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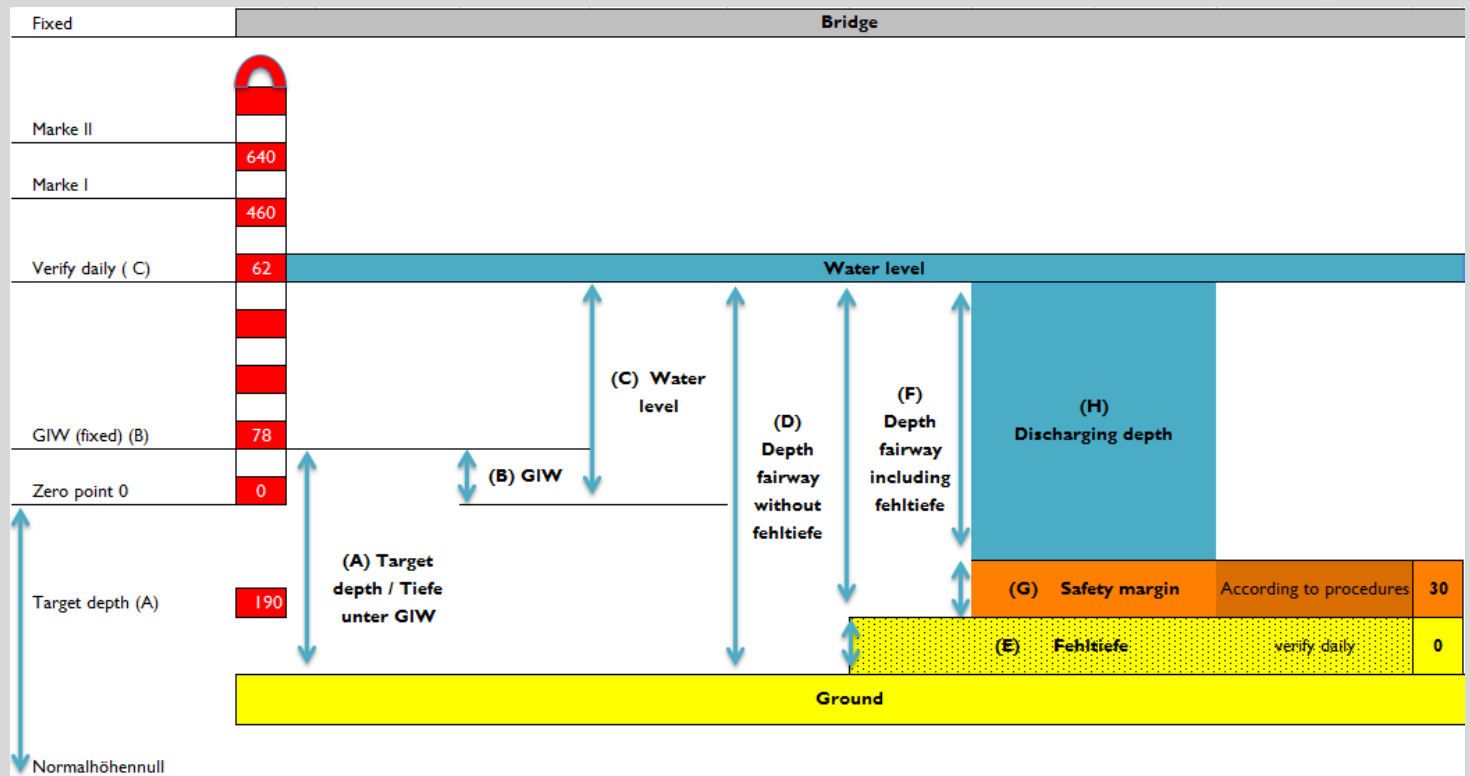
INFORMATION SHEET CALCULATION NAVIGATIONAL DEPTH

BACKGROUND INFORMATION

To determine the discharging depth, often a rule of thumb is used. However, in situations when the water level takes extraordinary measure, it is good practice to perform a calculation as accurate as possible. The depth of the waterway in different sailing areas can be determined by the *Pegel* (water level). In order to determine the correct discharging depth with use of the *Pegel* position, additional information is required.

Below the calculation is explained by using an image and which information is needed is described.

CALCULATION DISCHARGING DEPTH



CALCULATION EXAMPLE KAUB NOVEMBER 11, 2015

The information needed for the calculation will be clarified in the following 2 pages.

A	Target depth	190	cm
B	GIW	78	cm -
C	Water level	62	cm +
D	Depth fairway	174	cm
E	Fehltiefe	0	cm -
F	Depth fairway	174	cm
G	Safety margin (UKC)	30	cm -
H	Discharging depth	144	cm

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A. TARGET DEPTH/TIEFE UNTER GLW

For the Rhine in Germany applies a specific target depth per sailing area with respect to the Gleichwertiger Wasserstand. These specifics indicate the target depth that the government sets opposing the Gleichwertiger Wasserstand.

from kmr to kmr	Routesection	Depth fairway at OLR
334,00 - 508,00	Iffezheim (locks) to Budenheim/Niederwalluf	2,10 m
508,00 - 557,00	Budenheim/Niederwalluf to St. Goar	1,90 m
557,00 - 592,20	St. Goar to Koblenz	2,10 m
592,20 - 763,00	Koblenz to Krefeld	2,50 m
763,00 - 952,00	Krefeld to Woudrichem (Rhine/Waal)	2,80 m

B. GLEICHWERTIGER WASSERSTAND (GLW)

Gleichwertiger Wasserstand is the tide position that is set during a longstanding period over an average of 20 days per year without icedrift. Because of the streambed alteration, this tide position is determined every 10 years by the Central Commission for the Navigation of the Rhine.

Pegel	GIW 2012
Basel-Rheinhalle (CH)	499
Maxau	369
Speyer	241
Mannheim	160
Worms	72
Mainz	168
Oestrich	87
Bingen	100
Kaub	78

Pegel	GIW 2012
Koblenz	78
Andernach	93
Bonn	141
Köln	139
Düsseldorf	97
Ruhrort	233
Wesel	177
Rees	120
Emmerich am Rhein	84

C. DAILY TIDE POSITION

The tide position per section plus the expectation for the coming days (when applicable) are shown on the website of the German waterway control Wasser- und Schifffahrtsverwaltung des Bundes (WSV) www.elwis.de

E. FEHLTIEFEN

Changes in the streambed of the river could cause that the target depth is not reached at certain locations. These *Fehltiefen* are mentioned and available at the website of the Wasser- und Schifffahrtsverwaltung des Bundes.

F. DEPTH FAIRWAY

Keep in mind that at certain loading-/dischargingdocks the depths can deviate. Information from local authorities are leading.

G. SAFETY MARGIN (UKC-UNDER KEEL CLEARANCE)

For safety reasons, it is necessary that the ship has a lesser depth than the fairway. A safety margin (UKC) is to be kept. How big this margin should be, is not determined. The German authorities point out that a margin of 20 cm is acceptable for sand- and gravel ground, however, this margin is definitely insufficient for a vessel navigating a river with rocky ground. The judgement of margin is expected to be with the captain and lies between 20 and 40 cm.

NORMALHÖHENNULL (NHN)

The water gauge is placed relative to the German reference *Normalhöhennull*. This is the reference for measures in Germany. Germany uses the sea-level of the North Sea at Amsterdam as a zero-point on the scale, and has set the *Normalhöhennull* equal to the NAP.

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PEGELS ON NOVEMBER 11, 2015

River	Pegel	from km	to km	Tide position 11-nov-15	Height	Target depth Tu/GIW	OLR /GIW 2012	Depth fairway	Safety- margin cm	Depth 11-nov-15
Rhine	Maxau	334	384	354	910	210	369	195	30	165
Rhine	Mannheim	412	432	126	910	210	160	176	30	146
Rhine	Worms	432	462	39	910	210	72	177	30	147
Rhine	Mainz	462	511	155	910	210	168	197	30	167
Rhine	Oestrich	511	525	76	910	190	87	179	30	149
Rhine	Kaub	540	556	62	910	190	78	174	30	144
Rhine	Koblenz	566	601	49	910	210	78	181	30	151
Rhine	Andernach	601	624	60	910	250	93	217	30	187
Rhine	Keulen	660	716	107	910	250	139	218	30	188
Rhine	Dusseldorf	716	763	64	910	250	97	217	30	187
Rhine	Ruhrort	763	794	194	910	280	233	241	30	211
Rhine	Wesel	794	837	140	910	280	177	243	30	213
Rhine	Emmerich	837	858	48	910	280	84	244	30	214

ROUTE SECTION GERMAN RHINE

Section	Reference tide- gauge	Riversection(Rhine-kmr)
Iffezheim - Germersheim	Maxau	334,00 - 384,00
Germersheim - Mannheim	Speyer	384,00 - 410,50
Mannheim* - Ludwigshafen	Mannheim	410,50 - 431,50
Ludwigshafen - Gernsheim	Worms	431,50 - 462,00
Gernsheim - Niederwalluf	Mainz	462,00 - 508,00
Niederwalluf - Lorch	Oestrich	508,00 - 540,00
Lorch - Bad Salzig	Kaub	540,00 - 566,00
Bad Salzig - Engers	Koblenz	566,00 - 601,00
Engers - Bad Hönningen	Andernach	601,00 - 624,00
Bad Hönningen - Mondorf	Bonn	624,00 - 660,00
Mondorf - Dormagen*	Keulen	660,00 - 710,00
Dormagen* - Krefeld	Düsseldorf	710,00 - 763,00
Krefeld - Orsoy	Duisburg/Ruhrort	763,00 - 794,00
Orsoy - Rees	Wesel	794,00 - 837,00
Rees - Nederlandse grens	Emmerich	837,00 - 857,00

Reference/Sources:

www.elwis.de

Teletekst

www.vaarweginformatie.nl

www.waterinfo.be

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