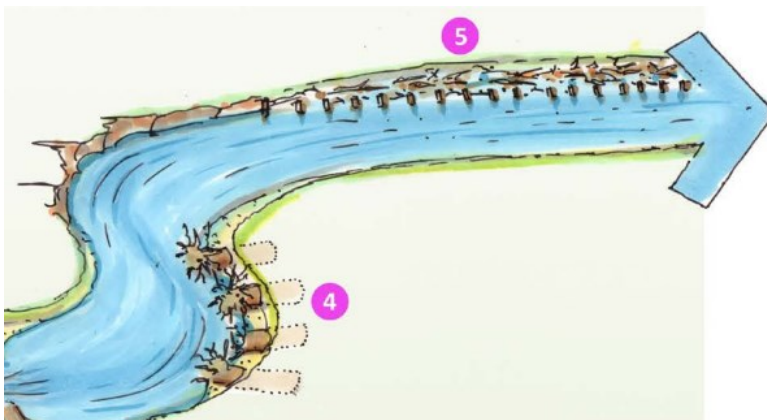


Figure 3.3 Bank protection using stumps, rows of stakes, and longitudinal wood (Source: Varianten toepassing dood hout in stromende wateren, Aa en Maas 2022)

In the new meanders, the (outer) bends will need to be provided with bank protection. Especially immediately after completion, the banks are very susceptible to erosion. By using natural materials such as wooden rows of stakes, stumps, or woody material that degrades over time, the banks can have the opportunity to become vegetated and more resistant to erosion. Monitoring the morpho dynamics of the new course will also provide insights into potential erosion-prone areas. Some locations can be identified in advance (e.g., upstream of Bakkes and RWZI) and will require permanent bank protection, possibly in the form of stone riprap. Stones removed from the west side of the current course, along the 'islands' with the new meanders, could potentially be used for this purpose. Along the high-water channel, more natural banks with vegetation will also be established.

In addition to the adjustments to the watercourse, the section between the NATO site and Bakkes/Kapelweien on the Dutch side is designated as an adjacent buffer zone for nature development. Here, grasslands, wooded areas, and ponds will be created in alignment with the elevation and prevailing groundwater conditions. Furthermore, rainwater runoff from the dry valley of Rimburgerweg will be directed to the Worm through a depression in the ground level.



At the location of Rimburchermolen, a fish passage will be incorporated to address the fish migration barrier created by the existing bottom trap with stone riprap. Additionally, the existing measurement point of the water board must be preserved.



In the section between Rimburchermolen and the RWZI, the former Roman road, Via Belgica, is located. This archaeological monument must be preserved in the ground, resulting in the absence of spatial interventions for most of this stretch. Only a section directly south of the RWZI has been released, based on previous archaeological soil research and will be utilized to create a new meander. The adjacent lands further to the south, up to the first residential plots of Rimborg, form a buffer zone of natural grassland.

At the level of the RWZI, the available lands of the water board and Wasserverband are utilized for micro-meandering and/or the integration of a one-sided two-phase profile with deadwood, gentle eco-friendly soft banks, and streamside vegetation. North of the RWZI, the water board still owns a parcel to create a new meander with an adjacent buffer zone featuring natural grassland. The maintenance path on the Dutch side is designed to have a turnaround loop here, while on the German side, the existing (maintenance) path remains unchanged.



4.2 Detailed plan elaboration

In continuation of the exploratory phase, the design will be further elaborated, integrated, and detailed in a subsequent planning phase. In this process, it is advisable to pay attention to the following aspects:

- Erosion protection measures
- Bottom traps and fish passage
- Desired vegetation / spontaneous development
- Layout of adjacent buffer zones
- Integration of runoff from Rimbürgerweg
- Hydrological effects and concurrent flow in the high-water channel
- Integration/mitigation of existing ecological values
- Management of exotic/invasive species
- Measures to enhance 'dry' nature in N2000 area (opportunity for synergy)
- Integration of new maintenance paths, especially in the German N2000 area
- Expandability of the design on the German side
- Addressing functional, remaining (agricultural) parcels between the NATO site and Bakkes.

5 The legal embedding of the plan

For the implementation of the European Water Framework Directive (WFD), the Worm River, which forms the land border between the Netherlands and Germany for certain stretches, is being restructured. There are insufficient possibilities to achieve the goals of the WFD on only the German or Dutch side of the border. Due to this cross-border nature, good agreements need to be made at the international level, which are also legally embedded. Legal embedding refers to the creation of binding agreements for the project to ultimately meet the objectives of the WFD.

5.1 Border agreement

The official national border is defined on the map accompanying the Border Agreement (See the text box below). Both the Netherlands and Germany must keep this border recognizable and secure by placing, checking, and maintaining the border markers. The construction work on the Worm River may alter the course of the border water, but the (national) border remains unchanged, and the existing national border is respected.

Border agreement

"Convention between the Kingdom of the Netherlands and the Federal Republic of Germany regarding the course of the common land border, border waters, land ownership near the border, cross-border land and inland waterway traffic, and other issues related to the border, with Appendices and Final Protocol (Border Agreement); The Hague, April 8, 1960."

Textbox 1. Description Border agreement

In this Border Agreement, further arrangements have also been made regarding maintenance obligations. The redesign will have implications for this, and additional agreements will need to be made in the areas of management and maintenance.

Notification of Intent to the Water Authority

Based on legal advice, various relevant authorities must be informed of the intention to modify the Worm, ensuring that the obligations from the border agreement remain legally binding.

Consequently, a combined letter has been drafted for two cross-border stream restoration projects, including the Worm. This letter includes the intention to establish a cooperation agreement for the Worm.

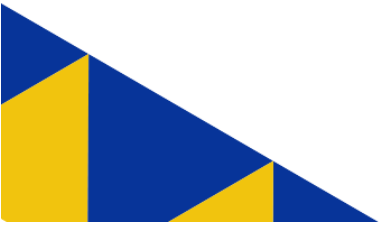
A Dutch version of this letter has been sent to the Dutch chairperson of the Permanent Border Water Commission, Mrs. van Duin, and a German translation of this letter has been sent to the German chairperson of the Permanent Border Water Commission, Obfrau Jekel. A copy of this notification has also been promptly sent to various relevant Dutch and German authorities. See a copy of both letters in Annex 3.



5.2 Cooperation agreement

Due to the cross-border nature and the agreements from the Border Agreement, we rely on collaboration with the German water management authority (Wasserverband Eifel-Rur). Therefore, a cooperation agreement has been drafted with binding commitments regarding the WFD objectives, national borders, collaboration, use of land properties, and management and maintenance.

The board of Waterschap Limburg and the board of Wasserverband Eifel-Rur entered into a cooperation agreement on December 21, 2023, in which both parties commit to the redesign of the Worm in accordance with the conceptual design. The cooperation agreement is attached as Annex 2. This ensures the realization of the project.



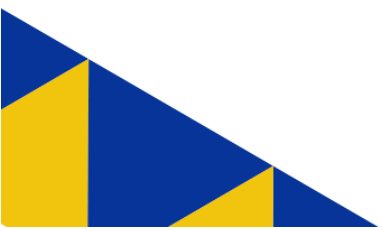


APPENDIX 1 DETAILED DESIGN





APPENDIX 2 COOPERATION AGREEMENT WL - WVER





APPENDIX 3 LETTER BORDERWATER COMMISSION

