Port Capacity Versus Port Safety

by

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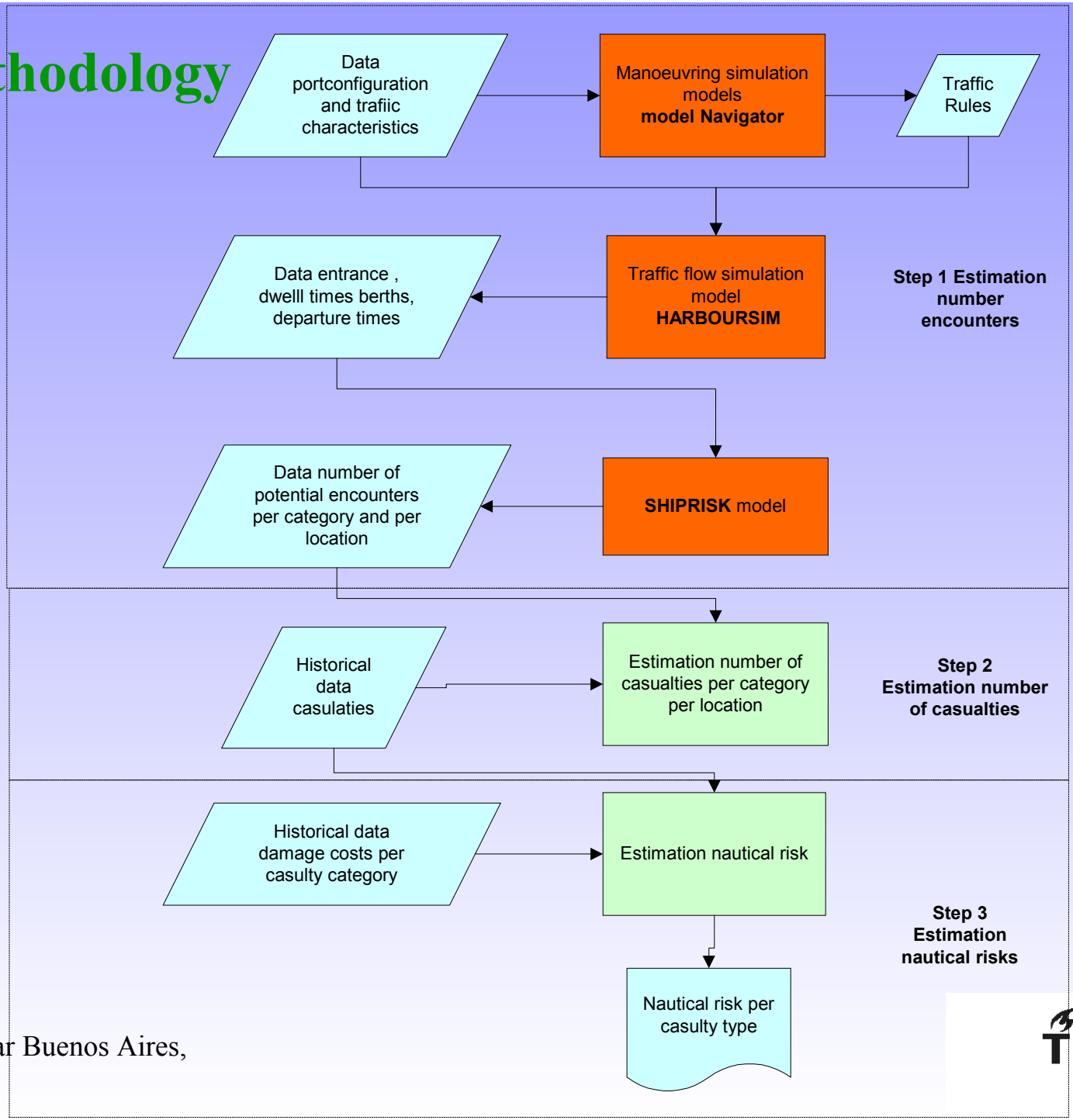
Seminar Buenos Aires,
2004

TU Delft

Methodology



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Safety and Capacity Studies

- Manoeuvring simulation study
  - dimensions wet area and
  - the accompanying ship traffic rules
- Traffic flow simulation study
  - estimation wet infrastructure capacity
  - number of berths
- Ship Risk model
  -determines the number of encounters
  -and with historical data the number of casualties

Puerto America, Venezuela

Figure 1 Project Location

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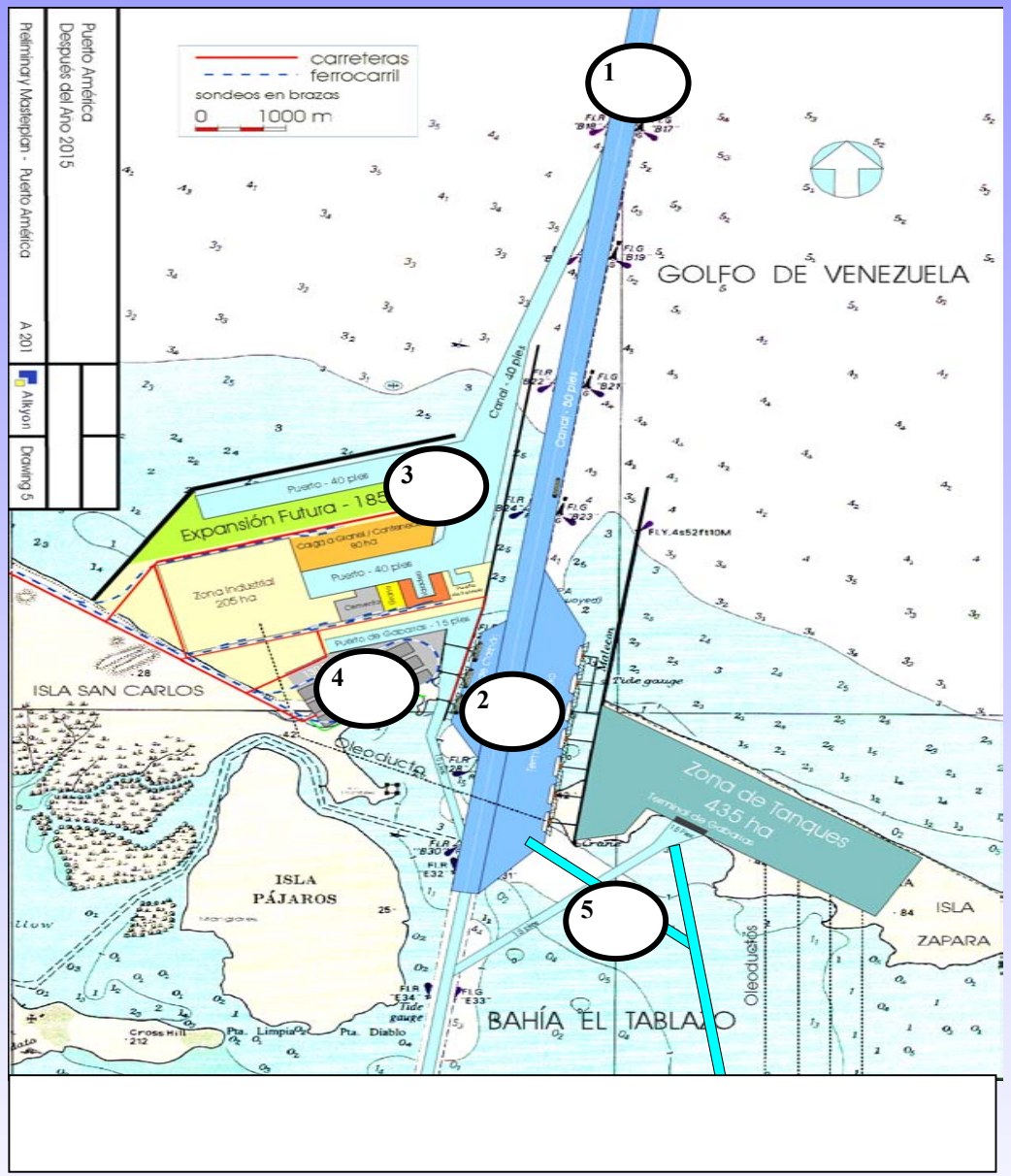
Site Puerto America



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Manoeuvring Simulation Model

RESULTS:

-Safe interval times

-Blockage times of TB

-Berthing and deberthing times

-

VESSEL:

Cape size crude tanker

Berthing Manoeuvre in the deep water port

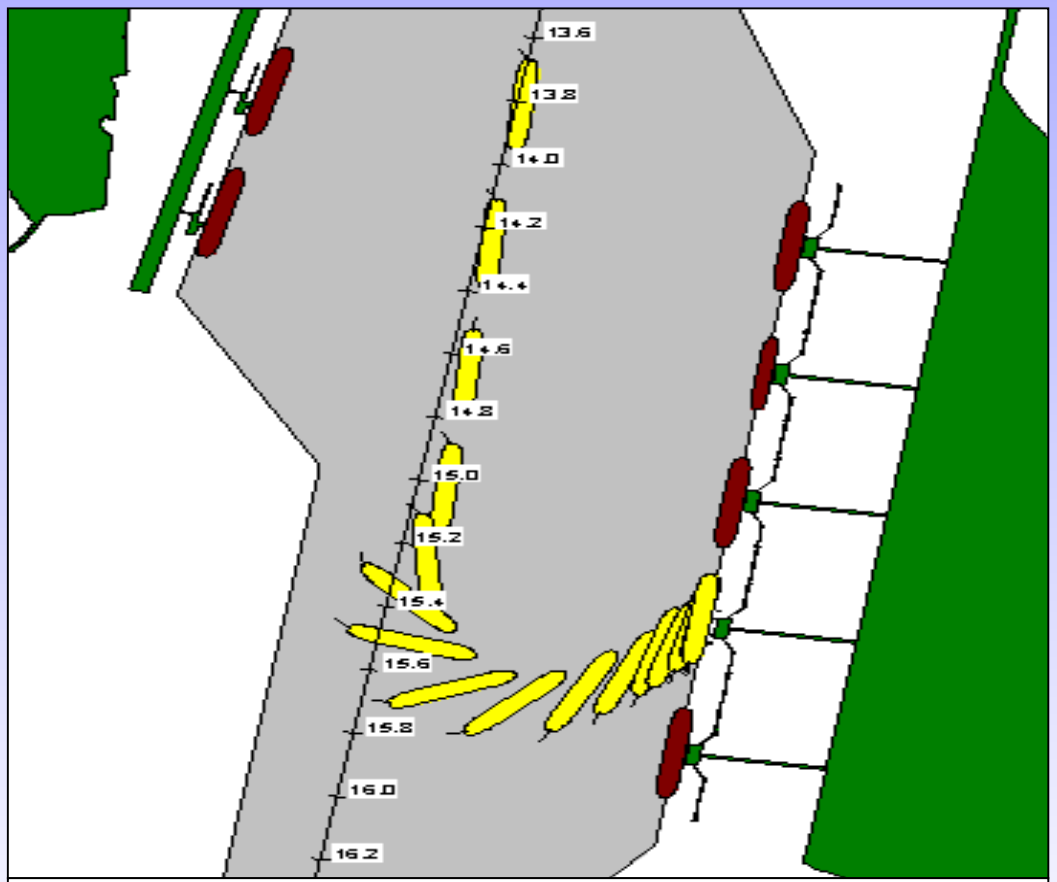


Figure 10. Track plot of tanker arrival in deep water port

Model Harboursim

Input:

Random arrivals of the different ship types, traffic rules, dwell times, sailing times etc.

Simulation:

Ship traffic through the port

Output:

Entrance time and departure time from the terminal, waiting times of the vessels, satisfying:

1. The traffic rules
2. Availability of a berth
3. Tidal conditions
4. Etc

Traffic volume 2015, 54 ft channel

Boundary conditions, Puerto America 2015, 54 ft channel

Oil terminal, 4 berths, terminal 1

SHIPTYPE	OIL1	OIL2	OIL3	OIL 4	OIL 5	OIL6
DWT range	5000-35000	35000-84000	65000-97500	95000-138750	125000-168750	145000-198750
SERVT [h]	8.0	15.9	20.3	19.6	23.4	26.5
number	205	208	154	106	85	72
i.a.t [min]	2564	2527	3413	4958	6184	7300

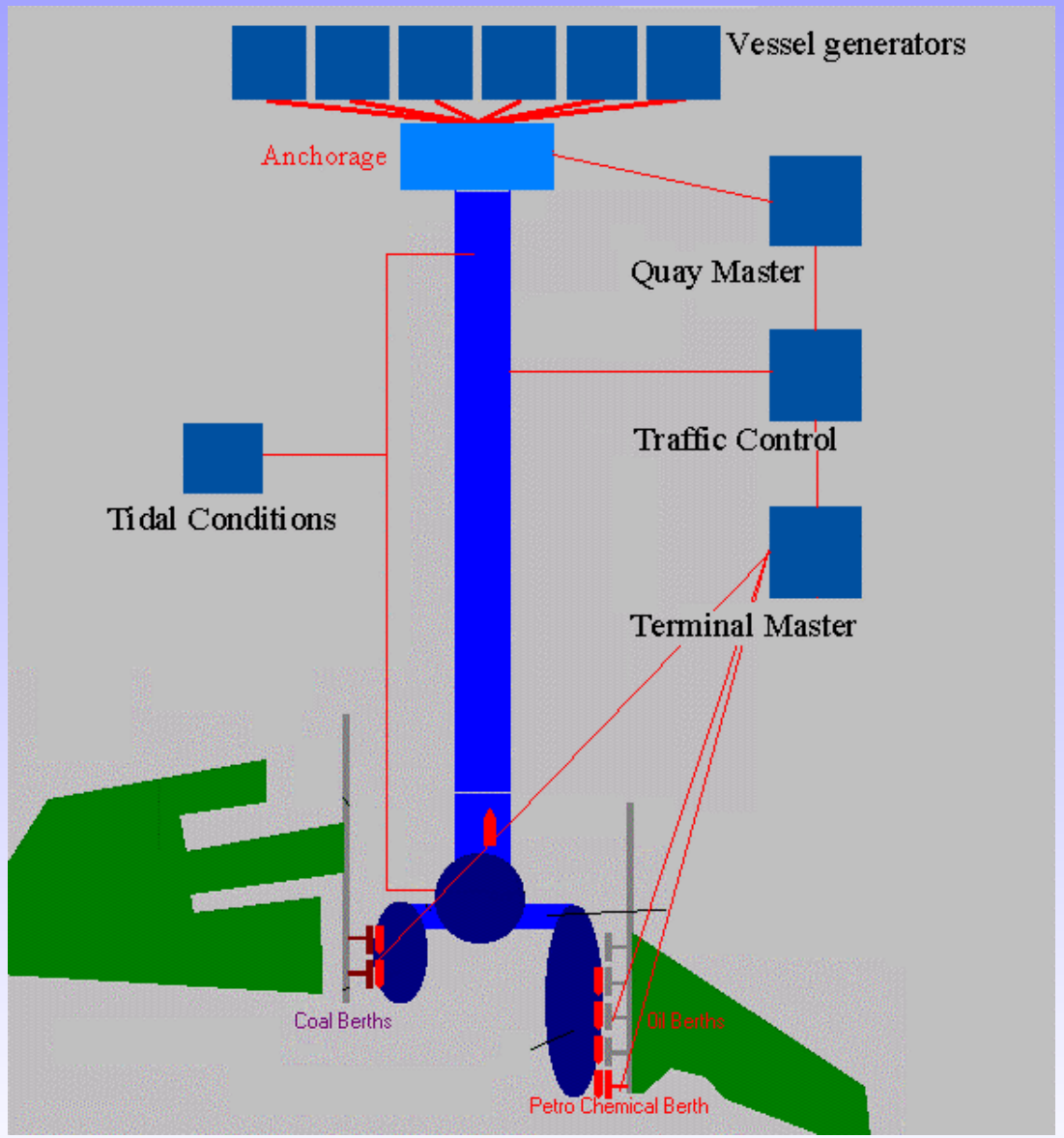
Coal terminal, 2 berths, terminal 3

SHIPTYPE	COAL 7	COAL8
DWT range	5000-35000	121500-185625
SERVT [h]	6.7	39.1
number	80	141
i.a.t [min]	6570	3728

Petro chemical terminal, 1 berth, terminal 2

SHIPTYPE	PETRO 9	PETRO10
DWT range	5000-30000	30000-50000
SERVT [h]	7.5	12.0
number	98	143
i.a.t [min]	5363	3676

Configuration Traffic Flow Simulation Model



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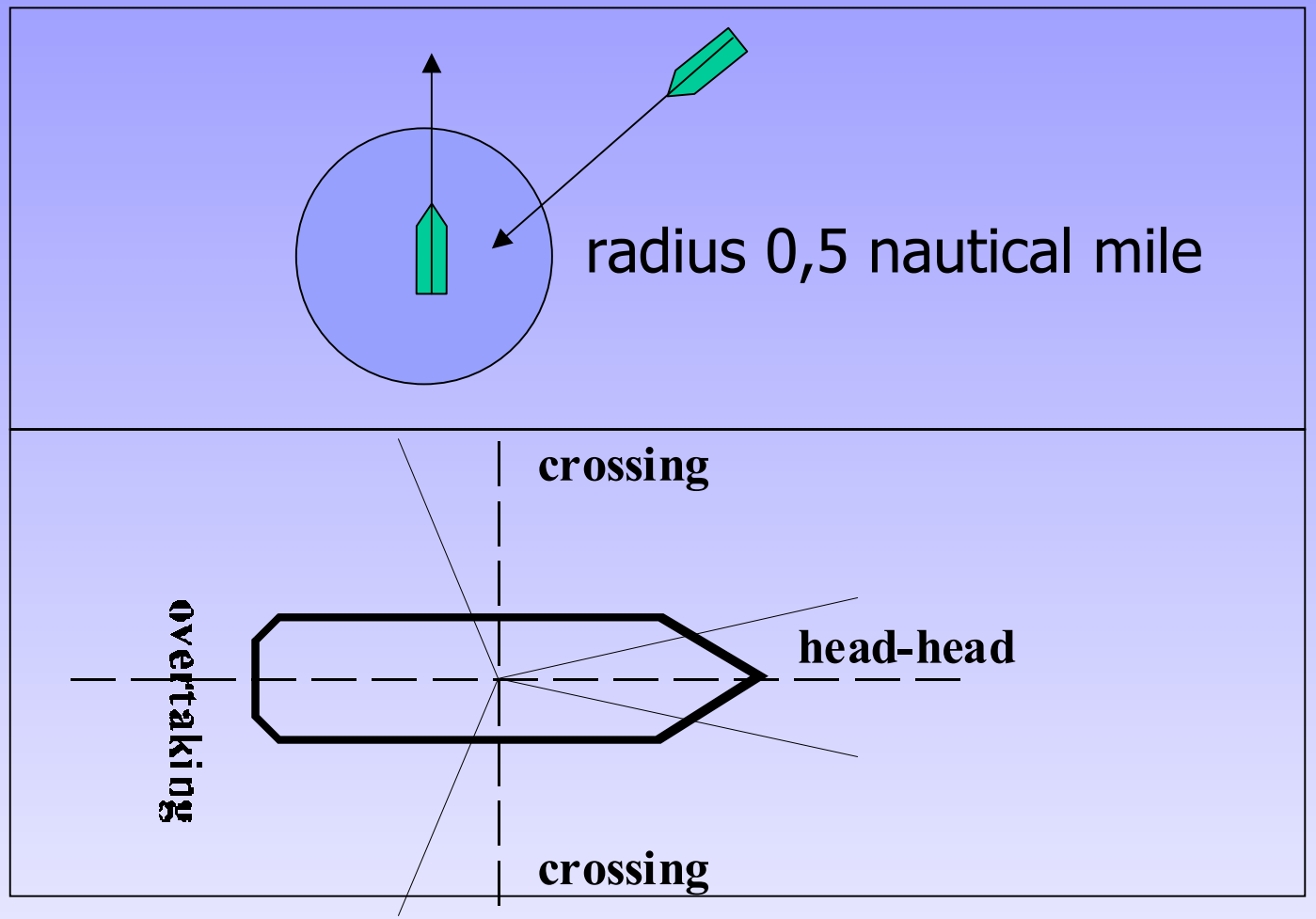
Major Components Shiprisk

Component	Task
Main	Initialises the model
Ship	Describes the process of the ship
Generator	Generates the individual vessels according to output from the traffic flow simulation model.
VTS	Controls the distances between the vessels
Encounters	A data component , provides the data of each potential encounter

ENCOUNTER DEFINITION



Number accidents per 10^6 encounters (registered in the Straight of Dover)

Visibility	Type encounter	Accidents
Good	head-head	6.2
	crossing	4.9
	overtake	6.2
Foggy visibility <1500m	head-head	88
	crossing	14
	overtake	90
Heavy Fog visibility <500m	head - head	290
	crossing	630
	overtake	350

Model Shiprisk

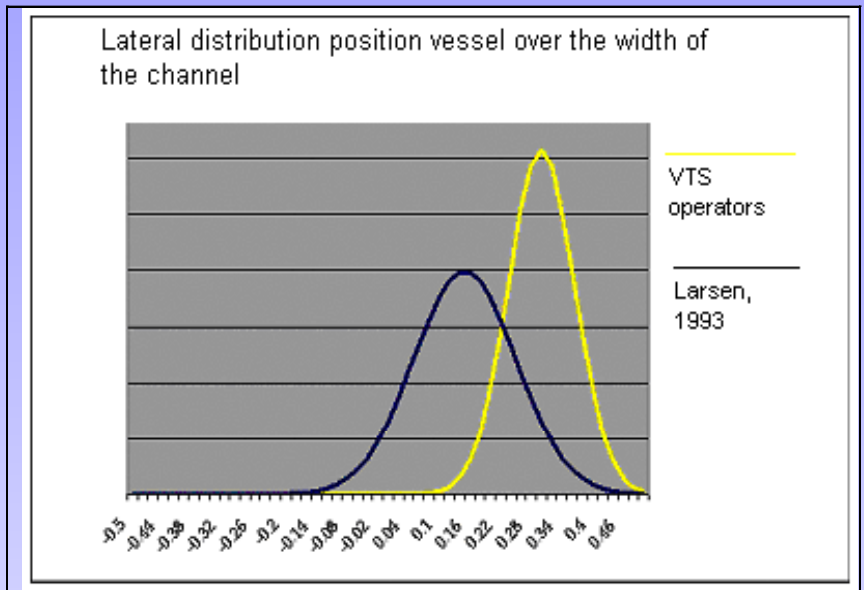
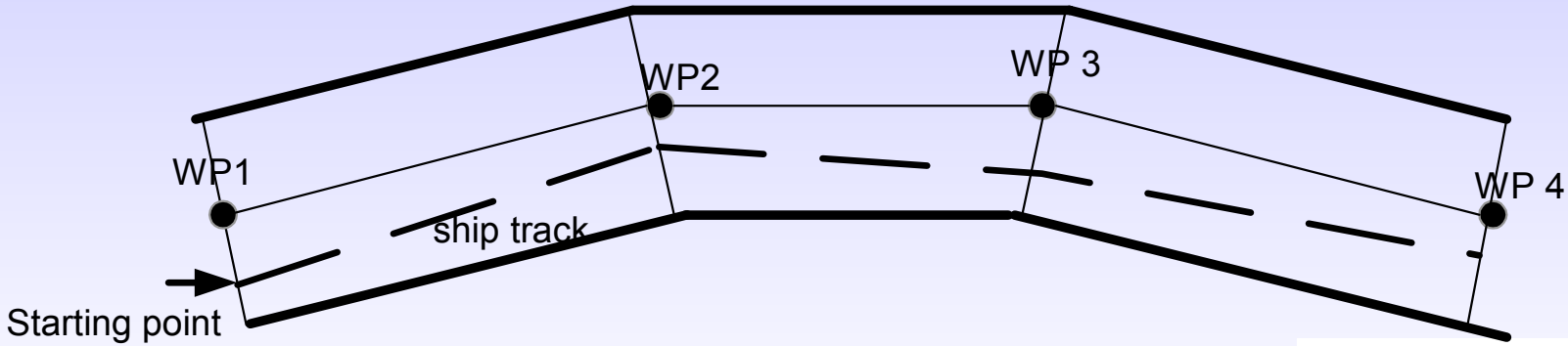


Figure 1 Lateral distribution ship position in the channel



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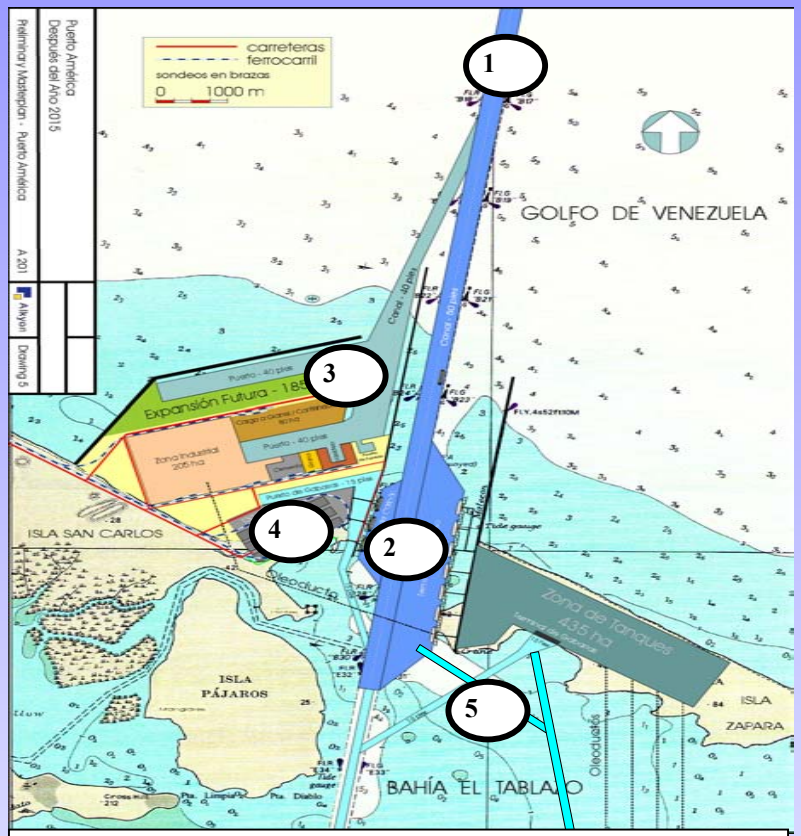
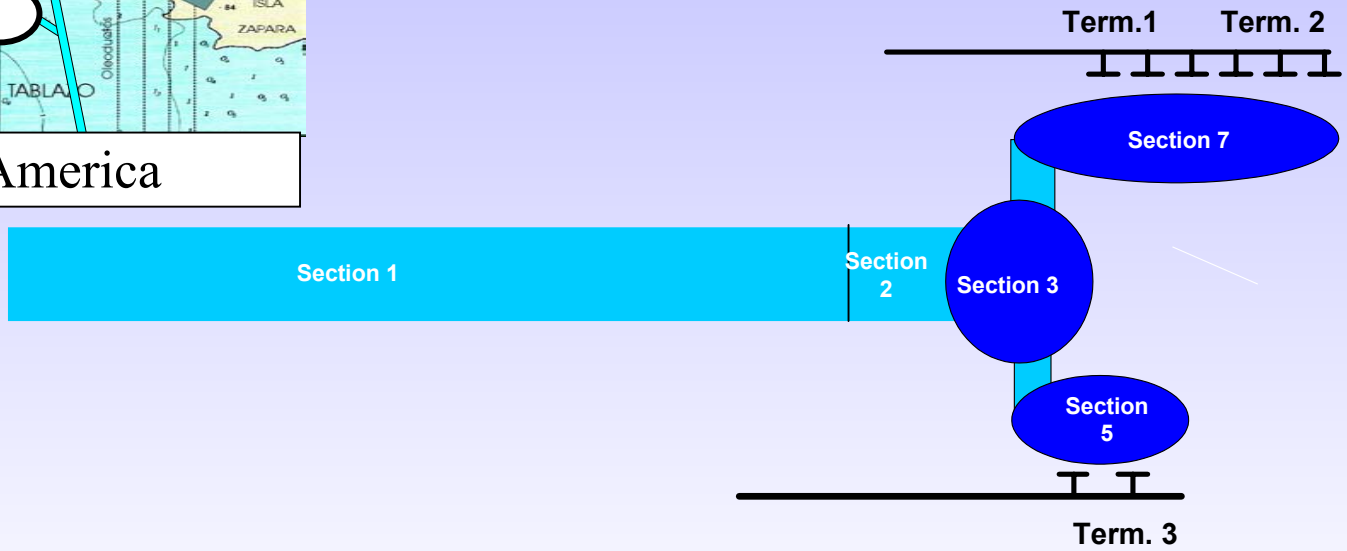
System Puerto America



Situation Puerto America



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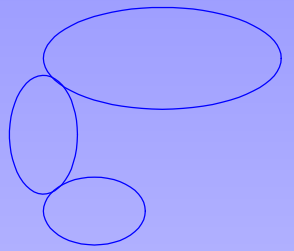
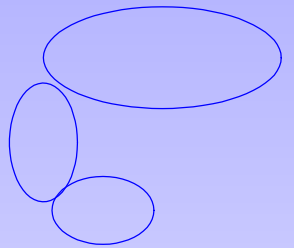
Encounter densities, Puerto America

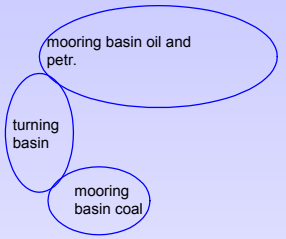
No Traffic Rules
Number encounters 870



No encounters allowed in the mooring basins
Number encounters 783



No encounters allowed in the turning basin and moorings basins
Number encounters 711



No encounters allowed in the turning basin, moorings basins and restricted encounters in the approach channel
Number encounters 313

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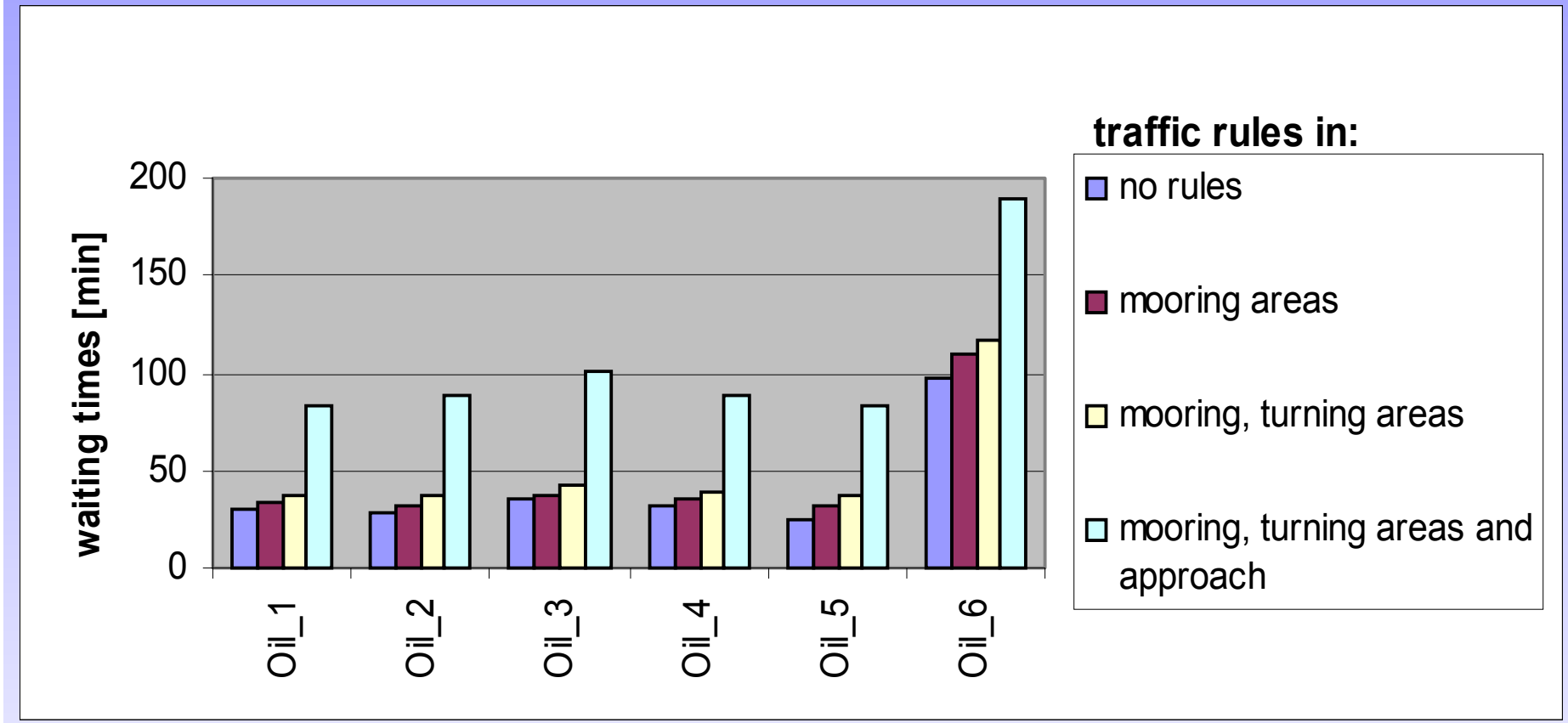
Waiting times versus traffic rules



Some conclusions and recommendations

- The model 'SHIPRISK' provides a quick insight of the nautical risks
- More prototype information should come available with respect to encounter frequencies
- More data on vessel behaviour depending on infrastructural conditions, environmental conditions, and traffic loads should be collected for a statistical description of vessels tracks