PIANC French Section

PIANC Mediterranean Days

and Conference «Port of the future» by Cerema

25 to 27 october 2023 in Sete France

Evaluation of port facilities for transport operations of widmills components

Lourdes Pecharromán, Raúl Redondo, Leandro Pires
Siport21

Features

Maritime-port engineering consultancy (Madrid, Spain)

24 years

1.500+ projects

58 countries

25 people

1.800 seafares

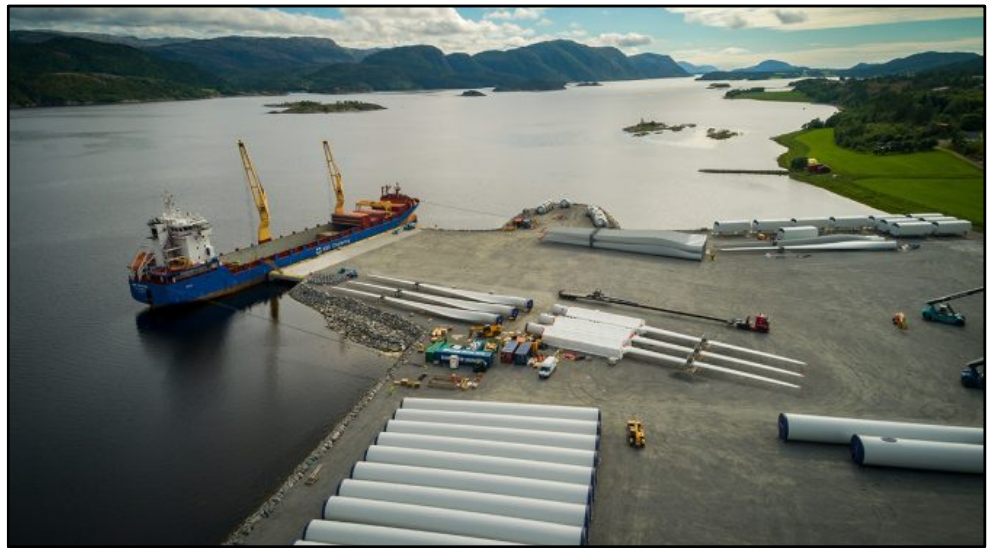
600 training programmes

50 International Shipping companies

Real Time Simulator Center
Maritime Training Provider - DNV

Index

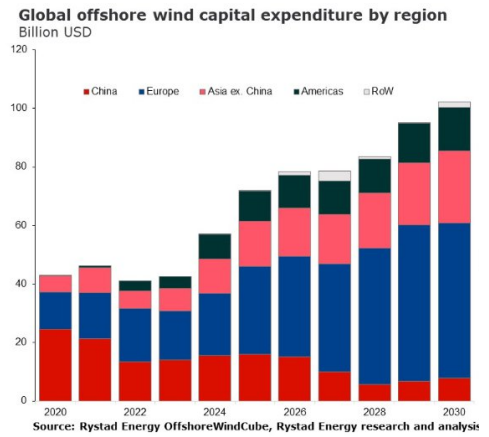
- Introduction
- Assesment
  - Access to port areas of vessels with heavy cargo
  - Loading / unloading process
- Case study

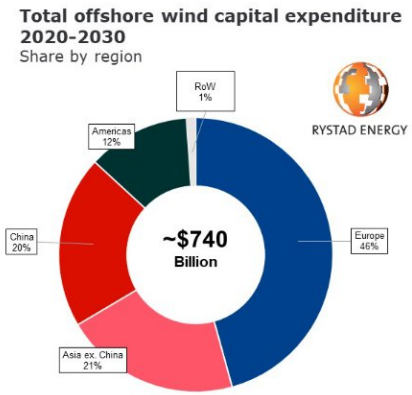


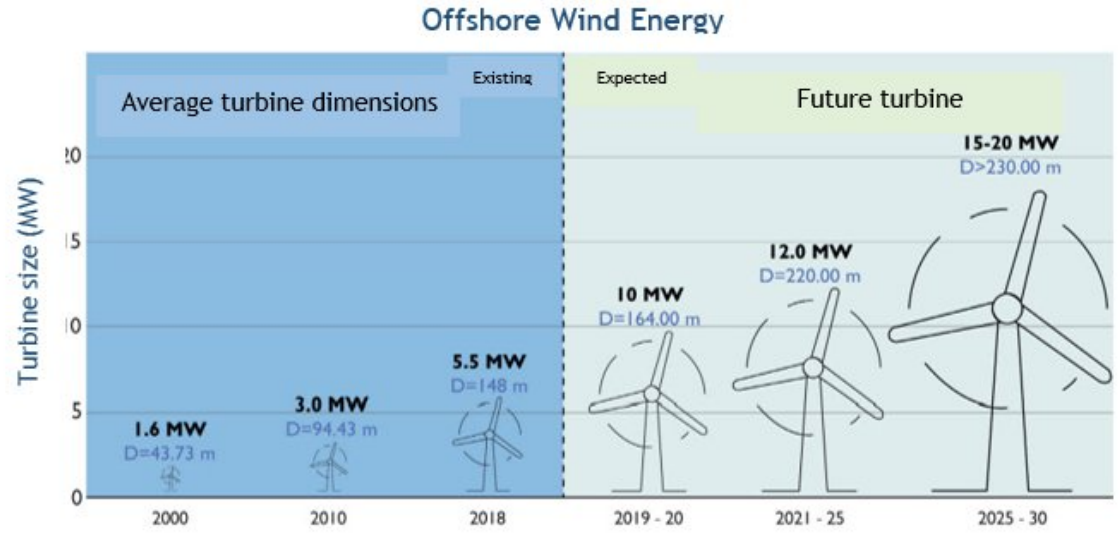
Introduction

Offshore wind

- Very specific industry, strong growth and great expectations
- Efficiency improvement
- Large volume elements
- Transportation challenge
  - Inland transport
  - Waterborne transport







Introduction

Port infrastructure and fairways

- Large areas (storage and handling)
- Large volume components
- Facilities and equipment for handling high loads

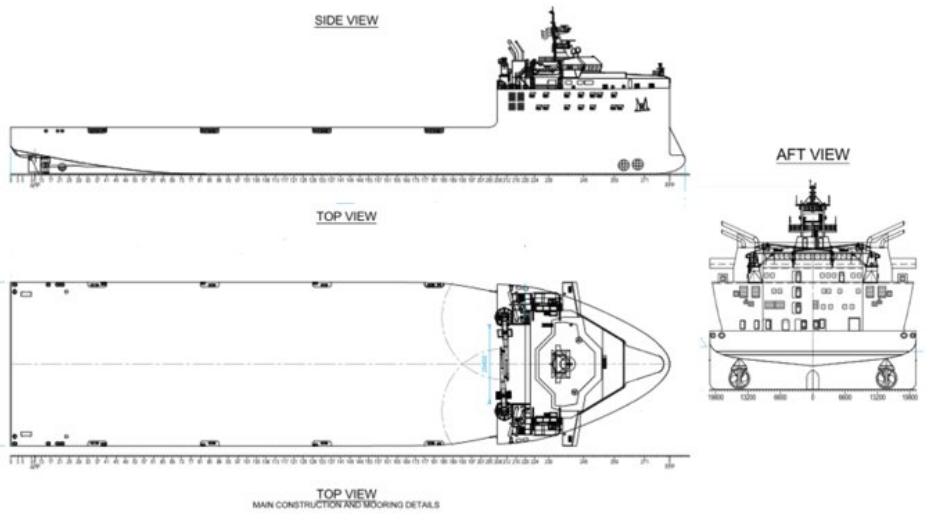
- Mooring and loading
  - Procedures
  - Loading / unloading operations
  - Operational limits

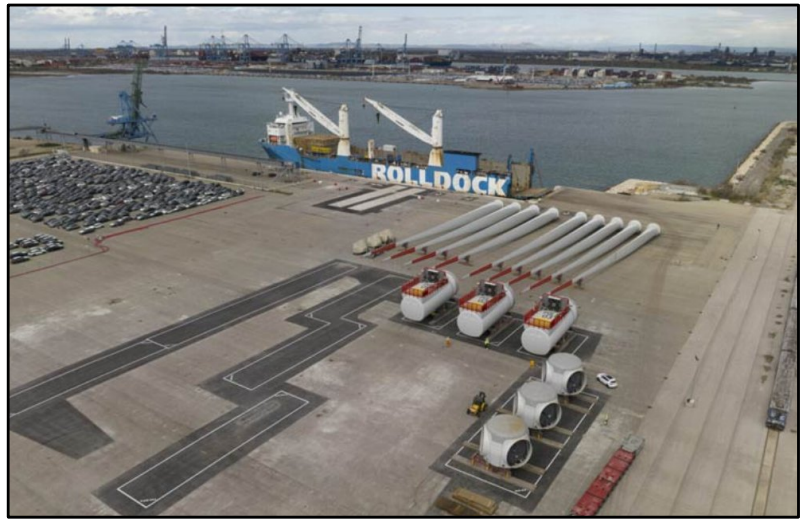
- Navigation
  - Compatible navigable and manoeuvring areas
  - Additional manoeuvring assistance (tugs)

Introduction

Heavy lift vessels

- L/B → 3.8-4.5
- Large draft variation (16 m)
- Exposed to large loads (75.000 t)
- Loading process
  - Flo-Flo / Ro-Ro / skidd on
- Propulsion: azimuth propellers (2) + bow thruster

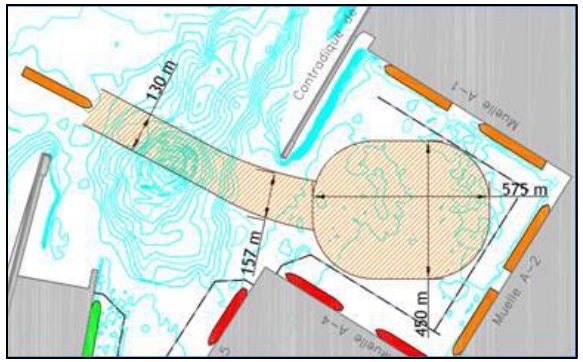


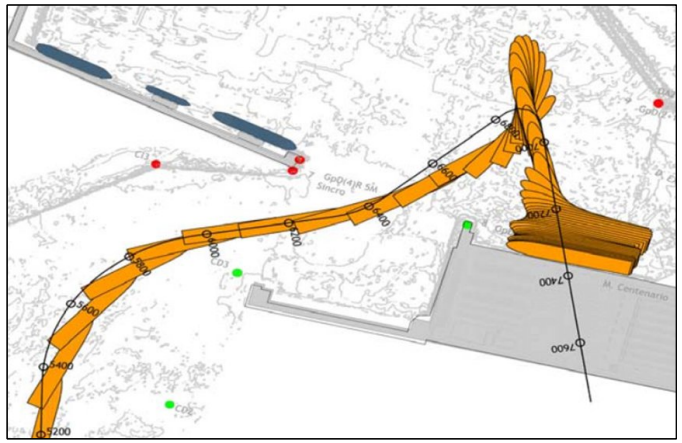


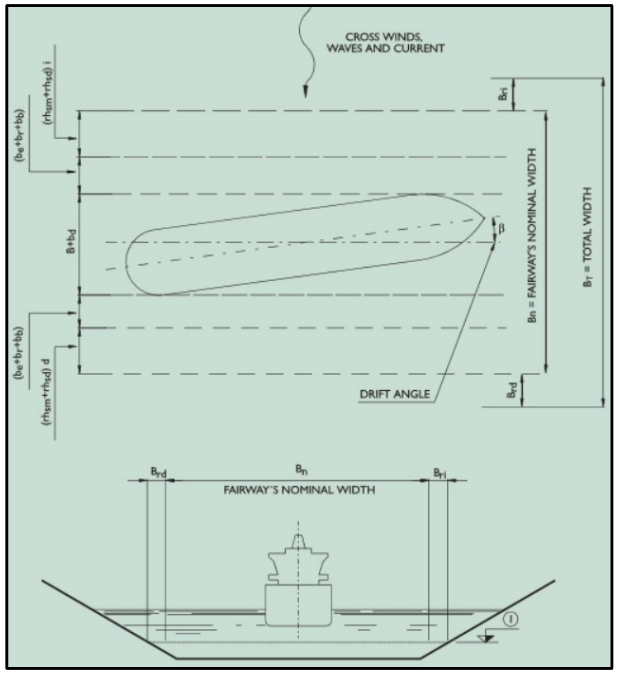
Assessment

Access conditions of vessels to port areas - Methodology

- Concept design (empirical formulation ROM 3.1-99 / PIANC 121 - 2014)
- Numerical model with Autopilot + safety margins
- Real Time Simulator (RTS)



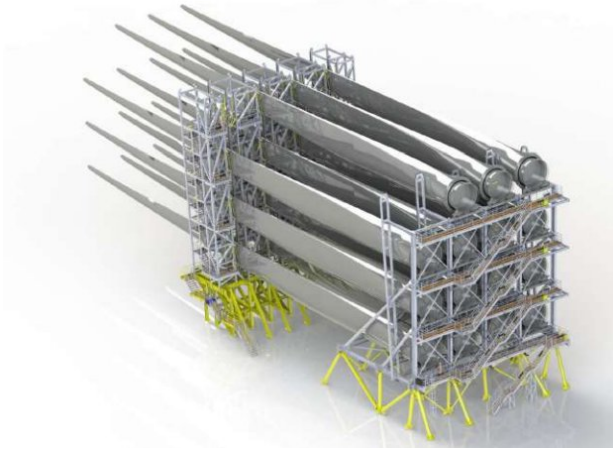




Assessment

Loading /unloading process

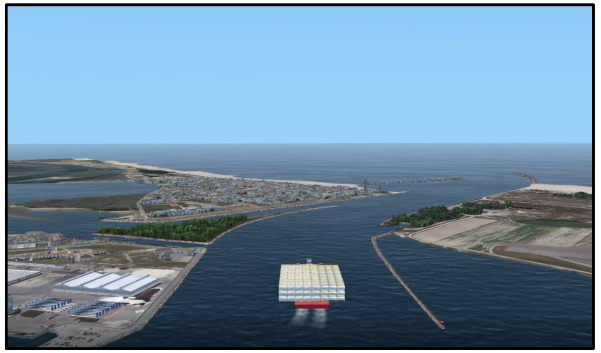
- Relative movements between vessel and cargo → Limited movements
- Stowage process → Control loads
- Grillage and sea fastening
- Passing ships effects when loading / unloading

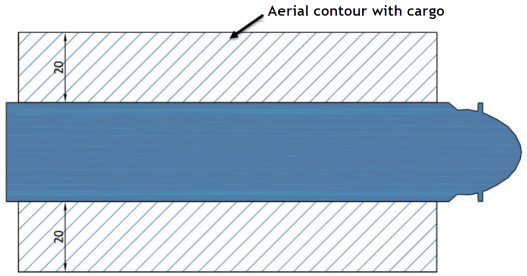


Case study

1. REQUIRED AERIAL & NAVIGABLE AREA FOR SAFE MANOEUVRES
2. ACCESS LIMITS
3. TUG REQUIREMENT

- Access channel with limited width (straight and curved sections)
- Wide sheltered manoeuvring area with other nearby terminals
- Wind (20 kn) + waves (Hs = 2.5 m open sea) + river discharge current (1.5 kn) (river + tide)
- Heavy lift vessel 173 x 42 x 5.5 m
- Manoeuvres to / from the offshore berth in the port
  - Approaches without cargo
  - Departures with cargo
    cargo stacked along and across the vessel
    length extended beyond the beam up to 20 m





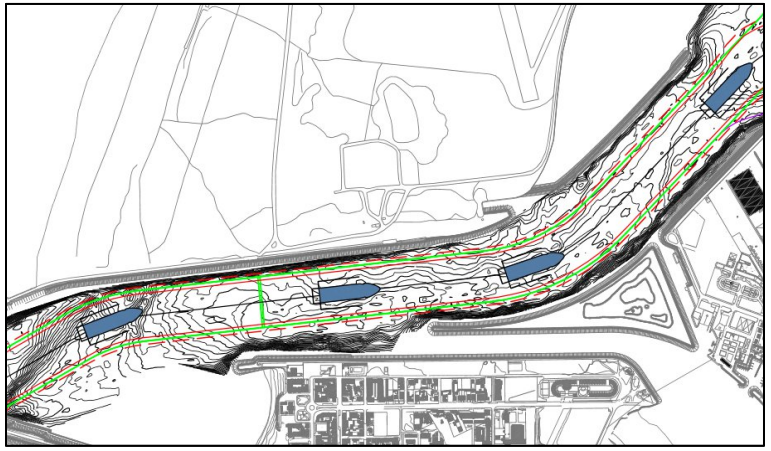
Case study

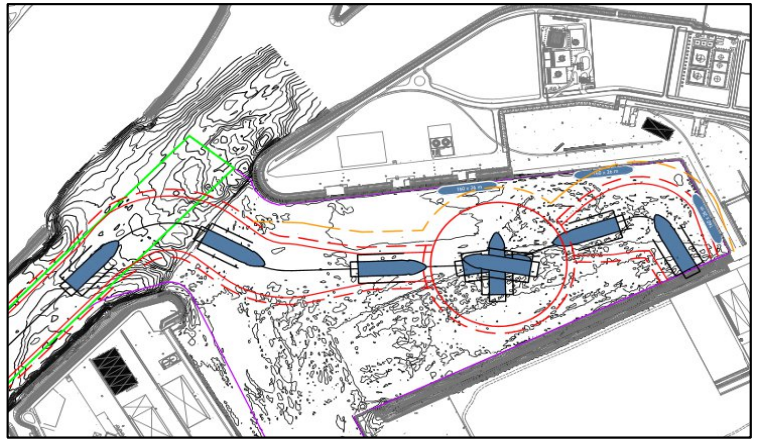
- **PRELIMINARY ASSESSMENT** (Required area and Critical points)

PIANC Guidelines. Report nº 121-2014 “Harbour Approach Channels Design Guidelines”

1. Outer channel. Straight section
2. Inner channel. Curved section
3. Basin access. Curved section
4. Basin
5. Turning area
6. Astern navigation and berthing

$$W = W_{BM} + \sum W_i + W_{BR} + W_{BG} = W_M + W_{BR} + W_{BG}$$





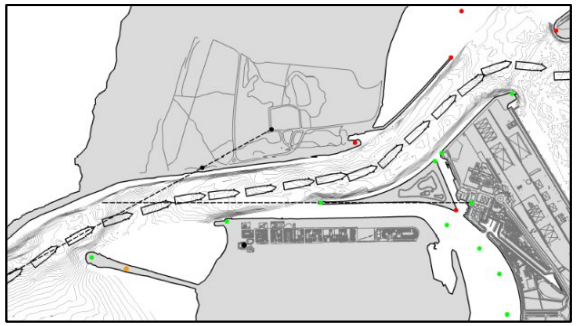
	Area	Hydrodynamic (44 m)	Aerial (84 m)
1	Outer channel	140.8 m	180.8 m
2	Inner channel	128.8 m	168.8 m
3	Basin entrance	156.7 m	196.7 m
4	Basin	83.6 m + 44 m (pt side)	123.6 m + 44 m (pt side)
5	Turning area	360.0 m* + 44 m (bow)	360.0 m + 44 m (bow) & 400.0 m (Stern)*
6	Approach to berth (astern)	191.0 m + 44 m (stb side)	231.0 m + 44 m (stb side)

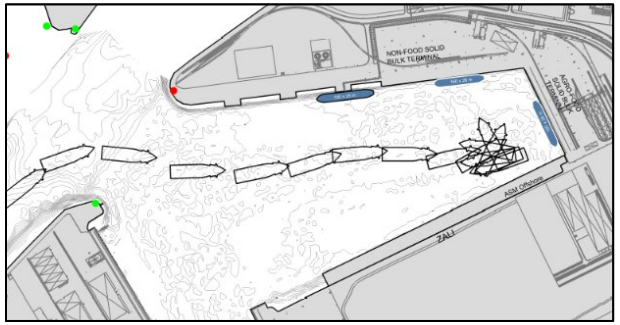
Case study

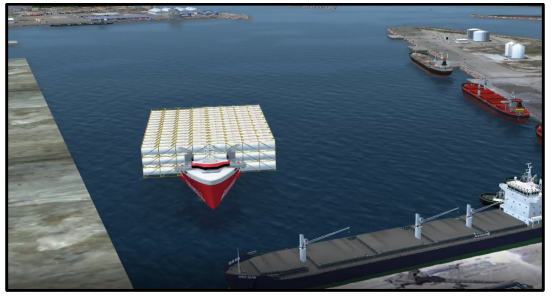
- **DETAILED ASSESSMENT**

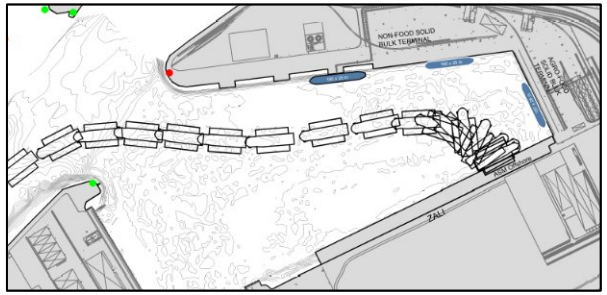
Real Time Simulator

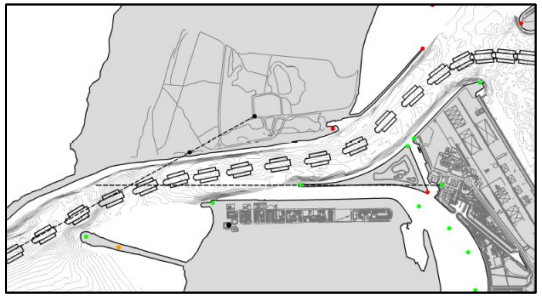
- Operational limits (wind, waves & current)
- Best manoeuvring strategies
- Human factor
- AtoN
- Tug requirements
- Required aerial / navigable area (statistical analysis <-> risk level) → Interferences







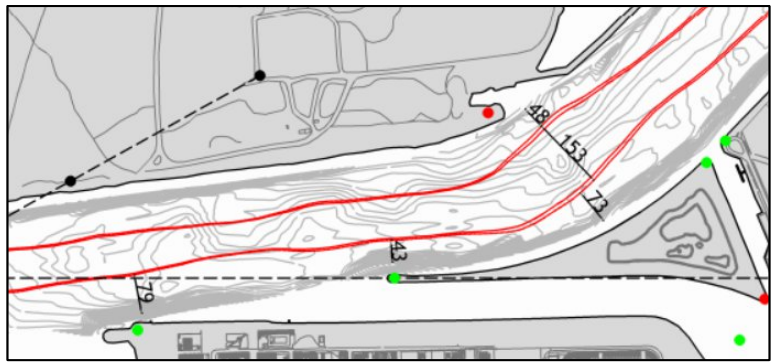


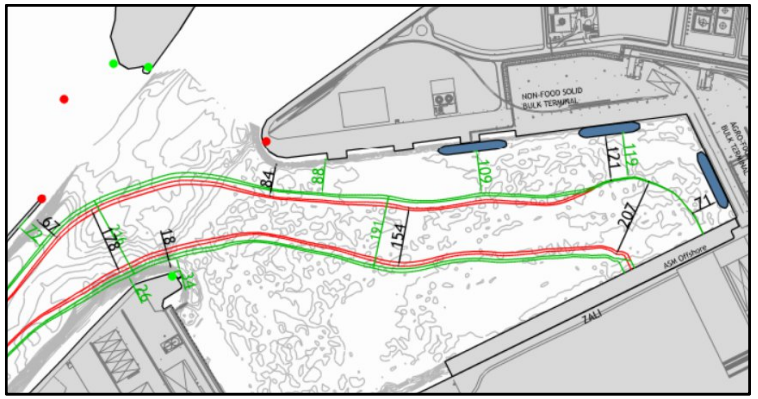


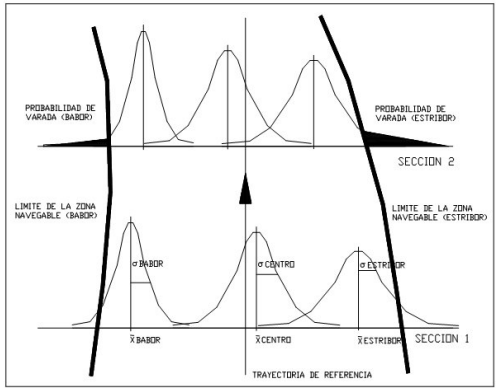
Case study

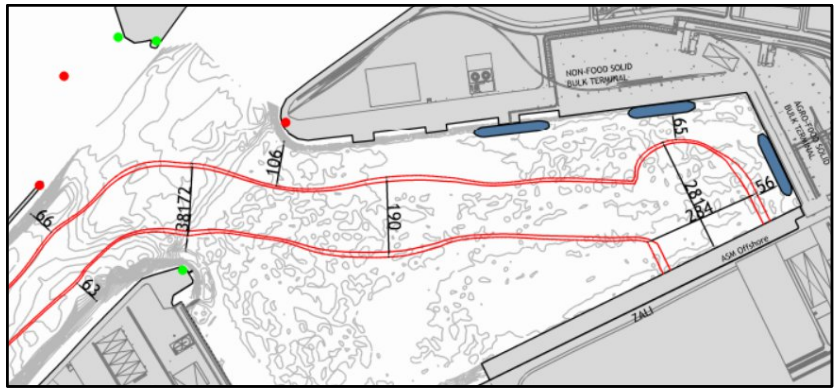
DETAILED ASSESSMENT

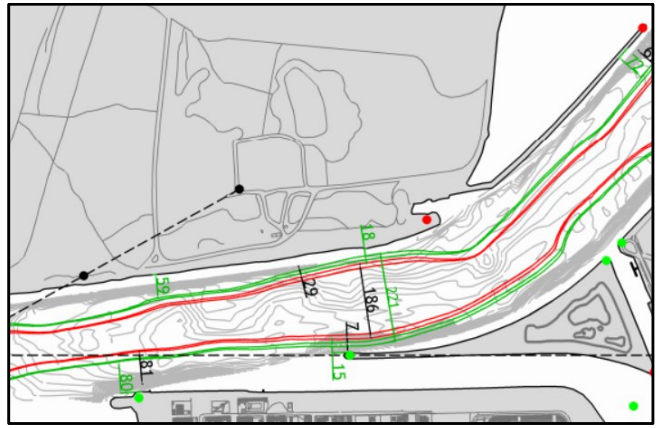
- Statistical analysis (Normal distribution (p + ci)) of the enveloped of repeated manoeuvres <-> Risk level)
- Detailed required aerial and navigable area











Summary

- Offshore wind industry → Opportunity
- Strong growth
- Creation and adaptation of facilities and shipyards
- Specific analysis and studies to guarantee safe operations
  - Nautical studies
  - Loading /unloading operations
  - Grillage and sea fastening
  - ….

Siport21

Consultoría Especializada en Estudios de Maniobra y Comportamiento de Buques

Contacto:
siport21@siport21.es

Siport21
Chile, 8 - 28290 Las Matas (Madrid) - España
Tel.: 0034 91 630 70 73
www.siport21.com

Síguenos en: