



**Report on the drafting of Flood Hazard Maps and Flood Risk Maps in the International River Basin District 'Rhine' (catchment > 2,500 km<sup>2</sup>, Part A) and the exchange of information according to Article 6, Par. 2 of the EC Directive on the Assessment and Management of Flood Risks (FD)**

**- Final Report (State: 22 March 2014) -**

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Schutz des Rheins

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van de Rijn



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## Preface

According to Article 6 of the FD, the Member States are obliged to prepare flood hazard maps and flood risk maps for areas presenting a potential significant flood risk identified according to Article 5, Par. 1 of the FD. FD Article 6, Par. 2 presupposes an exchange of information of the Member States concerned prior to preparing flood hazard and flood risk maps for areas identified according to FD Article 5 and shared by several Member States<sup>1</sup>.

On 18 October 2007 the Conference of Rhine Ministers charged the International Commission for the Protection of the Rhine (ICPR) to support the coordination required within the implementation of the EC Floods directive between EU states and Switzerland, as far as the catchment is concerned, in a comparable manner to what is done within the EC Water Framework Directive.

As a non EU member, Switzerland is not obliged to implement the FD. As was the case within the implementation of the Water Framework Directive, and based on national law, Switzerland has supported the coordination of the EU Member States with respect to implementing the FD. The same is true of Liechtenstein, as long as the FD is not transposed into law in the EEA.

The EU Member States are in charge of reporting on the state of implementation of the FD to the EU Commission.

The report at hand is available to the ICPR Member States for their reporting on the FD to the EU according to Article 6, Par. 1 and Par. 2 resp. Article 13, Par. 2. It presents the results of the exchange of information during 2010 to 2013 and of coordination work at the level of the IRBD Rhine according to FD Article 6, Par. 2.

The report and its annexes serve the EU Member States:

- (1) as documentation for the implementation of Article 6 resp. making use of FD Article 13, Par. 2 in the IRBD Rhine (catchment > 2,500 km<sup>2</sup>; part A) and the existence of flood hazard and flood risk maps;
- (2) as proof for the exchange of information in the IRBD Rhine required according to Article 6, par. 2 and covered by the reporting obligation.

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<sup>1</sup> See "[Report on the identification of potential significant flood risk areas](http://www.iksr.org/index.php?id=345&L=3) in the International River District Rhine" here: [www.iksr.org/index.php?id=345&L=3](http://www.iksr.org/index.php?id=345&L=3)

## Exchange of information according to FD Article 6, Par. 2 on drafting flood hazard and flood risk maps

In its Article 6, Par. 2 the Floods Directive provides that, for areas identified according to Article 5 and which are shared by several Member States, the preparation of the maps shall be „*subject to prior exchange of information between the Member States concerned*“. The reporting of the EU Member States to the EU Commission is based on the regulations of the "Reporting Sheet for Flood Hazard Maps and Flood Risk Maps"<sup>2</sup> approved by the Water Directors on 3 December 2010.



The exchange of information within the ICPR concerning the drafting of the flood risk maps is based on earlier work. Following the great floods of the Rhine in 1993/1995, the ICPR adopted the "Action Plan on Floods" in 1998. In this connection, in 2001 an ICPR Atlas of Flood Danger and Potential Damage due to Extreme Floods of the Rhine<sup>3</sup> was drafted from the outlet of Lake Constance until the North Sea.

After jointly drafting the report on the identification of flood risk areas in the IRBD Rhine (catchment >2,500 km<sup>2</sup> = part A) the states in the Rhine catchment have regularly exchanged information and coordinated the drafting of flood hazard maps and flood risk maps according to FD Article 6, Par. 2. The national reports or the reports for sub basins (e.g. Moselle-Sarre of the International Commissions for the Protection of the Moselle and the Sarre - ICPMS) contain the details on how the maps were prepared for flood risk areas for which a coordination is required in border regions.

The following products are available:

1. A **survey map showing the river sections** in the IRBD, part A (catchments > 2.500 km<sup>2</sup>), **for which the Member States have prepared flood hazard maps and flood risk maps** (see Annex 1).

*This map provides for the following categories:*

- a.  *green: river sections without potential significant flood risk*
  - b.  *red: river sections for which flood hazard maps and flood risk maps must be prepared according to FD Article 6.*
2. List of **internet links** towards the national or regional map portals for flood hazard maps and flood risk maps (see Annex 2)
  3. Results of the coordination of the Rhine bordering states concerning the **update of the Rhine Atlas 2001** (preparatory steps for drafting a harmonized Rhine Atlas 2014: Flood hazard maps and flood risk maps for the main stream of the Rhine from the Alpine Rhine until the North Sea, including Lake Constance/Lake IJssel): **Coordinated discharge values for the three scenarios** of the FD for an update of the flood hazard maps for the main stream of the Rhine. These values are applying for the Rhine Atlas and the national maps for the main stream of the Rhine (see Annex 3).

<sup>2</sup> See Floods Directive / 2007/60/EC: Reporting sheets, version December 2010 - Version no 2: February 2011"

<sup>3</sup> See ICPR Rhine Atlas 2001 [here](#) or as [interactive map](#)

The updated atlas will consist of flood hazard and flood risk maps and will be drafted as an interactive map based on national GIS data to be published on the ICPR website. At the same time, the Atlas is the entrance towards the map portals of the Member States, the Federal States and the major Rhine tributaries.

***Remark concerning national maps available for Switzerland:***

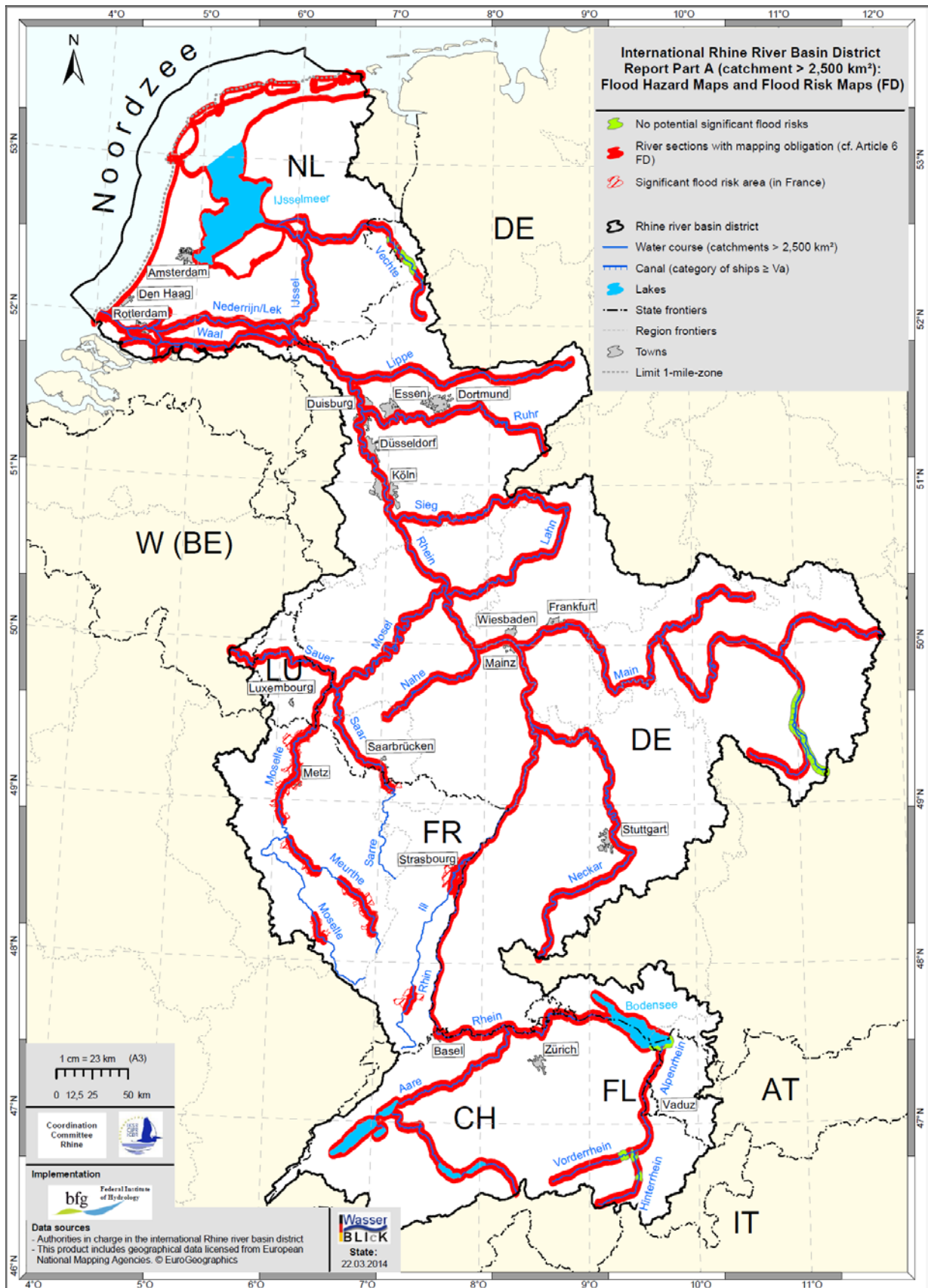
In Switzerland, maps representing the **flood intensity** and **flood hazard** are being drafted.

The Swiss maps of **flood intensity** represent the spatial extension (flooded surface) and occurring intensities (depth of flow and flow velocity) for different probability classes. Thus, their content corresponds to the flood hazard maps according to the Floods Directive.

The Swiss **hazard maps** include a 5 level classification based on the intensities and probabilities. They thus go beyond the flood risk maps provided for by the Floods Directive, but they do not make any indications with respect to goods at risk. With respect to their content their position is between the flood hazard map and the flood risk map according to the Floods Directive. As far as the planning of measures is concerned, the risks are indicated and assessed in detail.

For Switzerland the survey map concerning flood hazard and flood risk maps indicate existing Swiss flood hazard maps.

### Annex 1 - Survey map on flood hazard maps and flood risk maps



## Annex 2 - Internet links towards flood hazard maps and flood risk maps

**Netherlands:** [www.risicokaart.nl](http://www.risicokaart.nl)

**Germany:**

- **North Rhine-Westphalia:**  
[http://www.flussgebiete.nrw.de/index.php/HWRMRL/Risiko- und Gefahrenkarten](http://www.flussgebiete.nrw.de/index.php/HWRMRL/Risiko- und_Gefahrenkarten)
- **Rhineland-Palatinate:** Rhineland-Palatinate makes use of **Article 13, par. 1a** for all areas of operation in the IRBD Rhine.  
Interactive flood hazard and flood risk maps:  
<http://www.hochwassermanagement.rlp.de/servlet/is/8662/>  
**Hesse:** Interactive WEB-GIS map viewer concerning flood hazard and flood risk maps: <http://hwrn.hessen.de>
- **Baden-Württemberg:**  
[www.hochwasserbw.de](http://www.hochwasserbw.de)  
Map viewer: [http://udoprojekte.lubw.baden-wuerttemberg.de/udoprojekte/alias.xhtml?alias=hwgk\\_uf](http://udoprojekte.lubw.baden-wuerttemberg.de/udoprojekte/alias.xhtml?alias=hwgk_uf)
- **Saarland:** <http://geoportal.saarland.de/portal/de/fachanwendungen/wasser.html>
- **Bavaria:**  
For the Bavarian share of the area of operation Main, Bavaria makes use of FD **Article 13, par. 1b and Article 13, par. 3**.  
Information on drafting flood hazard maps/flood risk maps:  
[http://www.lfu.bayern.de/wasser/hw\\_risikomanagement\\_umsetzung/hwgk\\_und\\_hwrk/index.htm](http://www.lfu.bayern.de/wasser/hw_risikomanagement_umsetzung/hwgk_und_hwrk/index.htm)  
map for the coordination area Main: <http://www.iksr.org>
- **Lower Saxony:** [www.hwrn-rl.niedersachsen.de](http://www.hwrn-rl.niedersachsen.de) (particularly Vechte and Dinkel).  
Certain sections: no significant risks.
- **Thuringia:** <http://www.tlug-jena.de/hwrn>

**France:** The drafting of the maps of areas exposed to significant flood risks in 2013 and 2014 includes a hearing of local authorities in order to take into account their remarks.  
<http://www.lorraine.developpement-durable.gouv.fr/>

**Luxemburg:** <http://eau.geoportail.lu/>

**Belgium (Wallonia):** On 19 December 2012 the Wallonian government adopted the drafted maps (in particular for R. Sure and Our). The definite maps which will be part of the Flood Risk Management Plan will be adopted after the public hearing in 2015 at the same time as the Flood Risk Management Plans. These maps are available on the Wallonian geoportail:  
<http://geoportail.wallonie.be/cms/fr/sites/geoportail/home.html>  
<http://geoapps.wallonie.be/inondations>

**Liechtenstein:** Information available under the following address: [info.abs@llv.li](mailto:info.abs@llv.li)

**Austria:** <http://wisa.lebensministerium.at/> → Wasser Karten → Hochwasser

**Switzerland:**

State of risk mapping

<http://map.bafu.admin.ch/> > Natural hazards > state of natural hazard mapping

Hazard maps:

<http://www.bafu.admin.ch/gefahrenkarten>

<http://www.bafu.admin.ch/cartes-dangers>

<http://www.bafu.admin.ch/carte-pericoli>

**International Commission for the Protection of the Moselle and Saar (ICPMS):**

<http://www.iksms-cipms.org>

**Area of operation High Rhine (joint report):**

„Flussgebietseinheit Rhein – Bearbeitungsgebiet Hochrhein: Internationale Information und Koordination in Umsetzung der EU-Hochwasserrisikomanagementrichtlinie:

- Vorläufige Bewertung des Hochwasserrisikos und Abgrenzung der Risikogebiete
- Erstellung von Hochwassergefahren- und Hochwasserrisikokarten“

<http://www4.um.baden->

[wuerttemberg.de/servlet/is/110808/20131018\\_Koordinationsbericht\\_BG\\_Hochrhein\\_HW\\_RM.pdf](http://www4.um.baden-wuerttemberg.de/servlet/is/110808/20131018_Koordinationsbericht_BG_Hochrhein_HW_RM.pdf)



### Annex 3 - Draft of the Rhine Atlas 2014: Coordinated discharge values (Q) and water levels (H) for drafting flood hazard maps (main stream of the Rhine)

#### 1. Main stream

Within the coordination activities, the following discharge values were coordinated with a view to **drafting flood hazard maps** (basic water network 2,500 km<sup>2</sup>) and thus also for updating the Rhine Atlas:

(1) Floods with a low probability or extreme event scenarios.

Scope	Low probability HQ <sub>extreme</sub>
Alpine Rhine - Landquart to mouth R. III	5.250 m <sup>3</sup> /s*
Alpine Rhine - mouth R. III to Lake Constance	6.500 m <sup>3</sup> /s*
Lake Constance to mouth R. Thur	1.250 m <sup>3</sup> /s
Mouth R.Thur to mouth R. Aare	2.930 m <sup>3</sup> /s
Mouth R. Aare to mouth R. Wiese (point of reference: Basel)**	5.480 m <sup>3</sup> /s
Iffezheim to downstream mouth R. Neckar	6.500 m <sup>3</sup> /s
from mouth R. Neckar	7.600 m <sup>3</sup> /s
from mouth R. Main	10.300 m <sup>3</sup> /s
from mouth R. Nahe	10.400 m <sup>3</sup> /s
from mouth R. Moselle	15.250 m <sup>3</sup> /s
from Lower Rhine	15.300 m <sup>3</sup> /s
from Lobith	16.000 m <sup>3</sup> /s

\*Values taken from the Development Concept Alpine Rhine of the International Government Commission Alpine Rhine for the assessment of the present risk with respect to low probability, Austria applies 3,350 resp. 4,300 m<sup>3</sup>/s and additionally takes into account dike breaches and solid matter scenarios. The calculation values for concrete constructional protection measures are bilaterally agreed upon for each individual case for the shared border section

\*\*Discussions aimed at coordinating the section between the mouth of R. Wiese and Iffezheim are going on. The results will be included into the report as soon as they will be known.

(2) According to FD Article 6, par. 3b) a flood with a medium probability is defined by a return period of HQ 100-120 years.

Scope	Medium probability H <sub>100-120</sub>
Alpine Rhine - Landquart to mouth R. III	2.550 m <sup>3</sup> /s
Alpine Rhine - mouth R. III to Lake Constance	3.050 m <sup>3</sup> /s
Lake Constance to mouth R. Thur	1.100 m <sup>3</sup> /s
Mouth R.Thur to mouth R. Aare	2.260 m <sup>3</sup> /s
Mouth R. Aare to mouth R. Wiese (point of reference: Basel)**	4.780 m <sup>3</sup> /s
Iffezheim to downstream mouth R. Neckar	5.000 m <sup>3</sup> /s
from mouth R. Neckar	6.000 m <sup>3</sup> /s
from mouth R. Main	7.900 m <sup>3</sup> /s
from mouth R. Nahe	8.000 m <sup>3</sup> /s
from mouth R. Moselle	11.850 m <sup>3</sup> /s
from Lower Rhine	11.700 <sup>4</sup> m <sup>3</sup> /s
from Lobith	12.700 m <sup>3</sup> /s

\*\*Discussions aimed at coordinating the section between the mouth of R. Wiese and Iffezheim are going on. The results will be included into the report as soon as they will be known.

<sup>4</sup> The difference in discharge between the mouth of R. Moselle and the Lower Rhine can be explained by retention effects.

(3) According to FD Article 6, par. 3b) a flood of medium probability is defined by a return period of HQ 100-120 years, for the Alpine Rhine of HQ 30.

Scope	High probability H <sub>10</sub>
Alpine Rhine - Landquart to mouth R. III	1.950 m <sup>3</sup> /s*
Alpine Rhine - mouth R. III to Lake Constance	2.450 m <sup>3</sup> /s*
Lake Constance to mouth R. Thur	920 m <sup>3</sup> /s (basic value CH HQ <sub>30</sub> = 1.010 m <sup>3</sup> /s)
Mouth R. Thur to mouth R. Aare	1.660 m <sup>3</sup> /s (basic value CH HQ <sub>30</sub> = 1.940 m <sup>3</sup> /s)
Mouth R. Aare to mouth R. Wiese (point of reference: Basel)**	3.980 m <sup>3</sup> /s (basic value CH HQ <sub>30</sub> = 4.380 m <sup>3</sup> /s)
Iffezheim to downstream mouth R. Neckar	4.100 m <sup>3</sup> /s
from mouth R. Neckar	4.750 m <sup>3</sup> /s
from mouth R. Main	5.700 m <sup>3</sup> /s
from mouth R. Nahe	5.800 m <sup>3</sup> /s
from mouth R. Moselle	8.810 m <sup>3</sup> /s
from Lower Rhine	8.900 m <sup>3</sup> /s
from Lobith	9.500 m <sup>3</sup> /s

\*The basic value for AT and CH is HQ 30

\*\*Discussions aimed at coordinating the section between the mouth of R. Wiese and Iffezheim are going on. The results will be included into the report as soon as they will be known.

## 2. Tributaries

Many tributaries to the Rhine (Aare, III, Neckar, Main including Franconian R. Saale and Regnitz, Nahe, Lahn, Moselle/Sarre including Sûre, Sieg, Ruhr, Lippe, Vechte - see map 1) equally belong to the International River Basin Rhine (part A, catchment > 2,500 km<sup>2</sup>). According to the WFD, the **major tributaries Neckar, Main and Moselle/Sarre** constitute separate areas of operation. This is also supposed to apply to the FD.

	HQ <sub>10</sub>	HQ <sub>100-120</sub>	HQ <sub>extreme</sub>
<b>Neckar</b>	1.875 m <sup>3</sup> /s	2.840 m <sup>3</sup> /s	3.970 m <sup>3</sup> /s
<b>Main</b>	1.580 m <sup>3</sup> /s	2.580 m <sup>3</sup> /s	3.350 m <sup>3</sup> /s
<b>Moselle/Sarre:</b>	3.250 m <sup>3</sup> /s	4.500 m <sup>3</sup> /s	6.500 m <sup>3</sup> /s

Table: Relevant discharges for the implementation of the FD in the areas of operation at the mouth of R. Neckar, Main and Moselle/Sarre

## 3. Lake Constance

The flood hazard is due to the water level of Lake Constance. The values for defined return periods are taken from the report of the Working Group Water Level Prediction Lake Constance (determination of the extreme water level of Lake Constance, final version, state: 07.06.2011).

The water levels are indicated for different reference periods. The reason is that the riverine states to Lake Constance, i.e. Germany, Austria and Switzerland use different standard water levels as a reference for their indications of altitude (see Annex 1 of the above mentioned report):

- Germany: Standard water level of the North Sea near Amsterdam (m ü. NN)
- Austria: Standard water level of the Adriatic Sea near Trieste (m ü. A)
- Switzerland: Standard water level near Marseille (m ü. M]

Within the coordination, the following water levels were convened for drafting the **flood hazard maps**:

- (1) according to FD Article 6, par. 3a the lake level with low probability is defined for a return period of 1,000 years or scenarios for extreme events.

Lake Constance	Water level for the national vertical datum		
	DE [m ü. NN]	AT [m ü. A]	CH [m ü. M]
Lake Constance - Upper Lake	398,00	398,25 Basic value AT HW <sub>300</sub> = 398,02*	398,30
Lake Constance - Lower Lake	397,75	-	398,05

\*For the assessment of the present risk situation and low probability AT uses the lake level and a return period of 300 years, additionally taking into account scenarios of dike breaches.

- (2) According to FD Article 6, par. 3b) the lake level with medium probability is defined by a return period of 100 years.

Lake Constance	Water level for the national vertical datum		
	DE [m ü. NN]	AT [m ü. A]	CH [m ü. M]
Lake Constance - Upper Lake	397,57	397,82	397,89
Lake Constance - Lower Lake	397,30	-	397,62

- (3) According to FD Article 6, par. 3c) the lake level with high probability is defined by a return period of 10 years, resp. 30 years for AT and CH.

Lake Constance	Water level for the national vertical datum		
	DE [m ü. NN]	AT [m ü. A]	CH [m ü. M]
Lake Constance - Upper Lake	397,01	397,26 Basic value AT HW <sub>30</sub> = 397,55*	397,33 Basic value AT HW <sub>30</sub> = 397,62*
Lake Constance - Lower Lake	396,81	-	397,13 Basic value CH HW <sub>30</sub> = 397,39*

\*Basic value for AT and CH is a lake level with a 30 years return period.

#### 4. Coast and Lake IJssel area

As a matter of principle, the same approach applies to the **coast** and the **Lake IJssel area** as for the main stream and the tributaries, even though a flood with low probability (according to FD Article 6, par. 3a) is defined as an extreme event with a return period between two thousand and ten thousand years. This variant has to be seen in connection with legally defined protection levels in the Netherlands. Along the coast, the equivalent water levels (H) are caused by extreme storm tides. The same factor is dominant for the Lake IJssel area. With respect to drafting **flood risk maps** for the coast and the Lake IJssel area, this leads to the following starting points:

A low probability according to FD Article 6, par. 3a) is defined as an extreme event with a return period between two thousand and ten thousand years.

Coast	Low probability $H_{O_{extreme}}$
Hoek van Holland	NAP+5,0 m
IJmuiden	NAP+5,7 m
Den Helder	NAP+4,8 m
Harlingen	NAP+4,9 m
Lauwersmeer	NAP+5,0 m
Ameland (seaside)	NAP+4,4 m

The Normal Amsterdam Pegel (NAP) is the reference state for altitude measures in the Netherlands. The level Zero approximately corresponds to today's average sea level (North Sea). The German measure Normal Null has been derived from the Dutch NAP.

Lake IJssel area	Low probability $H_{O_{extreme}}$
Mouth R. IJssel	NAP+3,0 m
Lemmer	NAP+1,8 m
Workum	NAP+1,2 m
Enkhuizen	NAP+1,1 m
Almere	NAP+0,6 m

A medium probability according to FD Article 6, par. 3a) is defined as an event with a return period of  $\geq 100$  years.

Coast	Medium probability $H_{100}$
Hoek van Holland	NAP+3,6 m
IJmuiden	NAP+3,5 m
Den Helder	NAP+3,4 m
Harlingen	NAP+4,1 m
Lauwersmeer	NAP+4,2 m
Ameland (seaside)	NAP+3,5 m

Lake IJssel area	Medium probability $H_{100}$
Mouth R. IJssel	NAP + 2,0 m
Lemmer	NAP+1,2 m
Workum	NAP + 0,8 m
Enkhuizen	NAP+0,6 m
Almere	NAP + 0,3 m

A high probability according to FD Article 6, par. 3c) is defined as an event with a return period of 10 years.

Coast	High probability $H_{10}$
Hoek van Holland	NAP+3,0 m
IJmuiden	NAP + 2,8 m
Den Helder	NAP + 2,7 m
Harlingen	NAP+3,5 m
Lauwersmeer	NAP+3,5 m
Ameland (seaside)	NAP + 2,9 m

Lake IJssel area	High probability $H_{10}$
Mouth R. IJssel	NAP + 1,4 m
Lemmer	NAP + 0,8 m
Workum	NAP+0,6 m
Enkhuizen	NAP + 0,4 m
Almere	NAP + 0,1 m