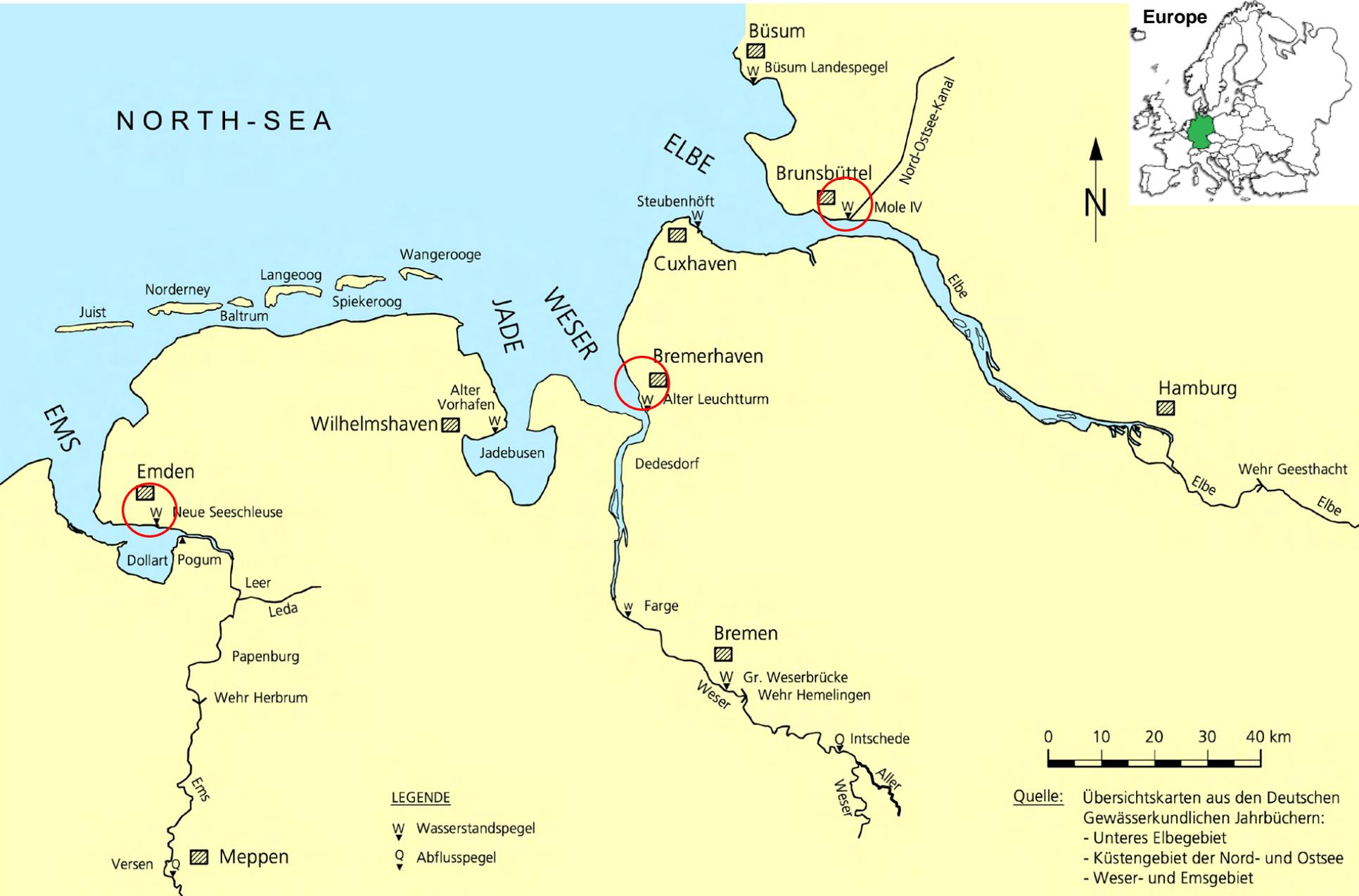


## 13. KFKI Seminar zur Küstenforschung

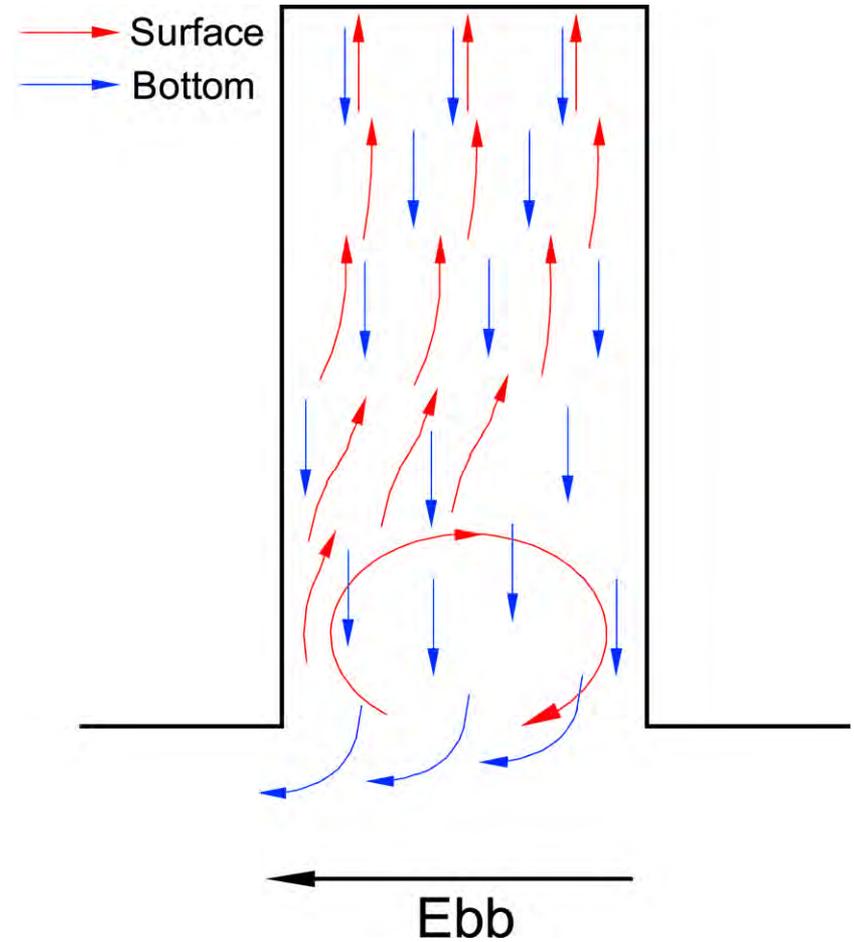
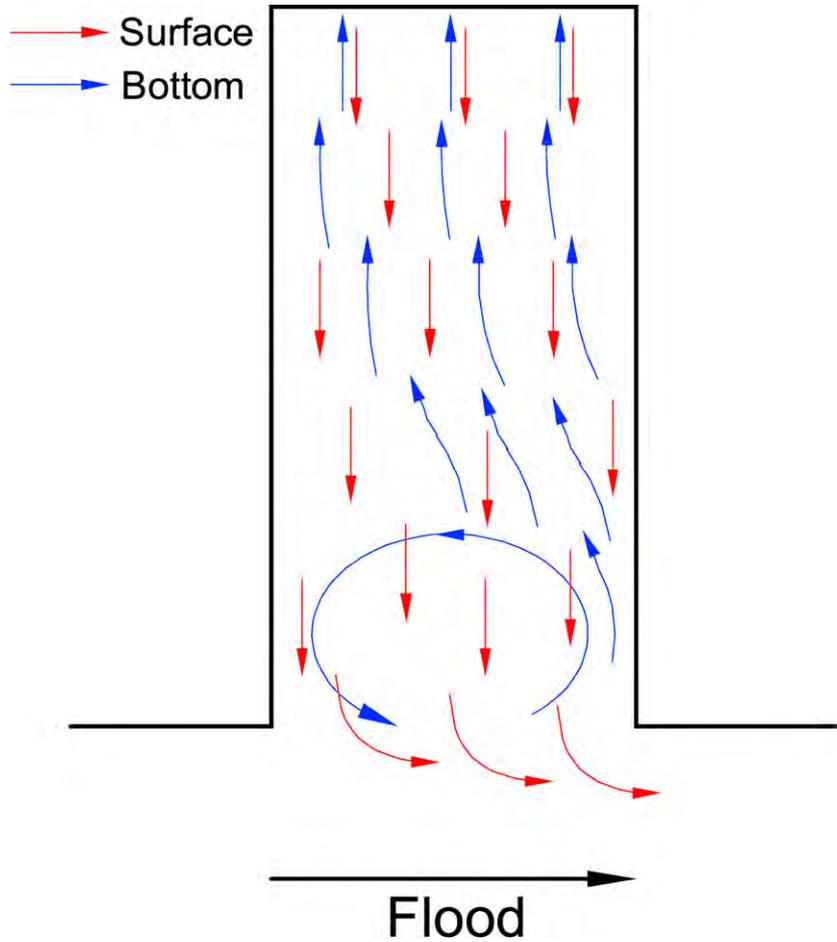
# EIGENSCHAFTEN UND VERHALTEN VON FLUID-MUD IN BRACKWASSERHÄFEN

# Map of the German North-Sea Coast

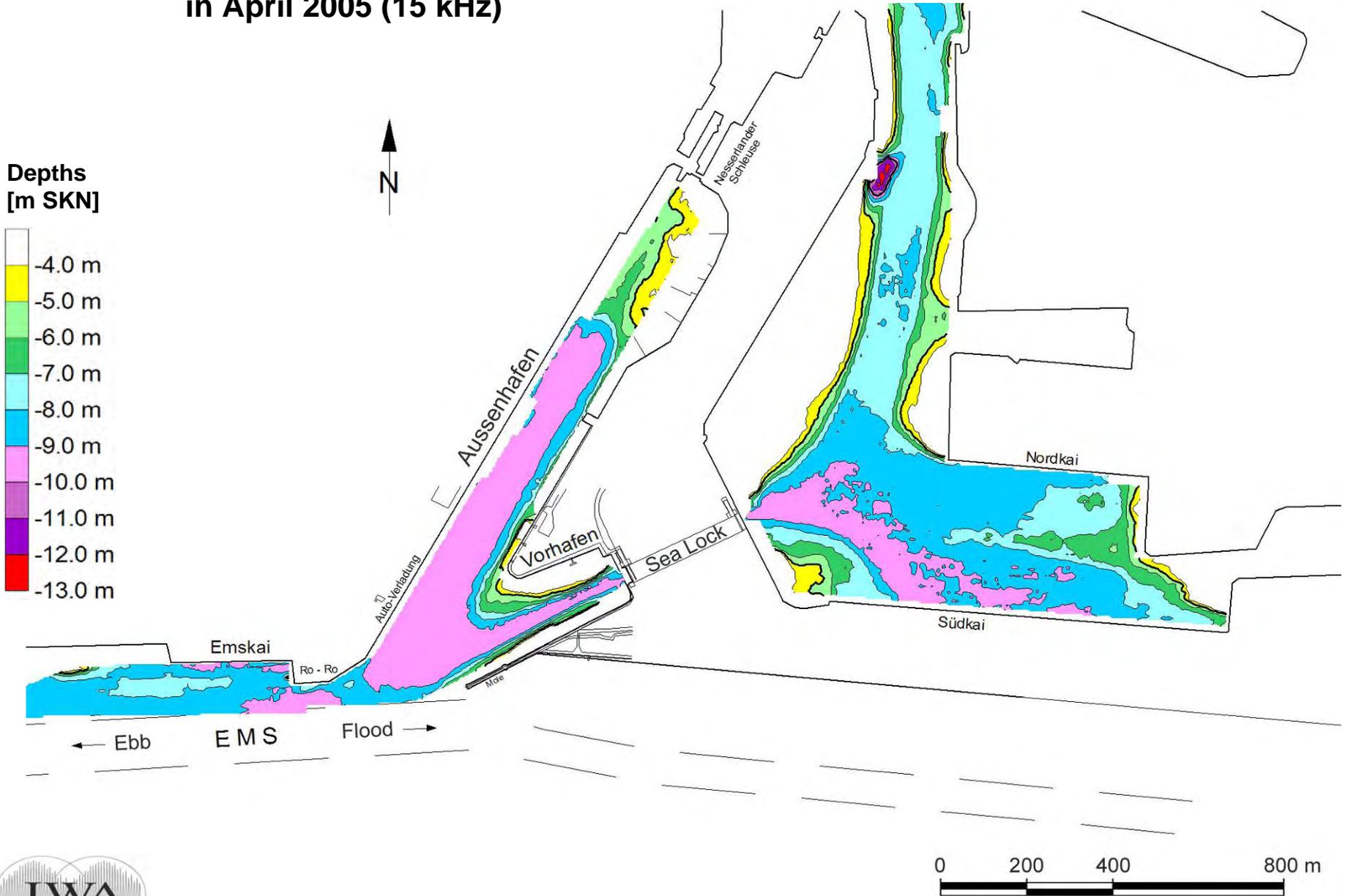


Quelle: Übersichtskarten aus den Deutschen Gewässerkundlichen Jahrbüchern:  
 - Unteres Elbegebiet  
 - Küstengebiet der Nord- und Ostsee  
 - Weser- und Emsgebiet

# Superposition of Current and Density Effect (schematic)



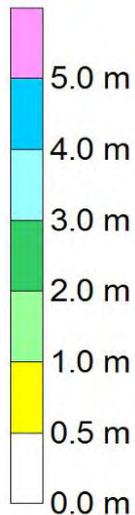
# Sounding Map of the Emden Harbour in April 2005 (15 kHz)



# Map of Differences between the 15 kHz- and 210 kHz-Horizon in the Emden Harbour

Sounding in April 2005

Differences between 15 kHz and 210 kHz

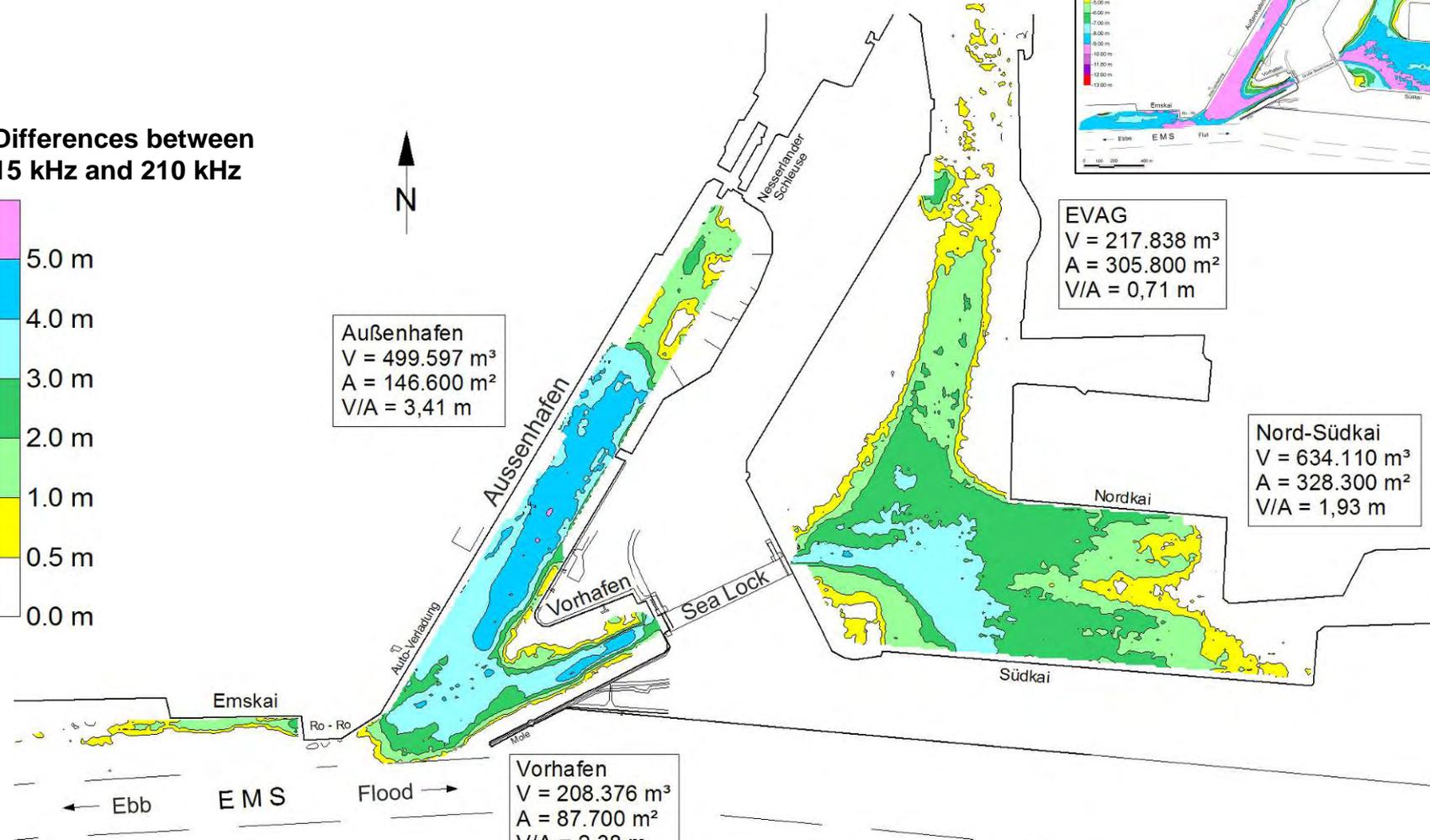
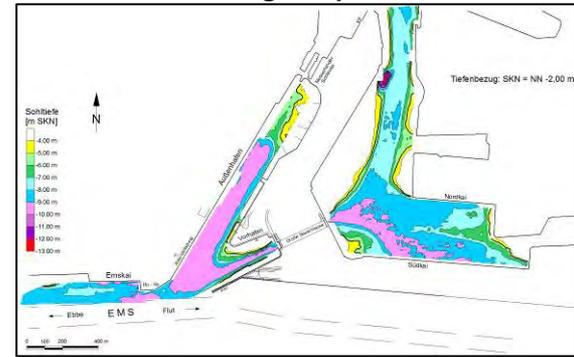


**Außenhafen**  
 $V = 499.597 \text{ m}^3$   
 $A = 146.600 \text{ m}^2$   
 $V/A = 3,41 \text{ m}$

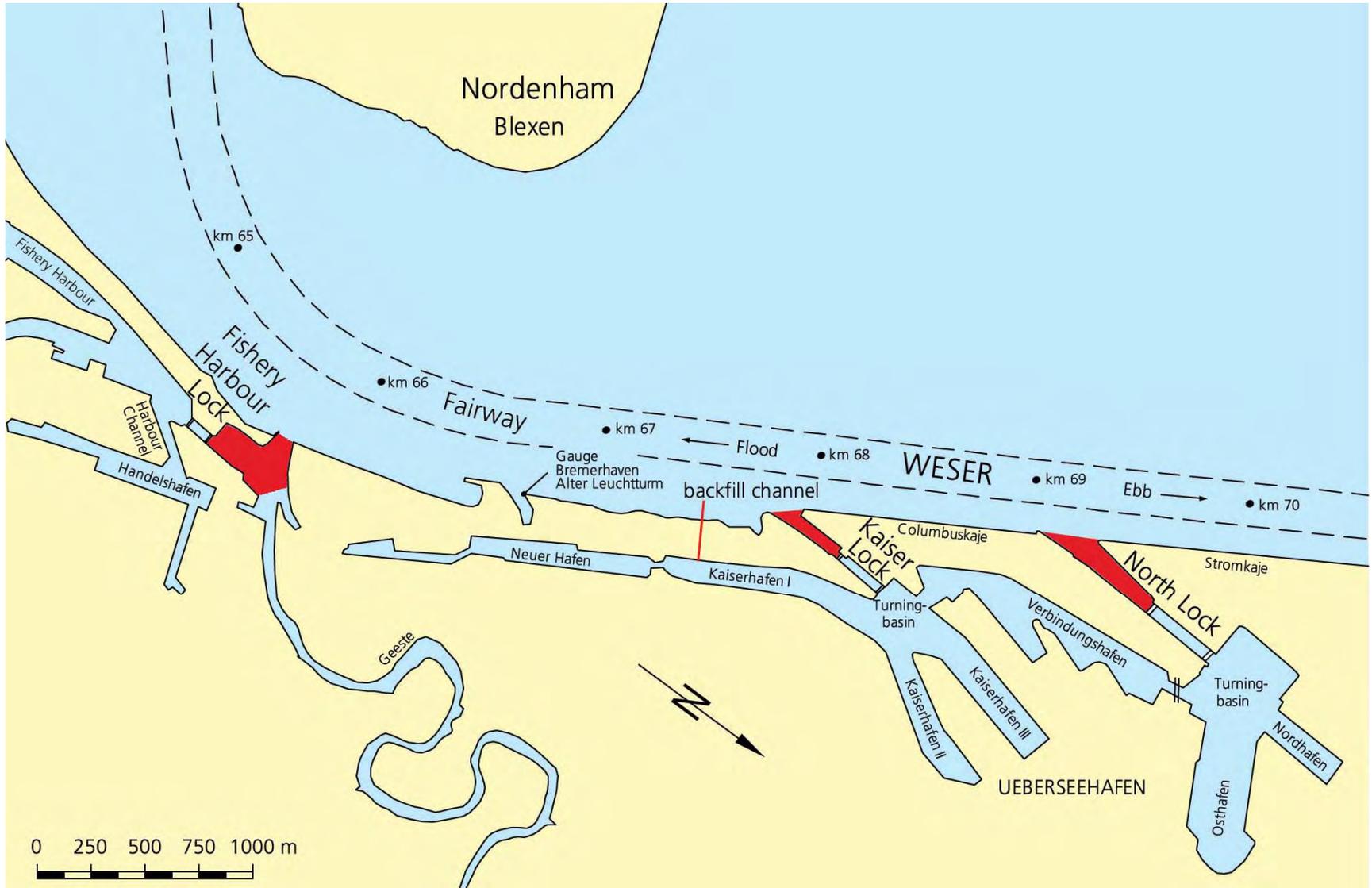
**EVAG**  
 $V = 217.838 \text{ m}^3$   
 $A = 305.800 \text{ m}^2$   
 $V/A = 0,71 \text{ m}$

**Nord-Südakai**  
 $V = 634.110 \text{ m}^3$   
 $A = 328.300 \text{ m}^2$   
 $V/A = 1,93 \text{ m}$

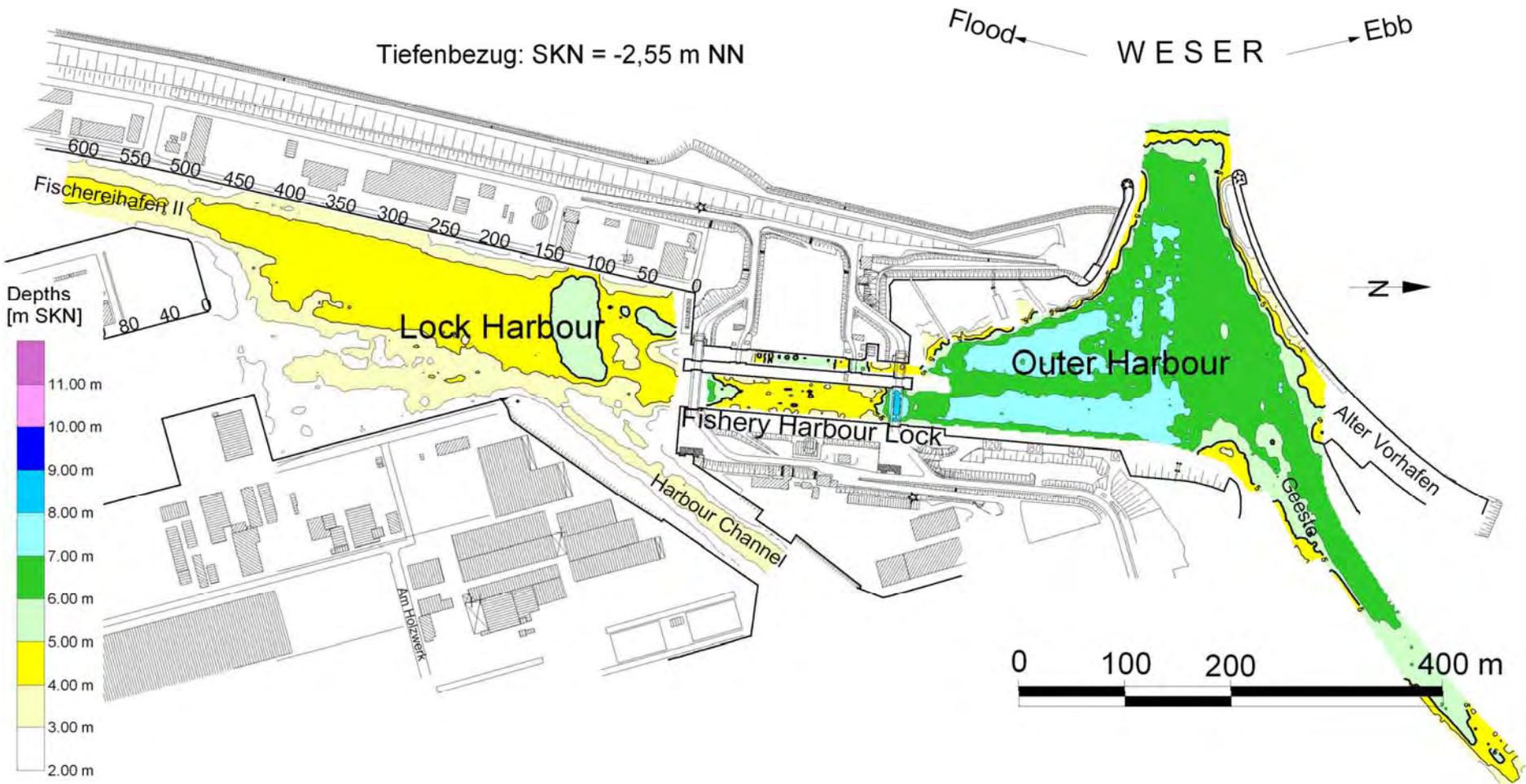
**Vorhafen**  
 $V = 208.376 \text{ m}^3$   
 $A = 87.700 \text{ m}^2$   
 $V/A = 2,38 \text{ m}$



# The Outer Harbours of Bremerhaven



# Sounding Map of the Fishery Harbour Area in December 2006 (15 kHz)

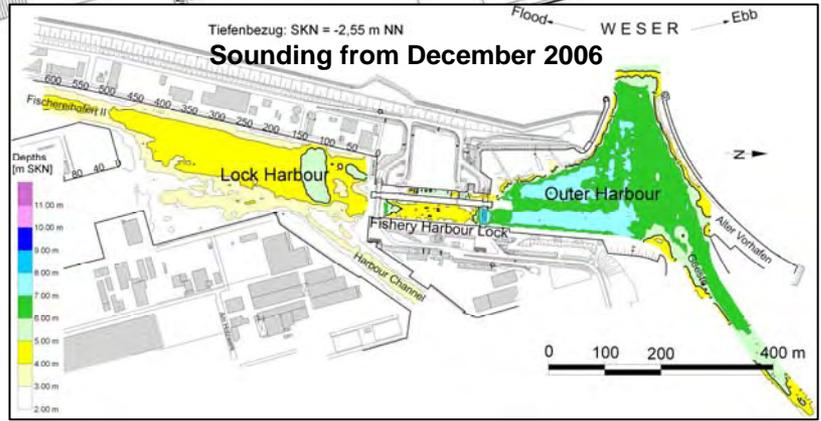
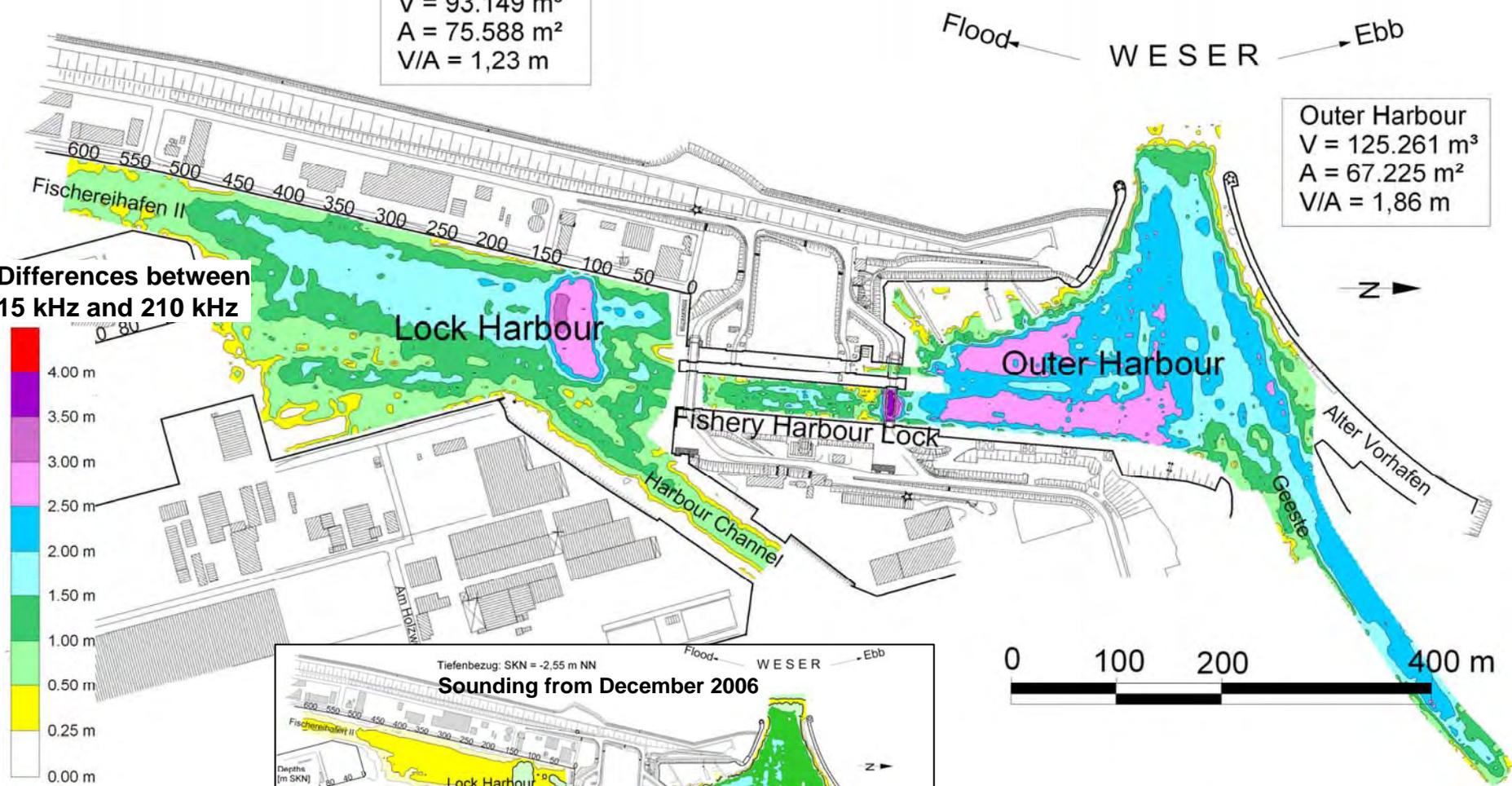
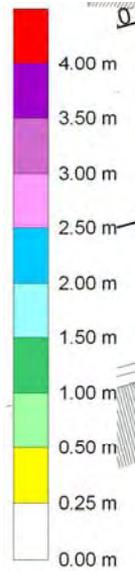


# Map of Differences between the 15 kHz- and 210 kHz-Horizon in the Fishery Harbour Area

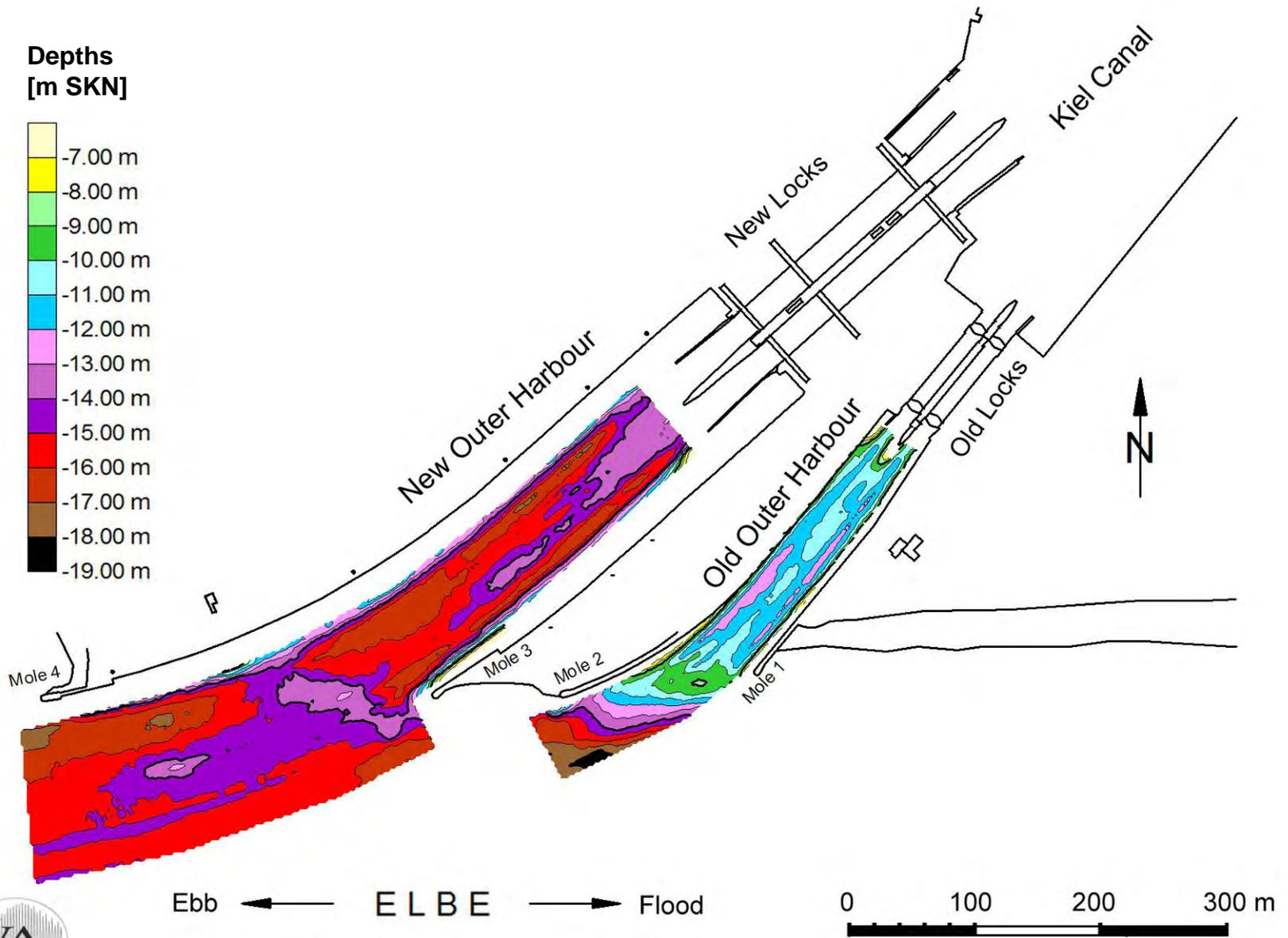
Lock Harbour  
 $V = 93.149 \text{ m}^3$   
 $A = 75.588 \text{ m}^2$   
 $V/A = 1,23 \text{ m}$

Outer Harbour  
 $V = 125.261 \text{ m}^3$   
 $A = 67.225 \text{ m}^2$   
 $V/A = 1,86 \text{ m}$

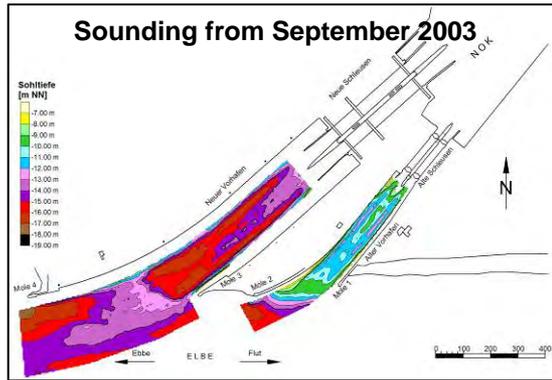
Differences between  
 15 kHz and 210 kHz



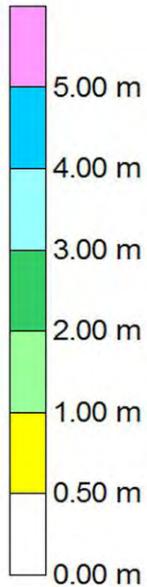
# Sounding Maps of the Outer Harbours of Brunsbüttel in September 2003 (15 kHz)



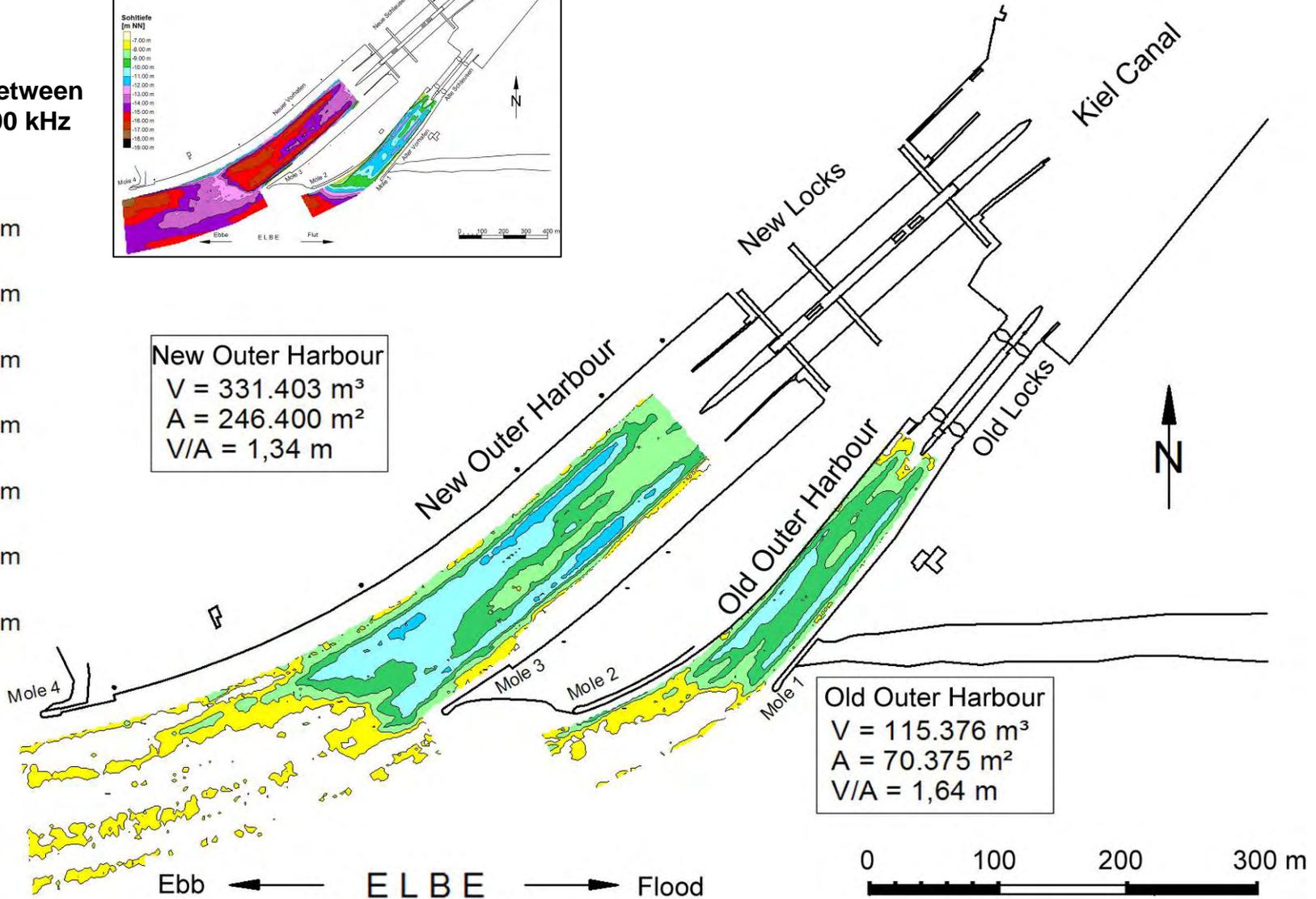
# Map of Differences between the 15 kHz- and 100 kHz-Horizon in the Outer Harbours of Brunsbüttel



Differences between 15 kHz and 100 kHz

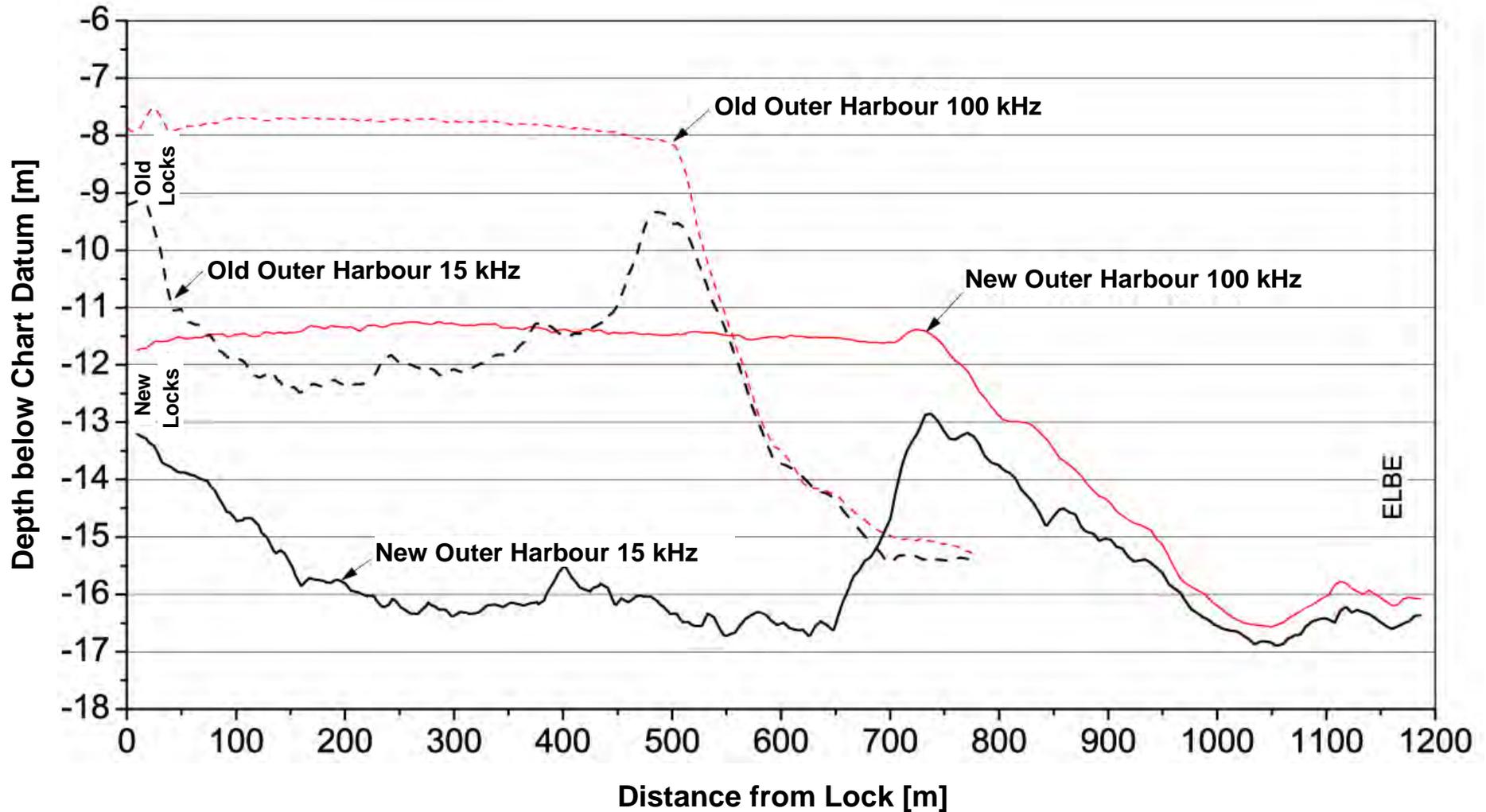


**New Outer Harbour**  
 $V = 331.403 \text{ m}^3$   
 $A = 246.400 \text{ m}^2$   
 $V/A = 1,34 \text{ m}$

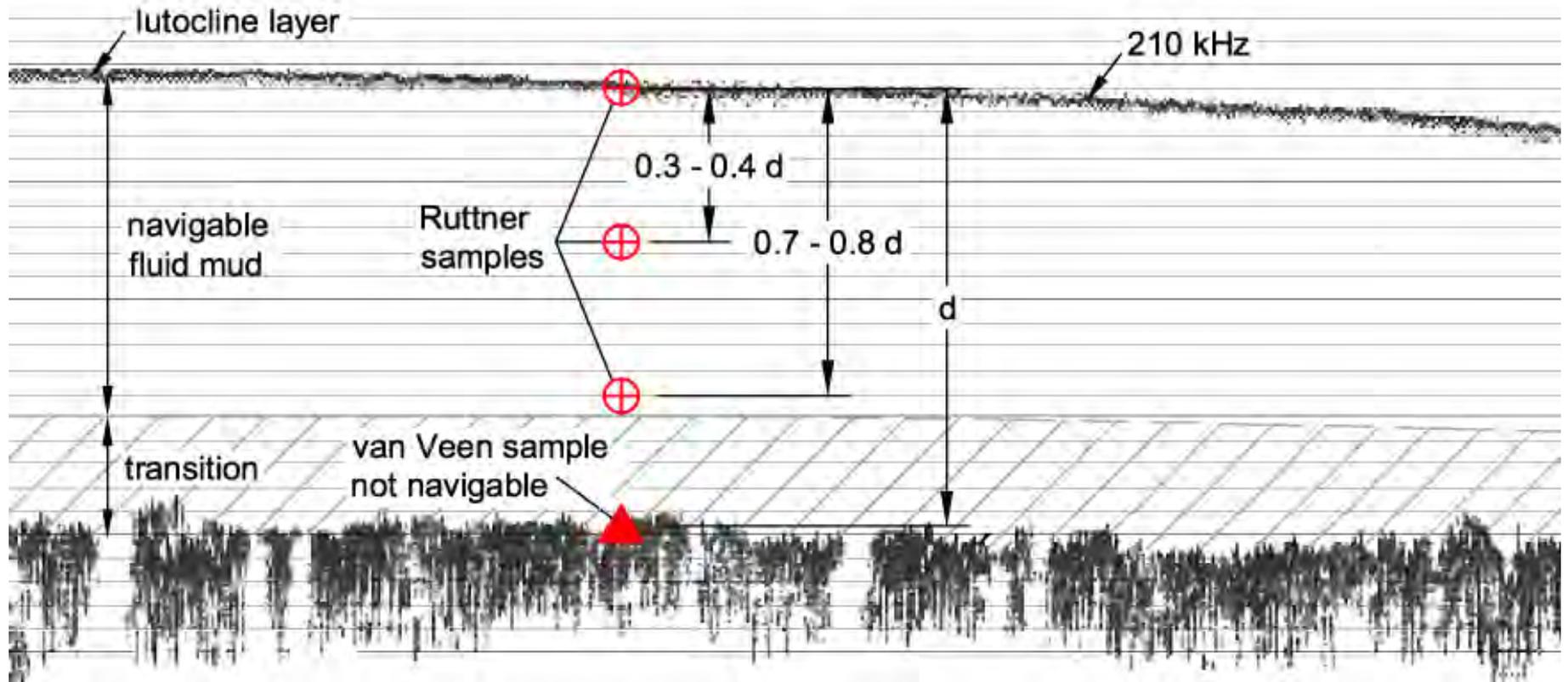


**Old Outer Harbour**  
 $V = 115.376 \text{ m}^3$   
 $A = 70.375 \text{ m}^2$   
 $V/A = 1,64 \text{ m}$

# Longitudinal Sections through the Outer Harbours of Brunsbüttel in September 2003 (15 kHz and 100 kHz)



# Sketch of Sample Positions in the Fluid Mud Layer (Sounding from December 2006 in Emden)



## Ruttner-Sampler with a Samples from the Lutocline

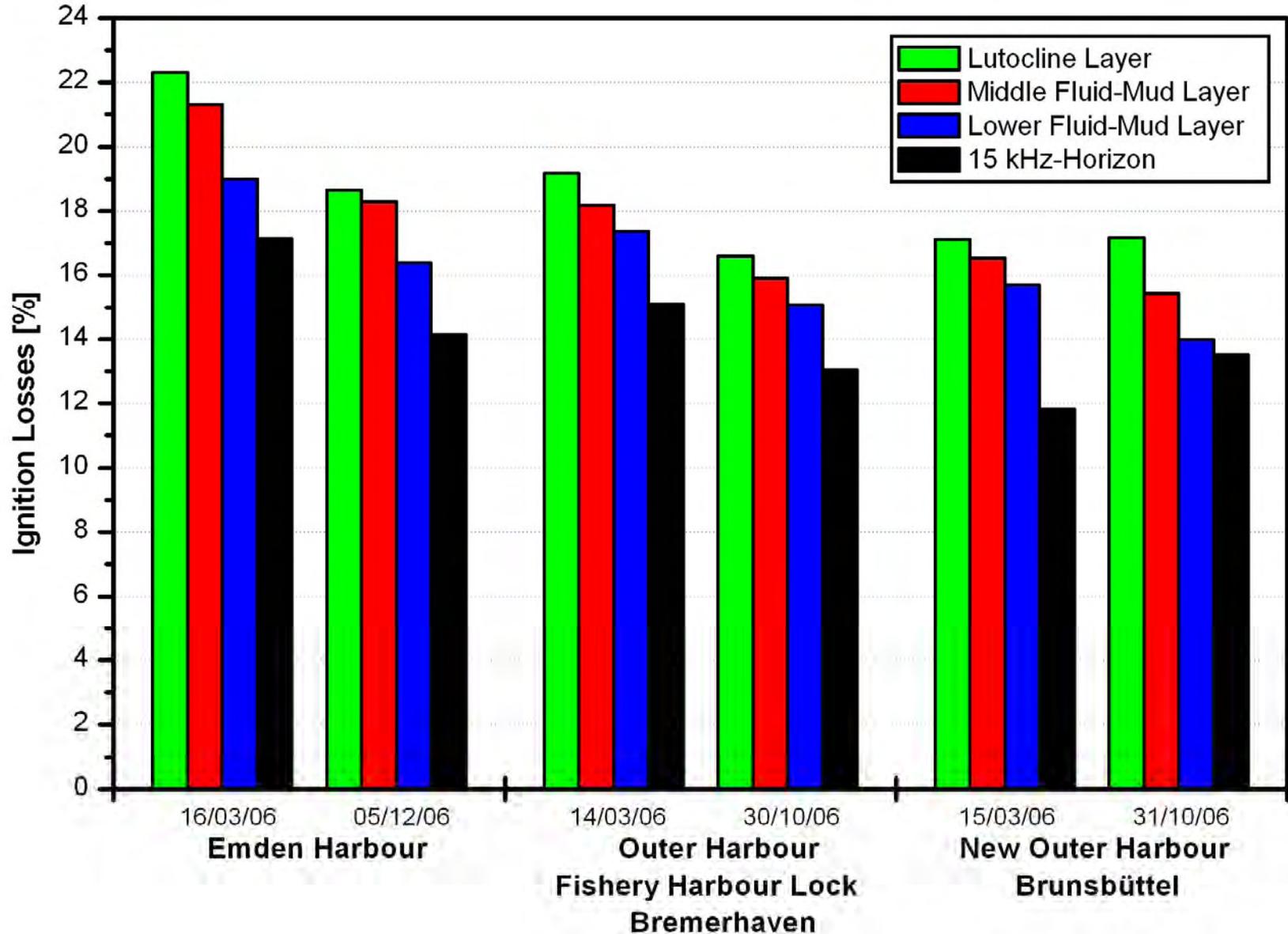


**Van Veen Bed Sample taken from the 15 kHz-Horizon in Bremerhaven on 15/03/2006**



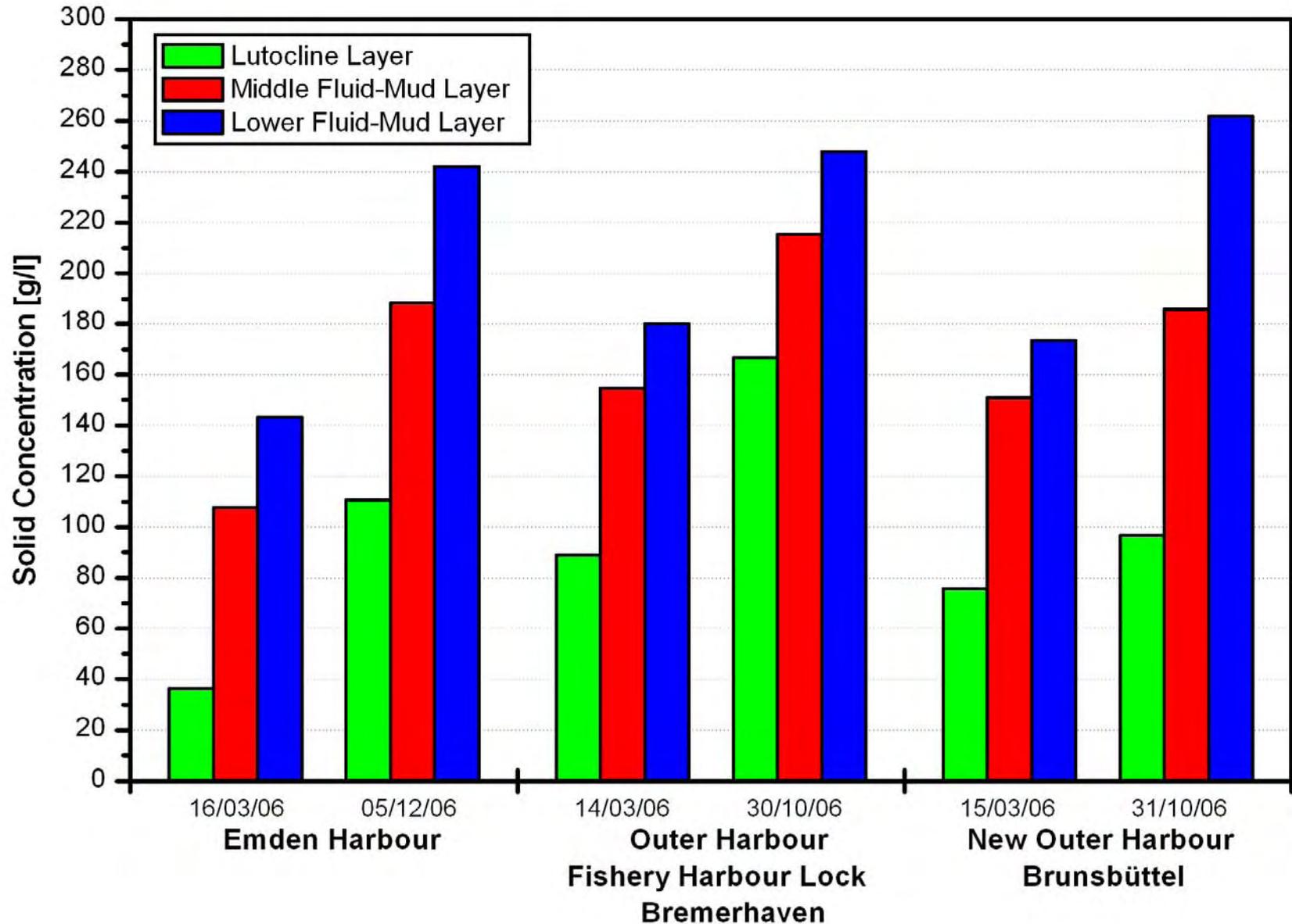
# Ignition Losses in the Different Layers and Harbours

Samples taken in Spring and Autumn 2006



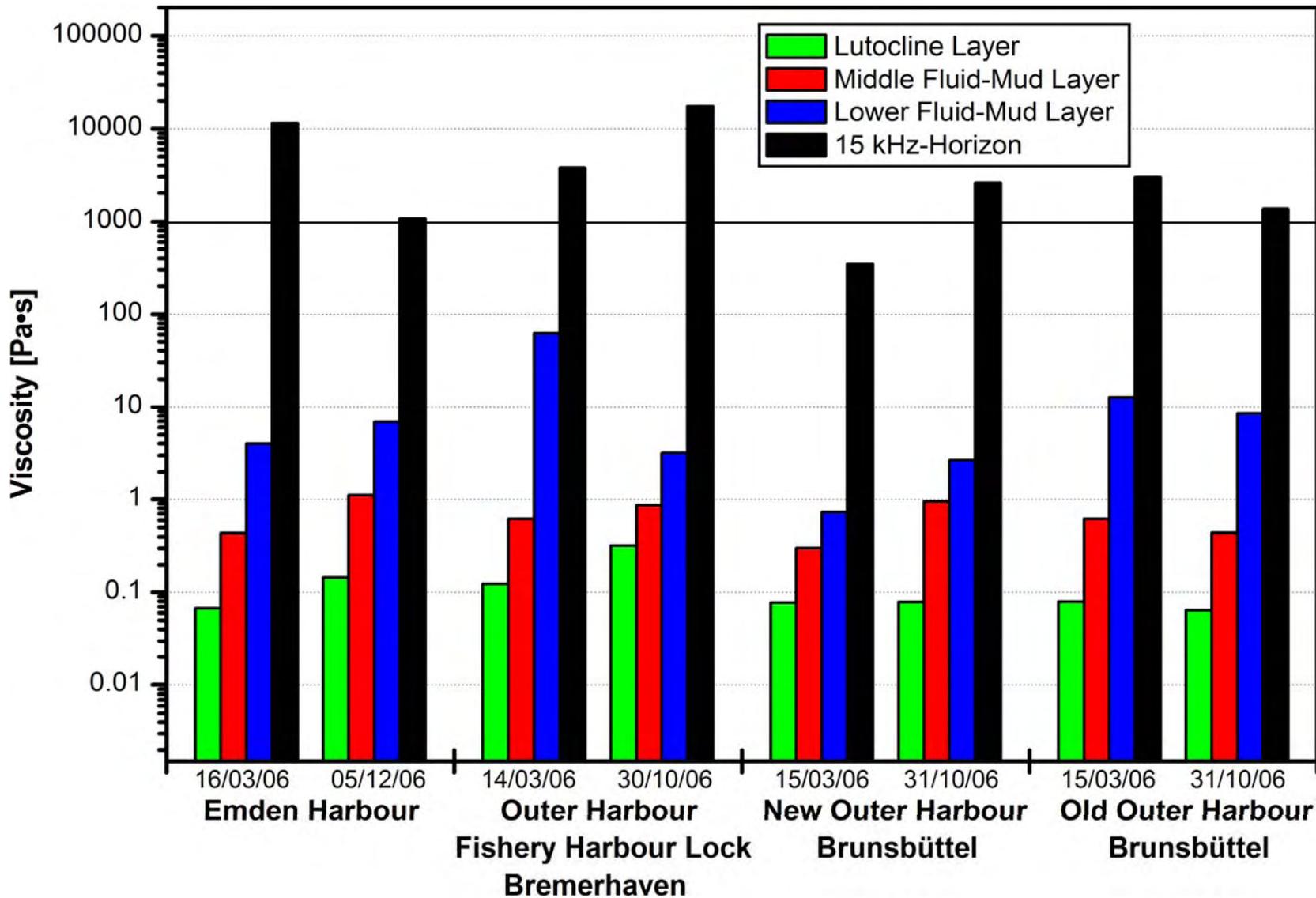
# Concentration of Solids in the Different Layers and Harbours

## Samples taken in Spring and Autumn 2006



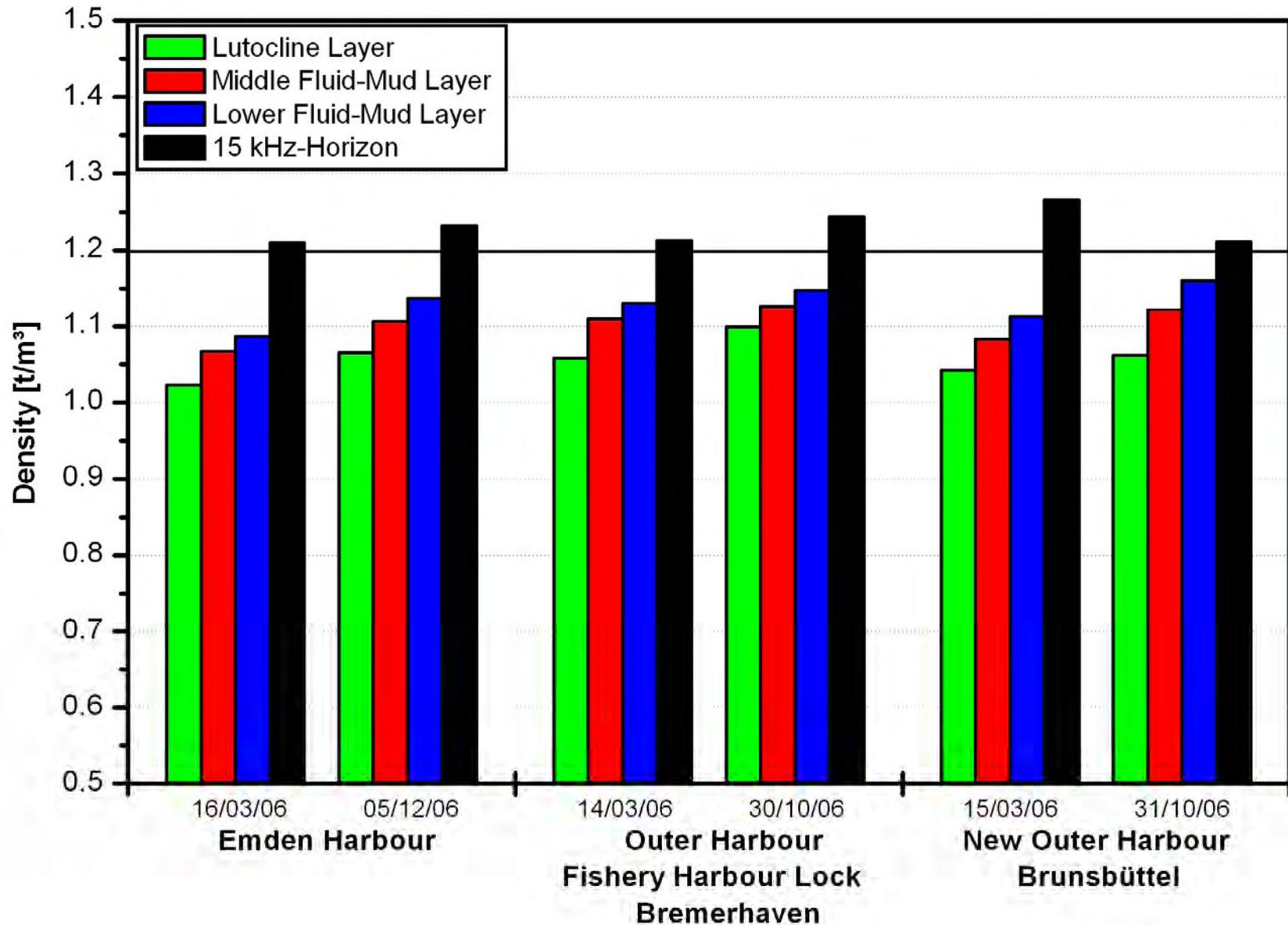
# Dynamic Viscosities in the Different Layers and Harbours

## Samples taken in Spring and Autumn 2006

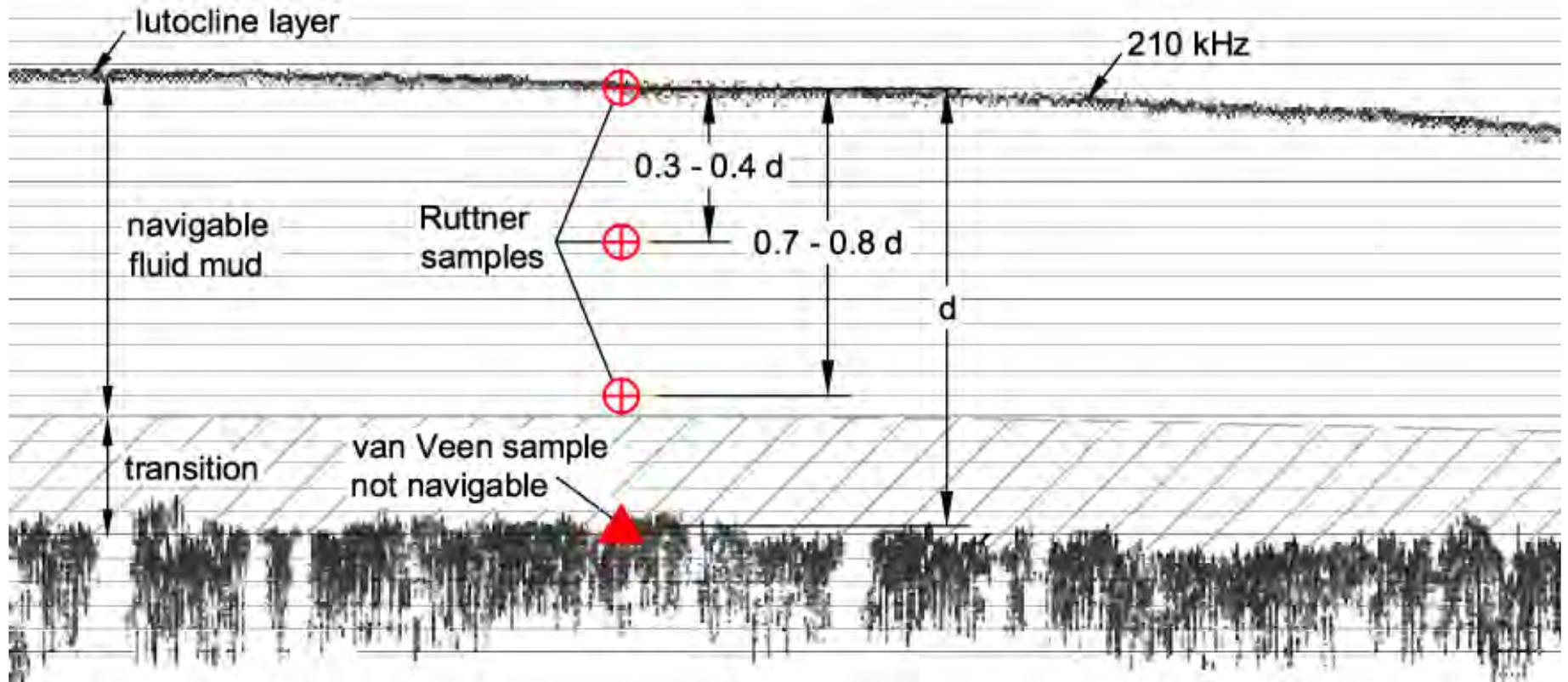


# Densities in the Different Layers and Harbours

## Samples taken in Spring and Autumn 2006



# Sketch of Sample Positions in the Fluid Mud Layer (Sounding from December 2006 in Emden)



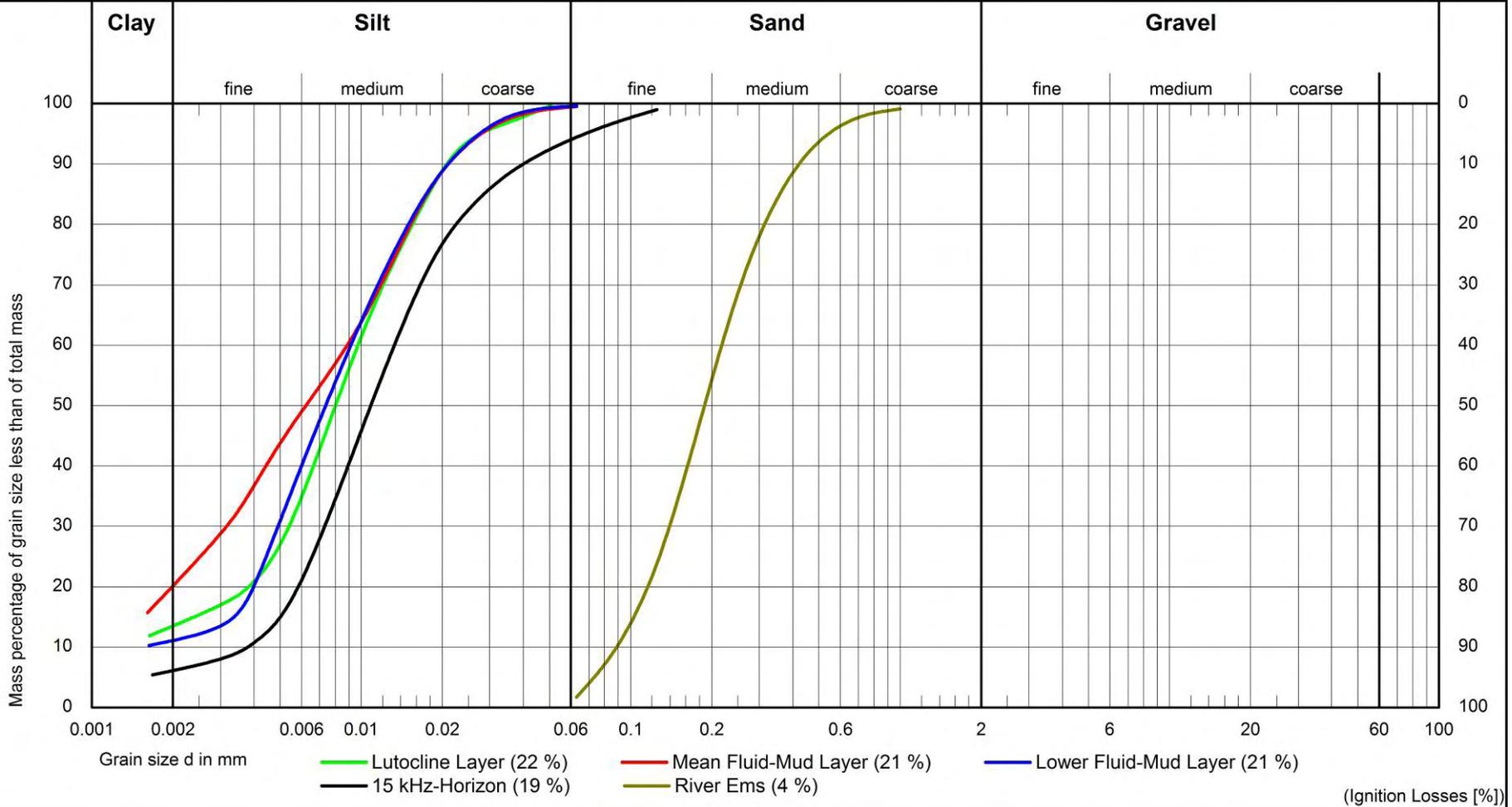
Taken by: University of Applied Sciences Bremen  
Institute of Hydraulic Engineering

Date: 16.03.2006

# Grain-Size Analysis

Project: Soil Samples, March 2006  
Emden Harbour

Method: VAN-VEEN Bottom-Sampler  
Ruttner-Sampler



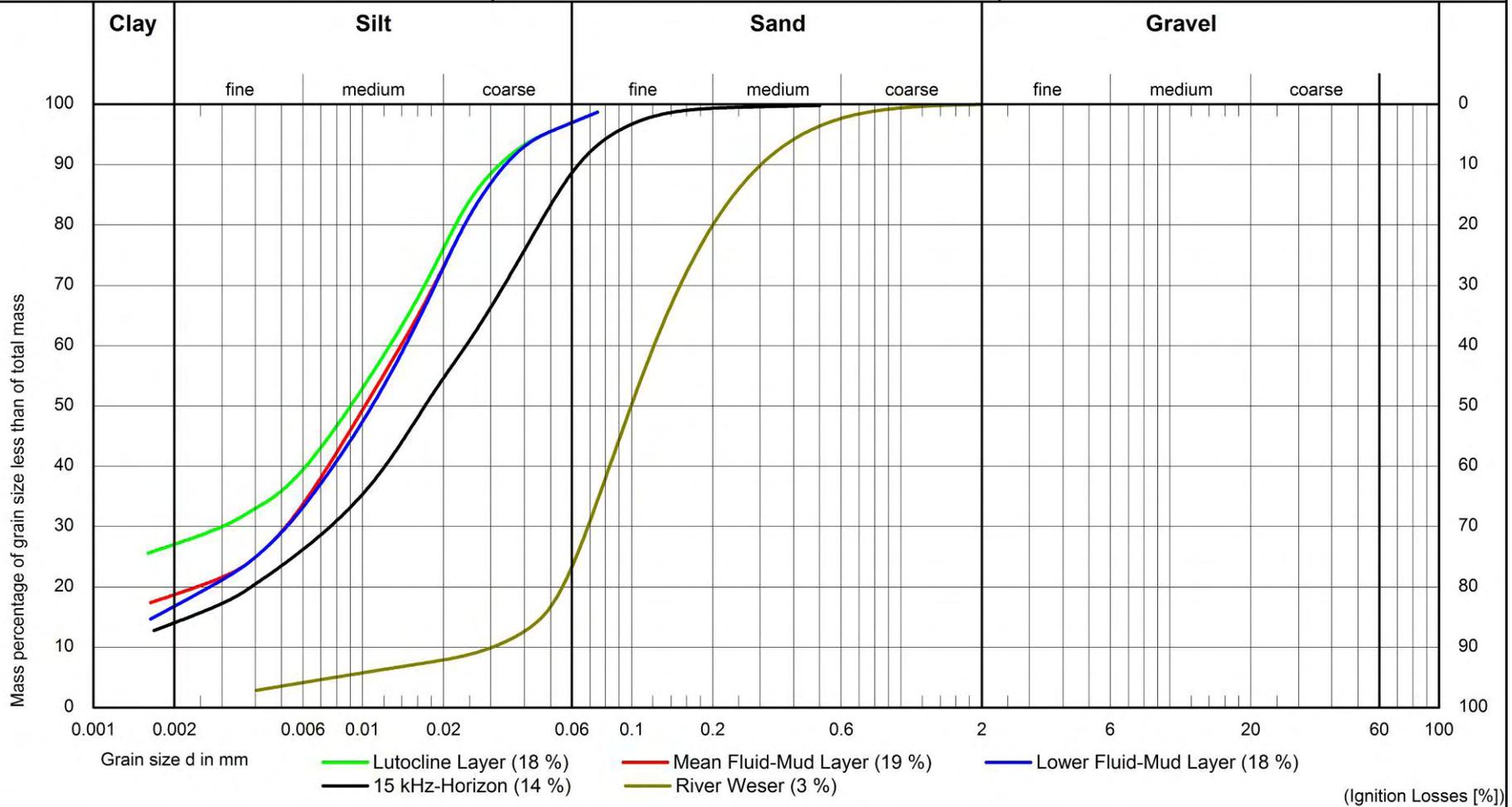
Taken by: University of Applied Sciences Bremen  
Institute of Hydraulic Engineering

Date: 14.03.2006

# Grain-Size Analysis

Project: Soil Samples, March 2006  
Outer Harb. Fishery Harb. Bremerhaven

Method: VAN-VEEN Bottom-Sampler  
Ruttner-Sampler



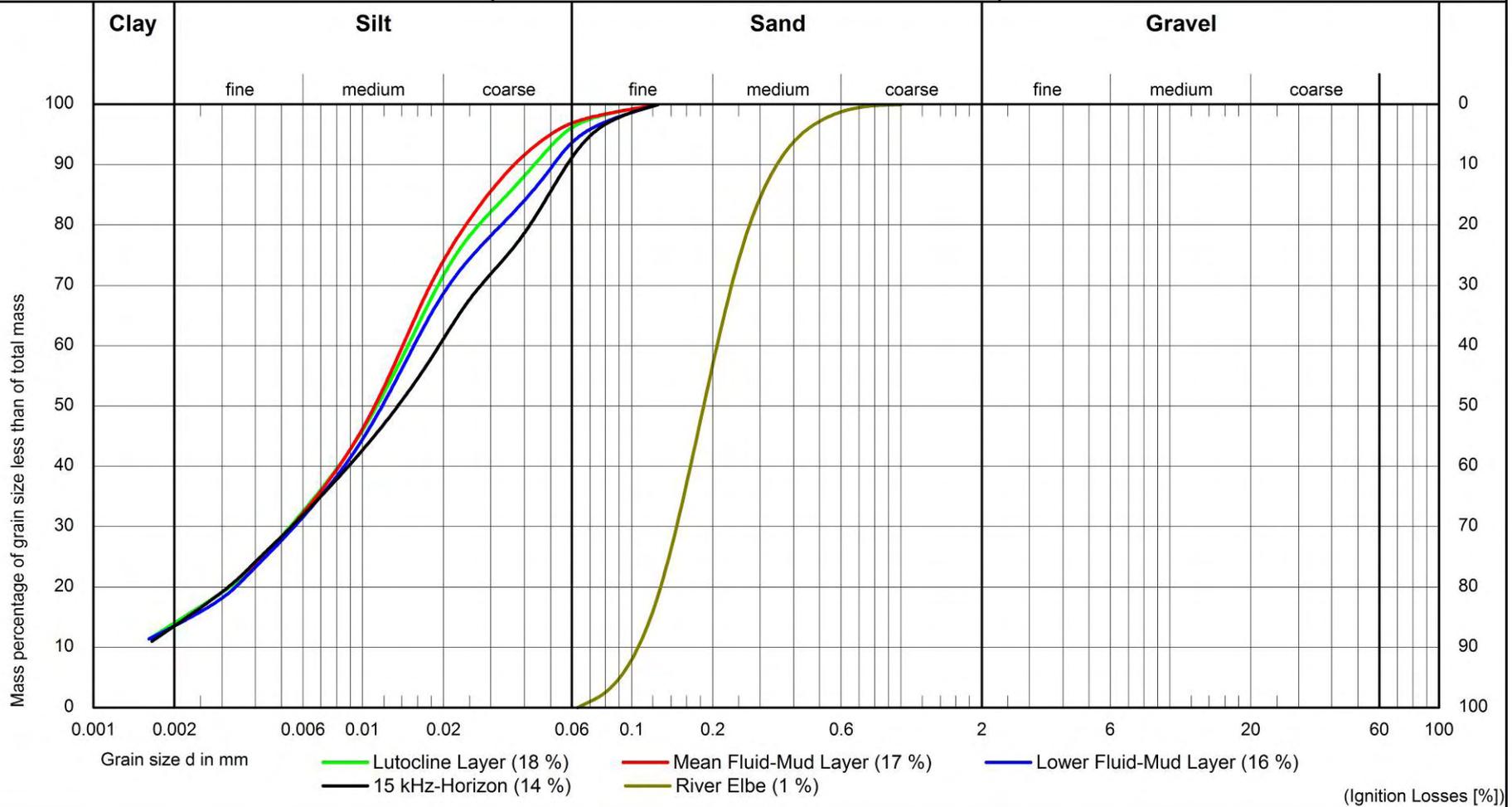
Taken by: University of Applied Sciences Bremen  
Institute of Hydraulic Engineering

Date: 15.03.2006

# Grain-Size Analysis

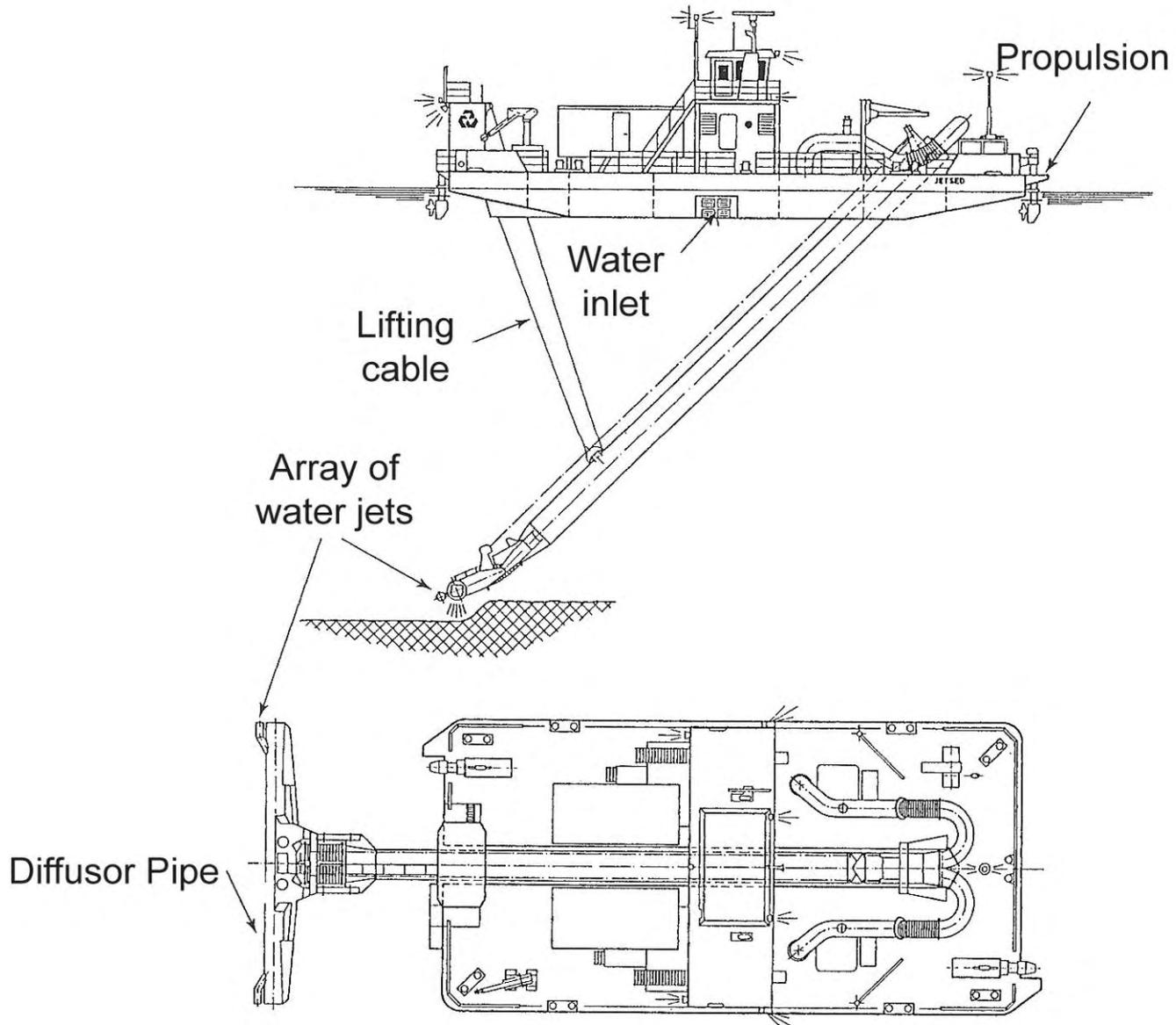
Project: Soil Samples, March 2006  
New Outer Harbour Brunsbüttel

Method: VAN-VEEN Bottom-Sampler  
Ruttner-Sampler





# Injection Dredger



## 13. KFKI Seminar zur Küstenforschung

# EIGENSCHAFTEN UND VERHALTEN VON FLUID-MUD IN BRACKWASSERHÄFEN