



**DEME**

**Dredging, Environmental  
& Marine Engineering**

# Dredging the Panama Canal and its Challenges

III WEDA Central America Chapter Congress

13 - 15 September 2016

Creating Land for the Future



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Content

**Who**  
are we?

**What**  
do we do?

Recent Projects  
in the  
Panama Canal

**Questions**







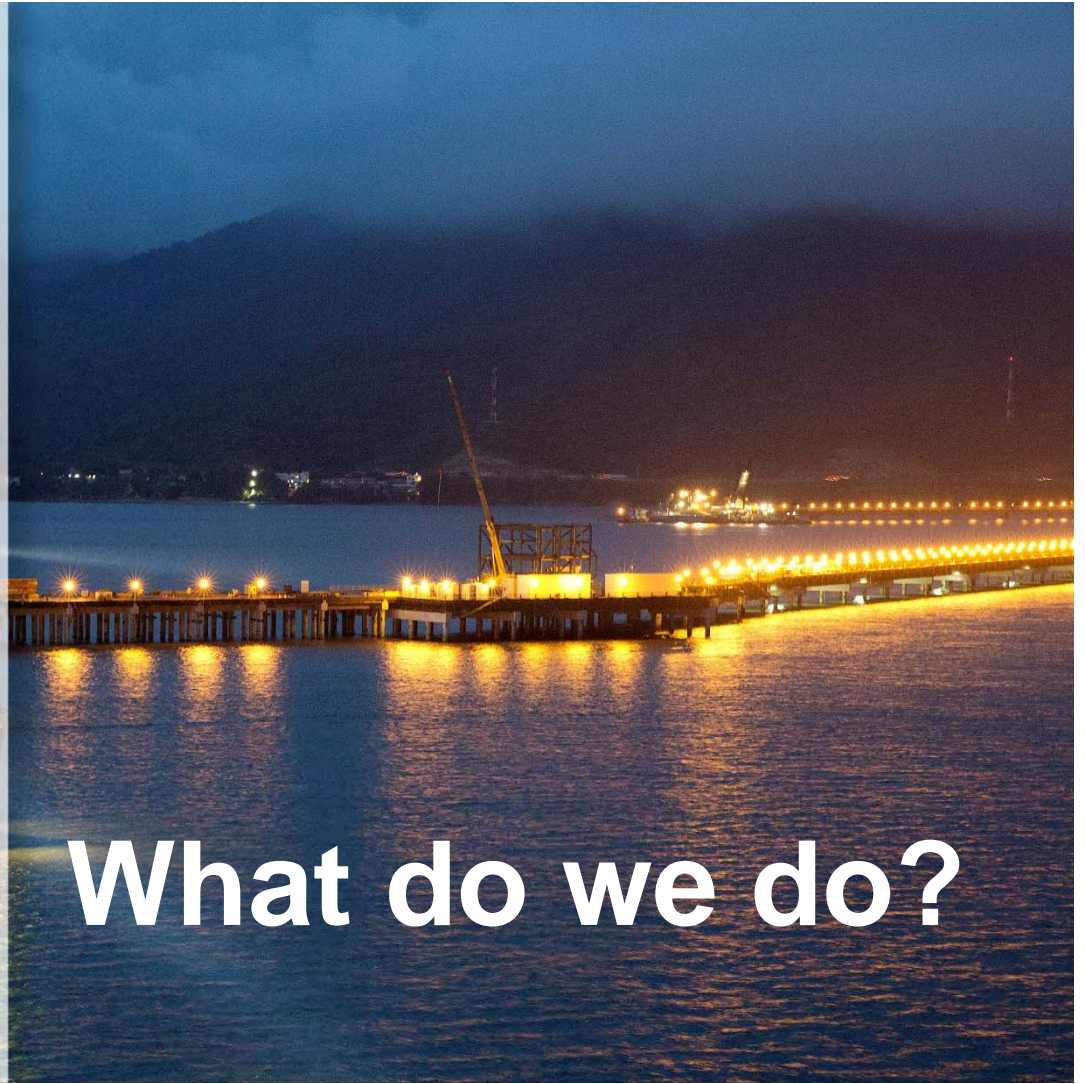
**Who are we?**



- Global solution provider in the maritime environment
- 150 years of experience in its core dredging activities
- Making the difference through innovation, but in a sustainable and safe way
- Active worldwide
- Turnover 2015: 2,6 billion USD
- + 4,000 employees







**What do we do?**



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## 6 activities for global solutions

Dredging & land  
reclamation

Marine and  
offshore  
solutions

Environmental  
solutions

Fluvial and  
marine  
resources

Infra marine  
solutions

Concessions &  
project finance  
solutions

DEME is a global solution provider







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## Dredging and land reclamation



### Dredging Armada active on the Suez Canal Expansion Project (2015)

Egypt

- JV with GLDD
- Contract Value: 540 million \$
- 40 million m<sup>3</sup> dredged
- Realised in only 10 months





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## Dredging and land reclamation

### New Doha Port Project (2012 - 2016)

Dredging, reclamation and  
breakwater construction

.....  
**Qatar**

- Contract Value: 1.2 billion \$
- 46 million m<sup>3</sup> dredged / excavated
- Organisation of reclamation area







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## Dredging and land reclamation



- 100,000 barrels of crude oil a day
- 12 million m<sup>3</sup> dredged
- Logistics and weather in open sea

SARB, Construction  
of two energy islands  
120 km offshore the  
coast of Abu Dhabi

.....  
UAE







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Marine engineering

## Heavy-lift Jack-up vessel INNOVATION

### Nordsee One

- Contract value: 260 million \$
- EPCI contract
- 72 monopiles of 3 MW → 216 MW
- 250,000 households
- Water depth up to 29m







## Decontamination of the 500 ha site of London Olympics 2012

UK



- Treatment of 1.2 million tonnes contaminated soil
- Maximizing the quantity of reused material
- Minimizing disposal of material







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## Marine engineering & civil works

- Contract Value: 800 million \$
- Fabricating and installation of tunnel elements, trench cleaning, backfilling, ...



Fehmarnbelt

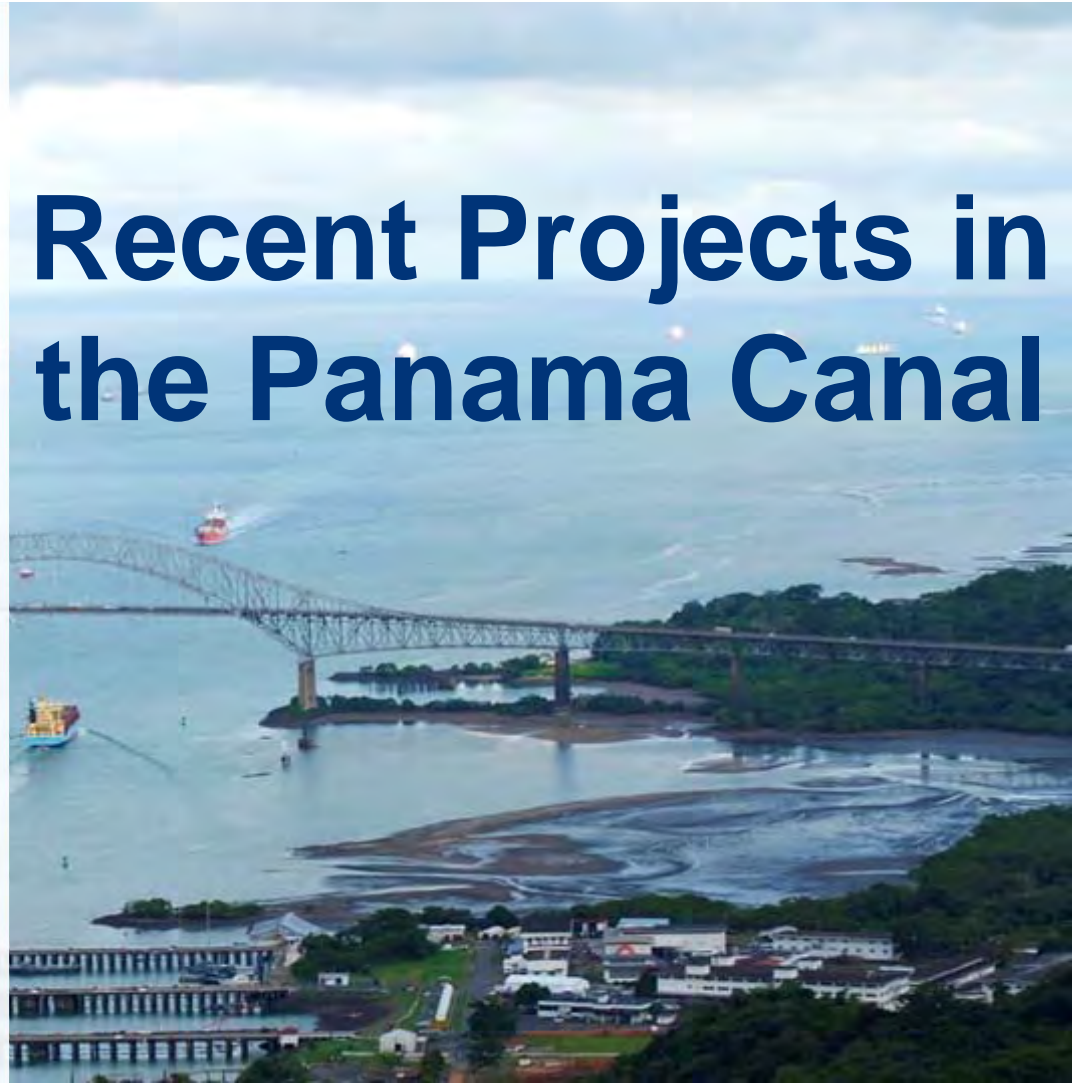
.....  
Danmark -  
Germany

The Fehmarnbelt link between Danmark and Germany will be the world's longest immersed road and rail tunnel (18 km).

Time saving: 10 min ↔ 1-2 hours (by road or ferry)



# Recent Projects in the Panama Canal





**Widening and Deepening of the Pacific Entrance and South Approach Channel  
to the Third Set of Locks of the Panama Canal**

**Widening and Deepening of the Northern Reaches of the Gatun Lake**

**Maintenance Dredging at Miraflores and Balboa Reach**

**Widening and Maintenance of the Pacific Entrance**







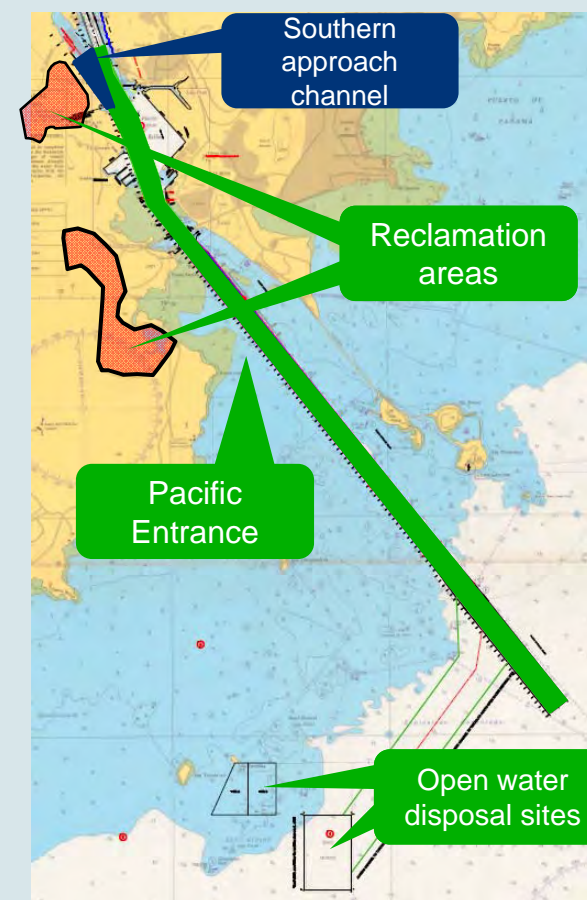
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## Project Locations





- Campaign 2008 – 2013
- Capital dredging:
  - Minimum width of 225 m
  - Design depth: 16.3 m MLWS – 0.3/0.4 m tolerance
  - Paid volume: 11,145,968 m<sup>3</sup>
- Open water disposal and reclamation areas
- Blasting campaign: 1,500,000 m<sup>3</sup>





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## Widening and Deepening of the Pacific Entrance Deployed Equipment



### **'CSD Vlaanderen XIX'**

.....

Length: 100 m  
Power: 11,728 kW (1,766 kW on cutter head)  
Dredging depth: 6.5 – 32 m  
Accommodation: 20 people



### **'CSD d'Artagnan'**

.....

Length: 124 m  
Power: 28,200 kW (6,000 kW on cutter head)  
Dredging depth: 6 – 35 m  
Accommodation: 43 people



### **'BHD Samson'**

.....

Length: 67 m  
Power: 4,124 kW  
Bucket capacity: 15 – 40 m³  
Dredging depth: up to 26 m  
Accommodation: 20 people







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## Widening and Deepening of the Pacific Entrance Deployed Equipment



### 'TSHD Breydel'

Length: 125 m  
Hopper capacity: 11,296 m<sup>3</sup>  
Power: 11,037 kW  
Dredging depth: up to 43 m  
Accommodation: 20 people



### 'TSHD Lange Wapper'

Length: 130 m  
Hopper capacity: 13,700 m<sup>3</sup>  
Power: 13,860 kW  
Dredging depth: up to 50 m  
Accommodation: 32 people



### 'Yuan Dong 007'

Length: 101 m  
Drilling system: 10 hydraulic  
rail-way drill rigs of 30 m  
Drilling depth: 60 m  
Accommodation: 68 people





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## Widening and Deepening of the Pacific Entrance Deployed Equipment



### ‘SHB Sloeber’

.....

Length: 91 m  
Hopper capacity: 2,735 m<sup>3</sup>  
Accommodation: 8 people

Sister barge ‘Pagadder’



### ‘SHB Pantagruele’

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Length: 77 m  
Hopper capacity: 2,000 m<sup>3</sup>  
Accommodation: 9 people





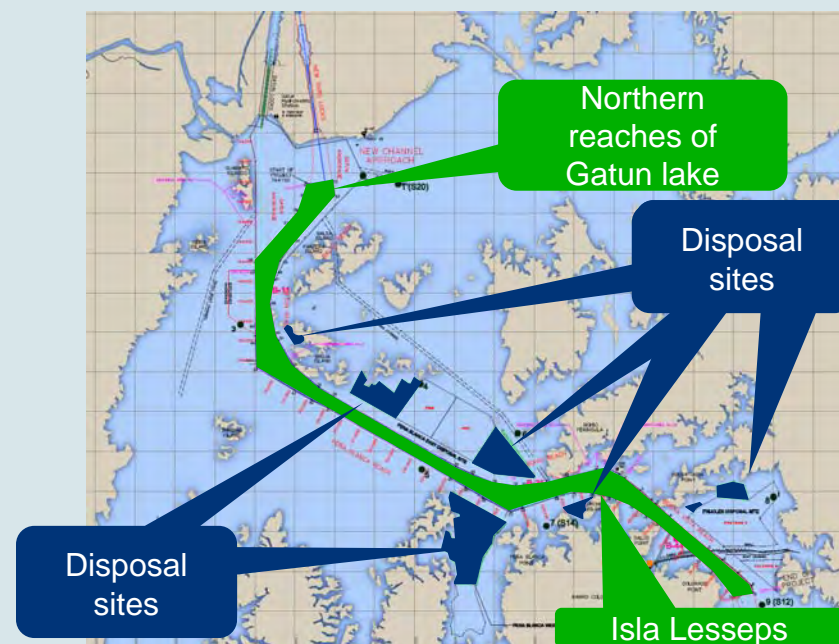
- Challenge – Basalt dredging
  - Very hard material → UCS up to 150 MPa
  - Thick layers drilling and blasting → Yuan Dong 007
  - Re-handling by CSD, BHD, clamshell
  - Thin layers → crushing + re-handling → specially designed crushing cutter head







- Campaign 2010 – 2012
- Capital dredging:
  - Minimum width of 305 m
  - Design depth: -16.76 m MLL – 0.6 m tolerance
  - Paid volume: 4 009 278 m<sup>3</sup>
- Open water disposal and reclamation areas
- Blasting campaign: 160,000 m<sup>3</sup>
- Object and tree removal campaign





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## Widening and deepening of the Northern reaches of the Gatun Lake Deployed Equipment



**'CSD d'Artagnan'**  
.....



**'TSHD Breydel'**  
.....



**'BHD Samson'**  
.....

**'D&B pontoon Thor'**  
.....

**'SHB Pagadder & Sloeber'**  
.....



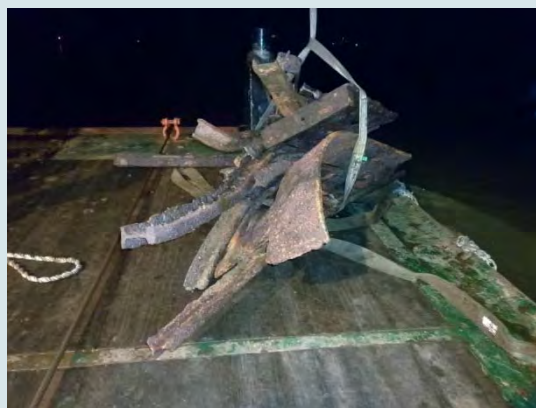


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## Widening and deepening of the Northern reaches of the Gatun Lake Challenge

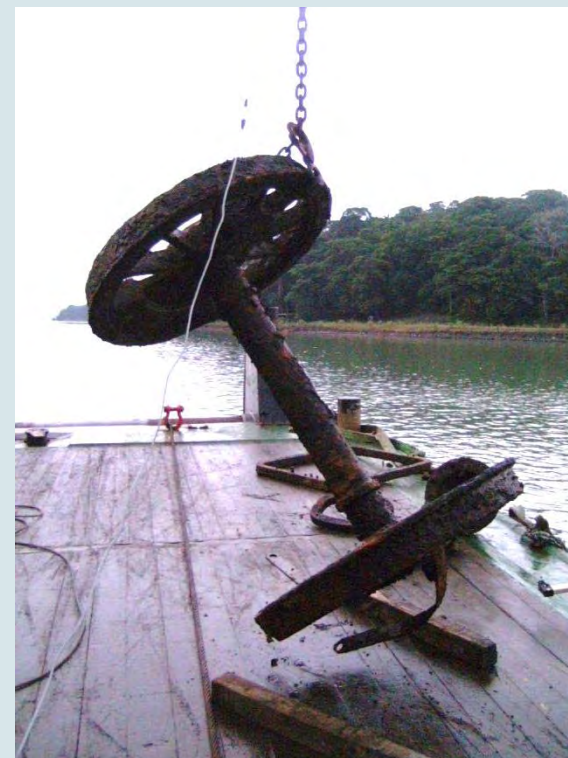
- Challenge – Object and tree removal prior to dredging

- 80T steel removed by multi-cat
- Locomotives (10T)
- Wagons (5T)
- Rail sections, cables, ...



- Challenge – Isla Lesseps

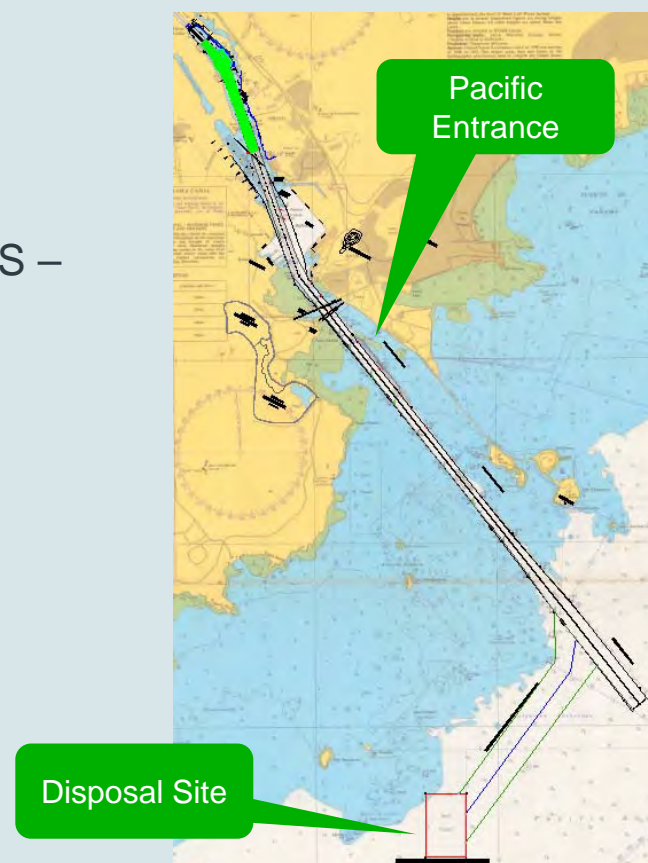
- Re-handling pre-blasted material with CSD







- Campaign 2014
- Maintenance dredging:
  - Design depth: 12.92 / 14.20 / 14.80 / 16.30 m MLWS – tolerance up to 14.80 m
  - Paid volume: 1,855,000 m<sup>3</sup>





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## Maintenance Dredging at Miraflores and Balboa Reach Deployed Equipment



### 'TSHD Breughel'

Length: 122 m  
Hopper capacity: 11,796 m<sup>3</sup>  
Power: 11,038 kW  
Dredging depth: up to 43 m  
Accommodation: 20 people





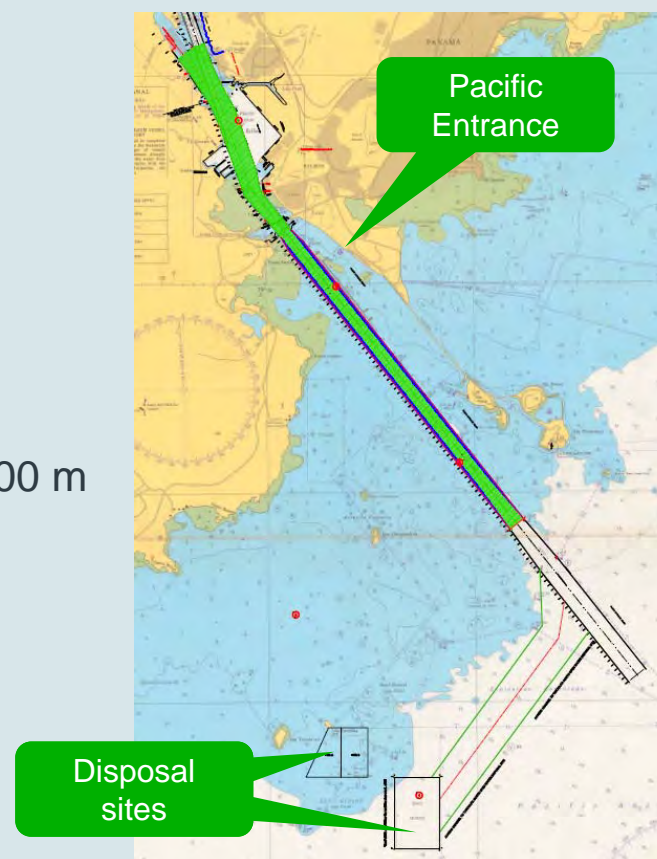
- Challenge – Traffic
  - Vessels transiting or mooring in commercial ports
  - Maintenance dredging within the existing canal
  - Only 4 hrs / day without traffic → dredging in front of the locks
  - Need for optimized dredging sequence
  
- Challenge – Shallow dredging
  - Material up to +1 m
  - Maximum draught dredger: 9.10 m







- Campaign 2016
- Maintenance dredging (green area):
  - Design depth: 16.3 m MLWS – 0.4 m tolerance
  - Paid volume: 1,540,784 m<sup>3</sup>
- Capital dredging (blue area):
  - Widening of 37.5 m on both sides → new width = 300 m
  - Design depth: 16.3 m MLWS – 0.9 m tolerance
  - Paid volume: 4,860,859 m<sup>3</sup>
- Removal of Oil Crib Structure





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## Widening and Maintenance of the Pacific Entrance Deployed Equipment



.....  
**‘CSD d’Artagnan’**  
.....

**‘SHB Pagadder & Sloeber’**  
.....



.....  
**‘TSHD Lange Wapper’**  
.....





- Challenge – basalt dredging without drilling and blasting
  - Specially designed cutter head
  
- Challenge – Shallow dredging
  - Slope dredging with TSHD
  
- Challenge – Dredging isolated outcrops of hard material with TSHD
  - Specially designed crush head
  - Reducing delays







**Thank you for  
your attention**

**Questions?**