CENTRE DE SIMULATION ET D'EXPERTISE MARITIME

MARITIME SIMULATION AND RESOURCE CENTRE

Designing a Simulation Area for Navigation Purposes

by
Alexandre Paradis

MARITIME SIMULATION AND RESOURCE CENTRE

About the MSRC:

- Founded in 2005
- Owned and operated by working marine pilots
- Four fully-instrumented navigation bridges
- Equipped with Kongsberg Digital's Maritime Simulation System
- Capability to operate simultaneous interactive scenarios including all four bridges
- In-house capabilities to build "pilot grade" ship models and customized geographic databases
- Vast portfolio of over 100 ship models and 30 databases

Clients and Partners:

- Pilot associations
- Port administrations
- Shipowners
- Government
- Stevedoring companies
- Engineering companies

AREA DATABASE FOR MARITIME SIMULATION PURPOSES

Database Components and Layers

Layers in an area database:

- Visual layer
- Radar file
- Bathymetry file
- Instructor map
- Buoys and objects
- Tides and currents
- Environmental data (wind, rain, etc.)

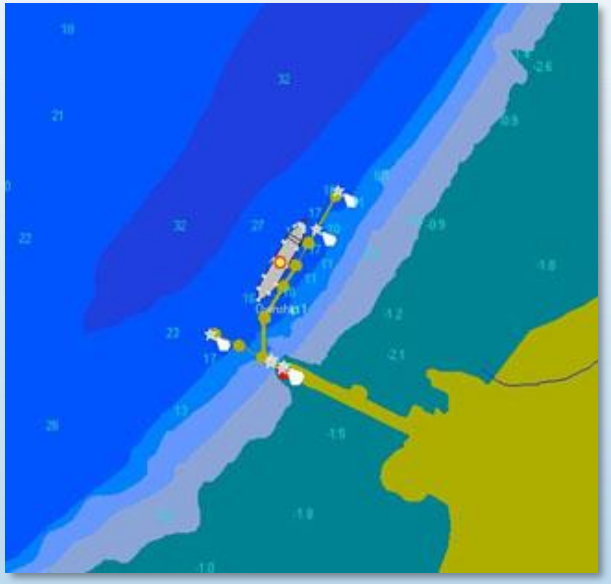
Source : Kongsberg Digital Simulation, 2017

Divided into 2 parts:

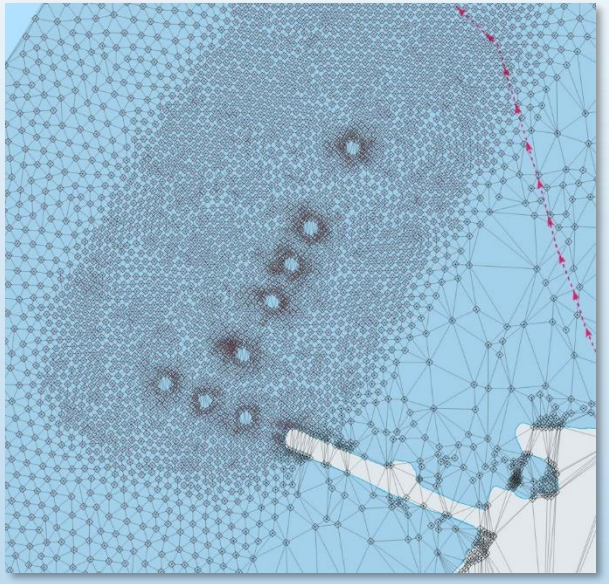
- Management files
- Visual files

Database Management Files

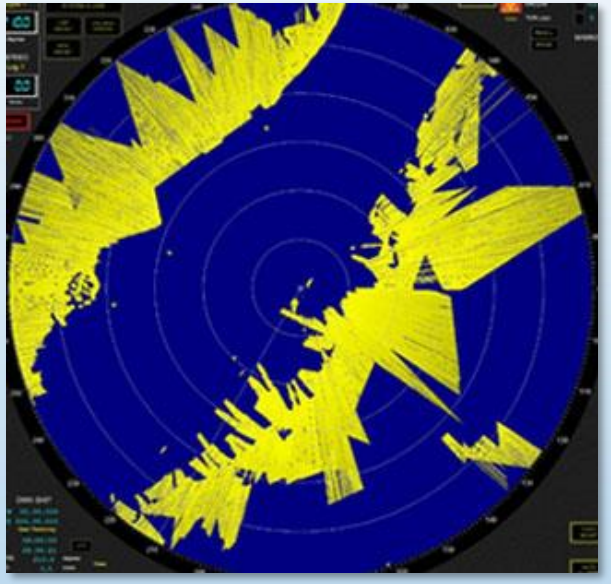
Instructor file



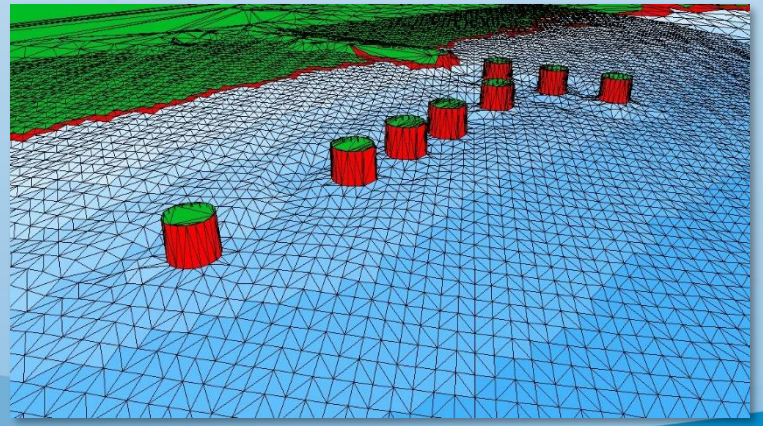
Currents and tides file



Radar file



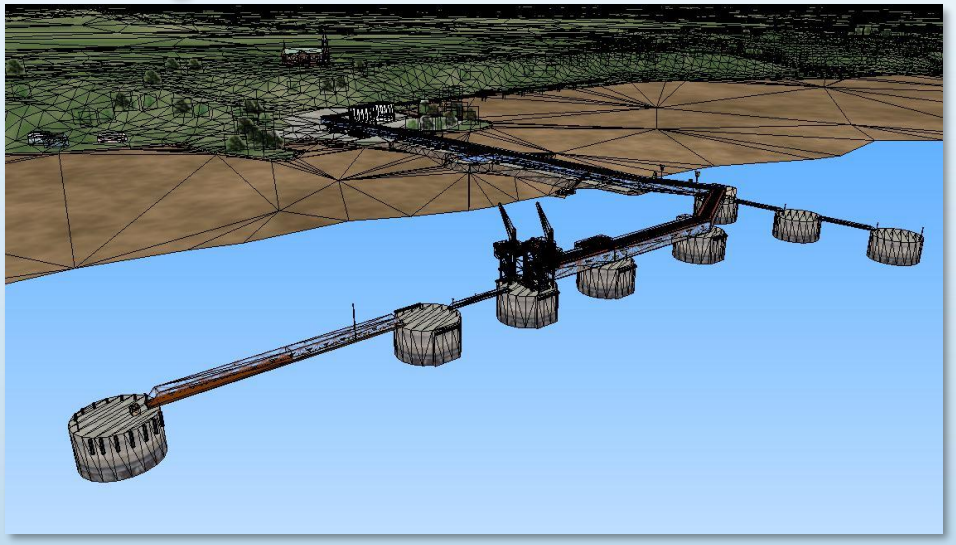
Bathymetry file



Ultramar/Valero,
St-Romuald

Database Visual Files

Modeling



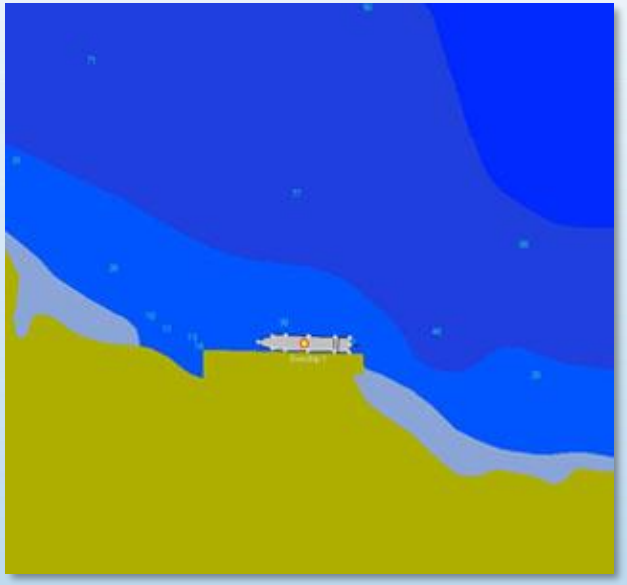
K-Sim simulation

Polaris simulation

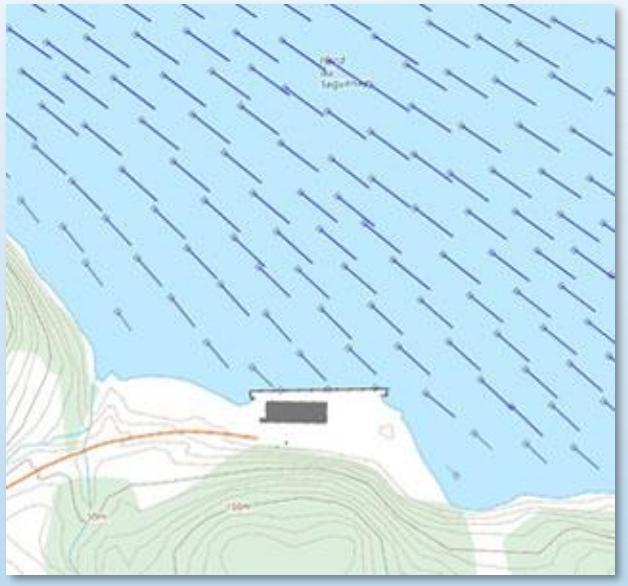
Ultramar/Valero,
St-Romuald

Database Management Files

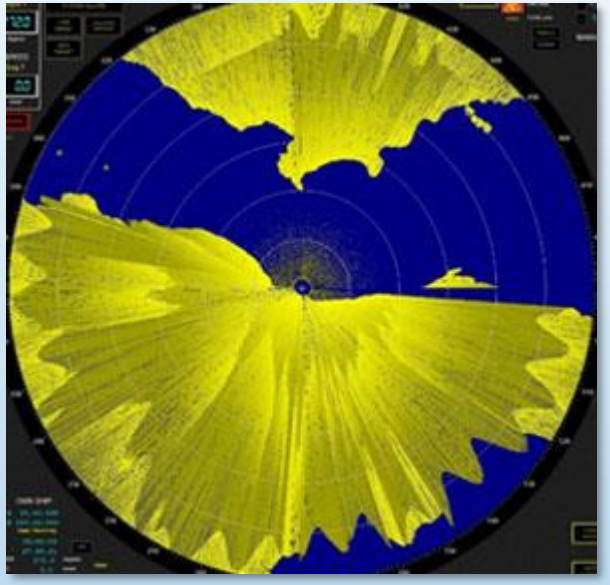
Instructor file



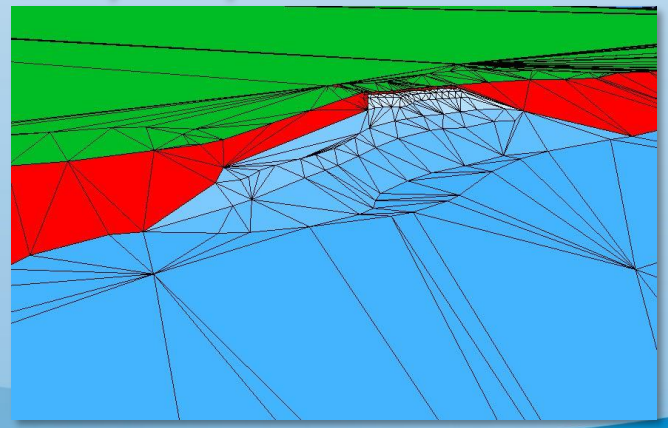
Currents and tides file



Radar file



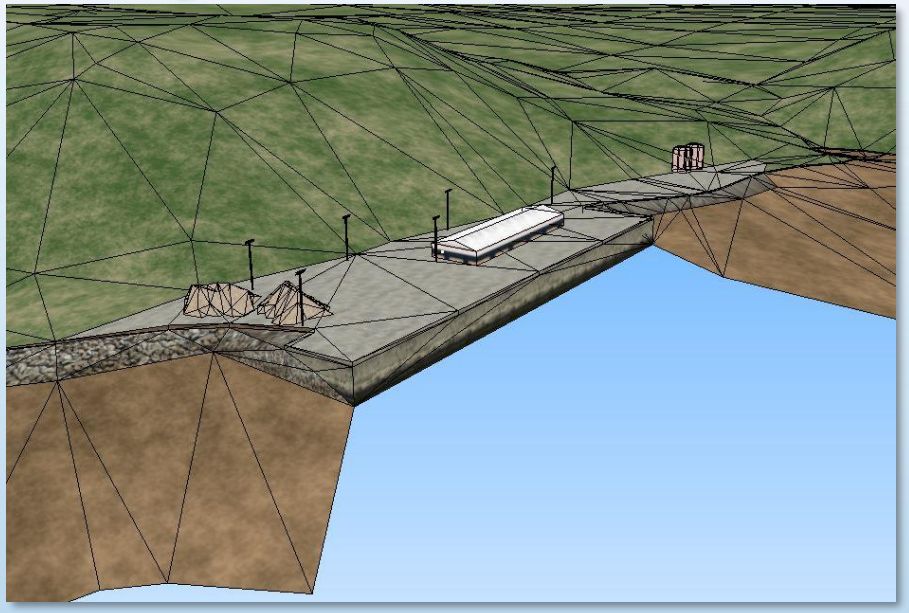
Bathymetry file



Maritime Terminal,
Grande-Anse

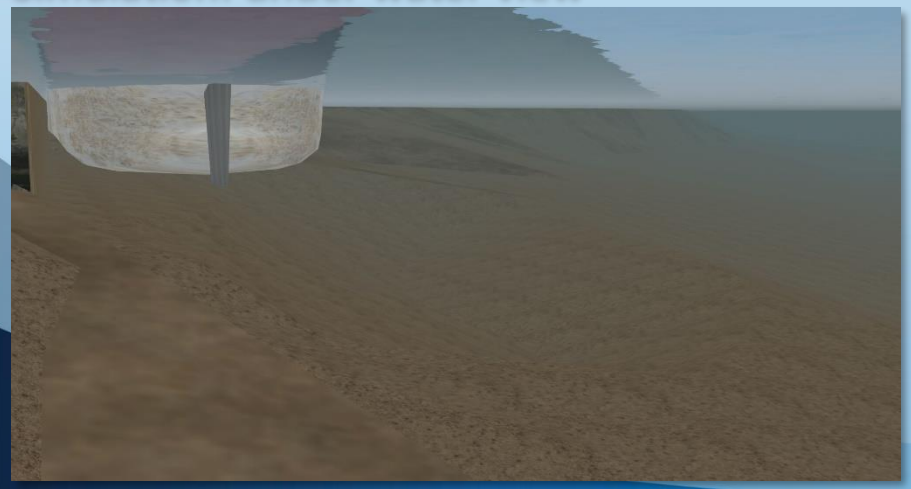
Database Visual Files

Modeling



Simulation

Simulation: under water view



Maritime Terminal,
Grande-Anse

www.sim-pilot.com

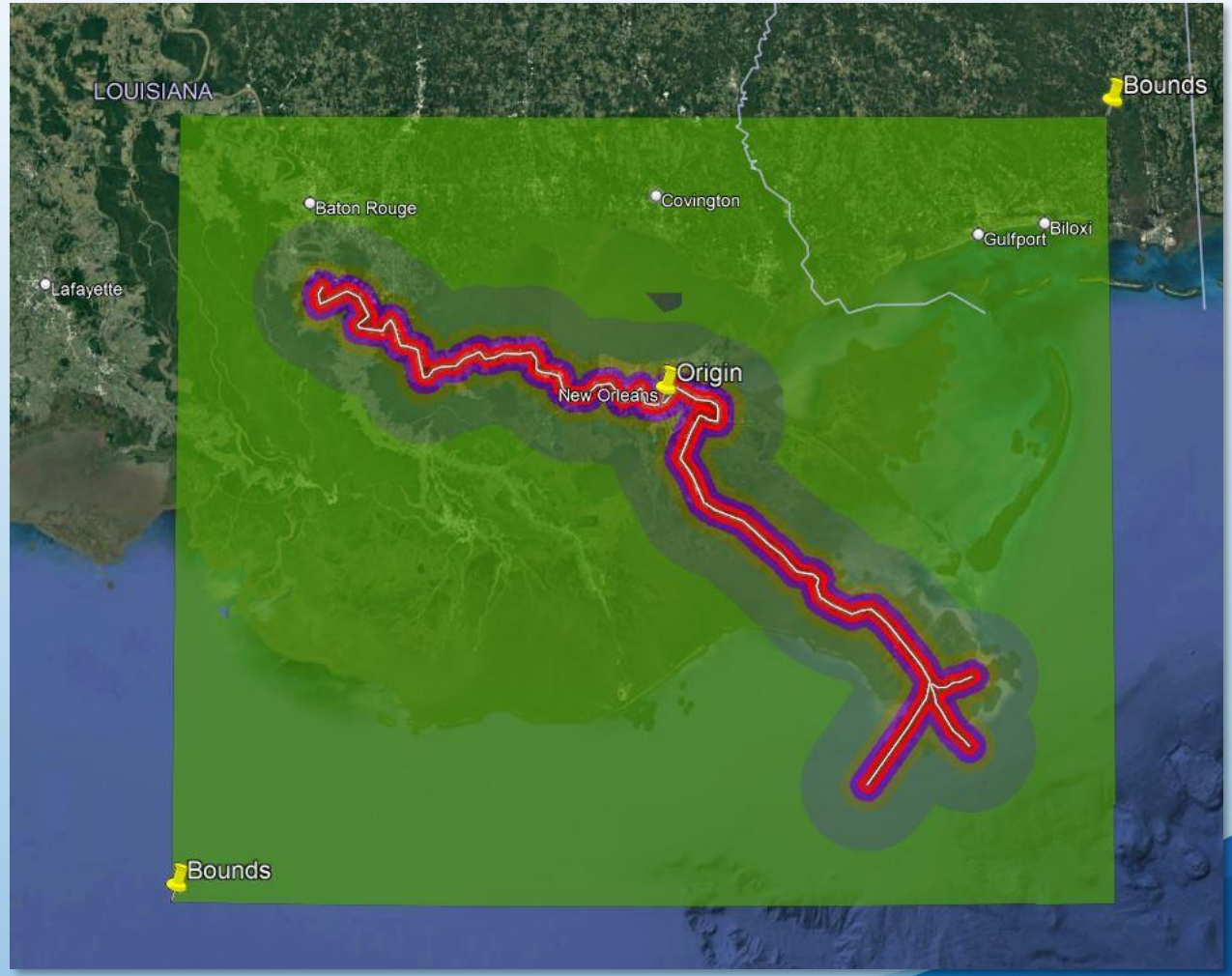
BUILDING AN AREA DATABASE

Design Phases

- Specifying the boundaries for the area
- Gathering all the information
- Setting up the project
- Management files
- Visual files
- Objects in the exercise area
- Deploying the database
- Updating the database

Specifying the Boundaries for the Area

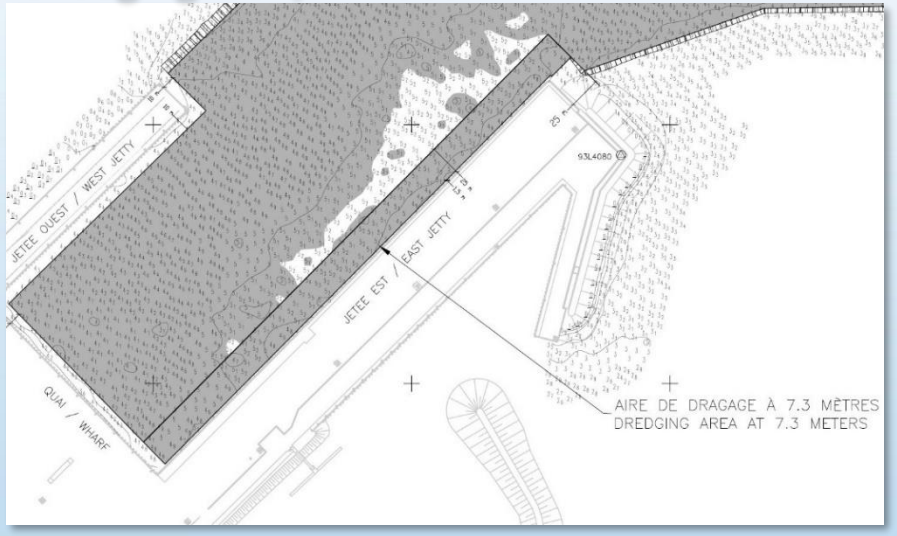
- Boundaries
- Origin of the database
- Navigation route
- Level of detail



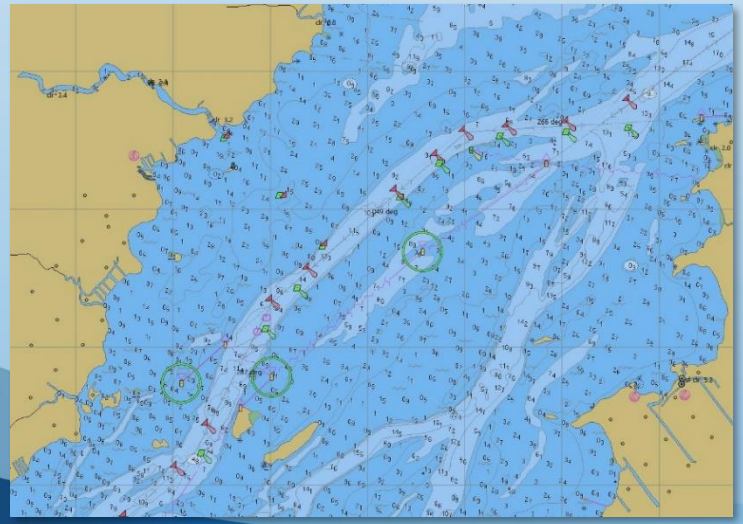
Gathering all the Information

- Electronic navigation charts
- Height map source
- Bathymetric surveys
- LiDAR surveys
- Engineering plans

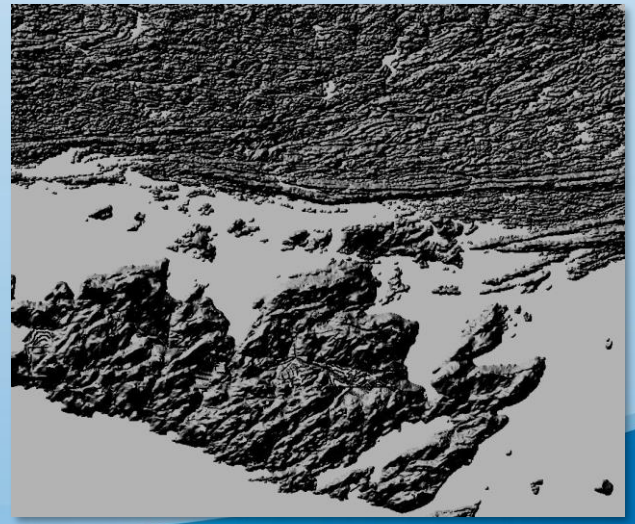
Dredging Plan, Rimouski



ENC, Saint Lawrence Seaway



Height Map, Georgian Bay



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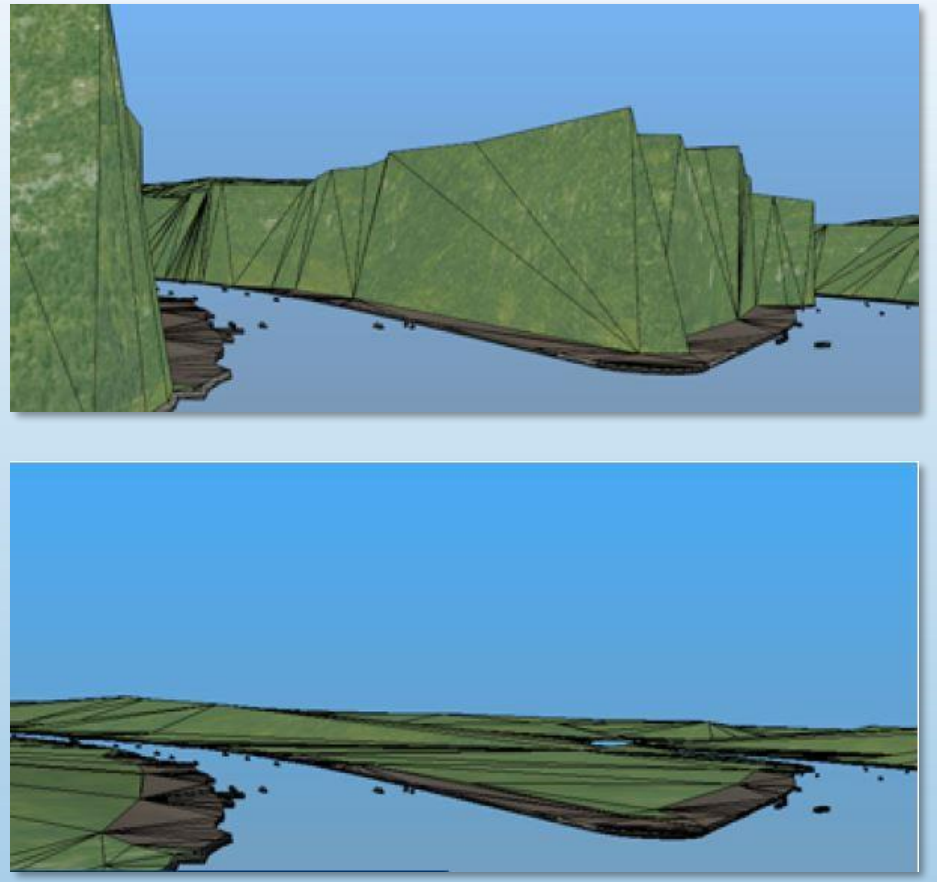
Setting up the Project

- Coast and tide simplification
- River shift
- Terrain texturing
- IALA region



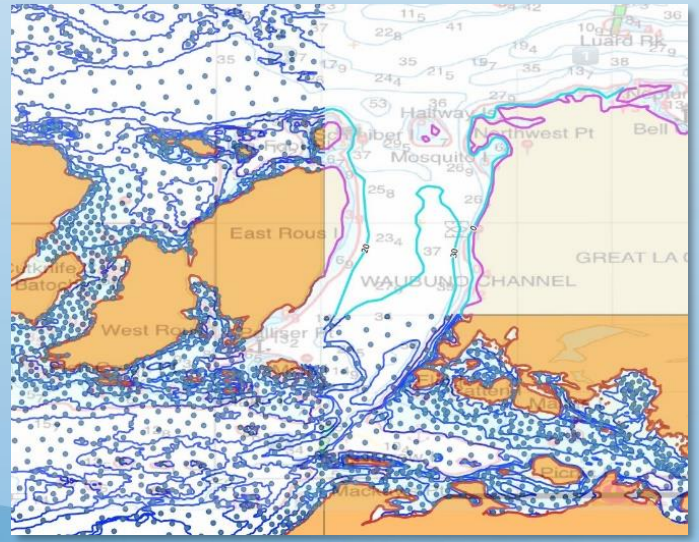
Source : Kongsberg Digital Simulation, 2017

Management Files

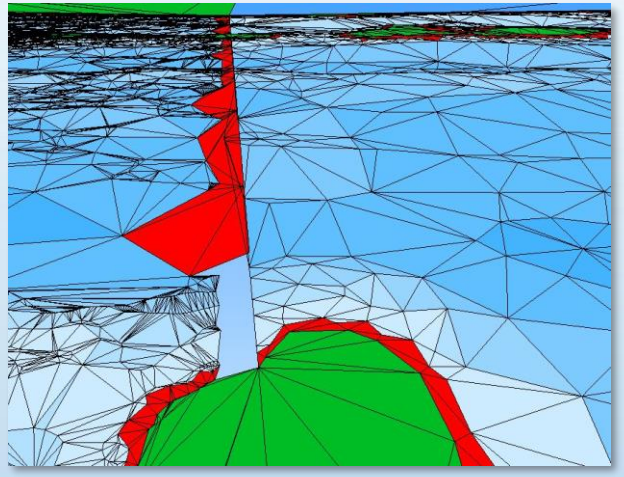
Editing K-DAG outputs:

- Ports and docks (future facilities)
- Radar file
- Buoys
- Instructor file
- Bathymetric data

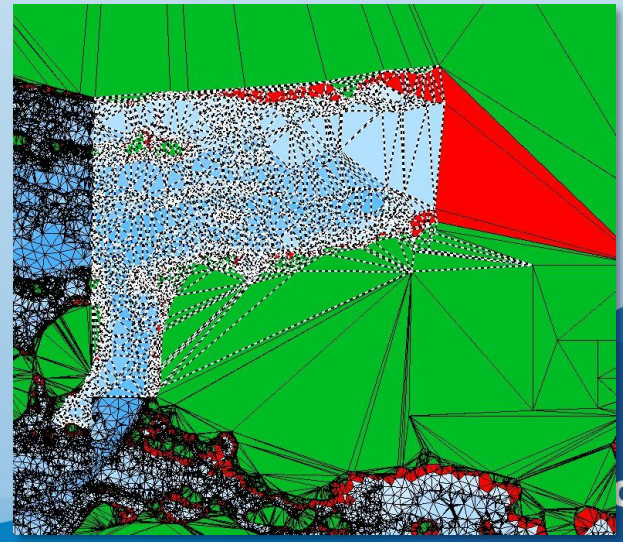
Raster vectorization



Connection between meshes

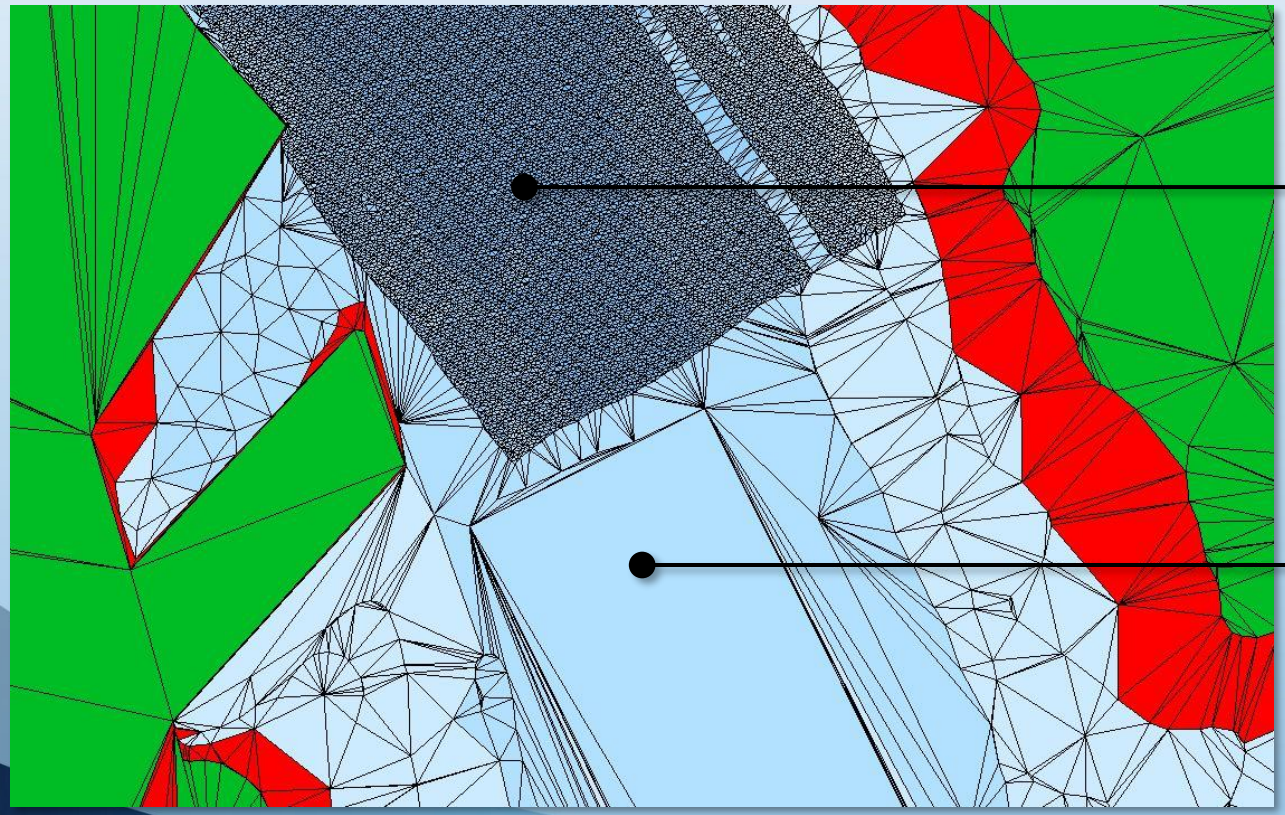


Data integration



Importance of the Data

- Bathymetry's influence on the ship’s movements
- Precision of the tides and currents greatly impact navigation



Multibeam echo sounder’s data

Marine Chart Data – Dredged Channel Display

Visual Files

Populate the visual files:

- Visual landmarks
- Buoys and NAVAIDS
- Ports and docks equipment
- Buildings and vegetation

Exercise Area Objects (EAO)

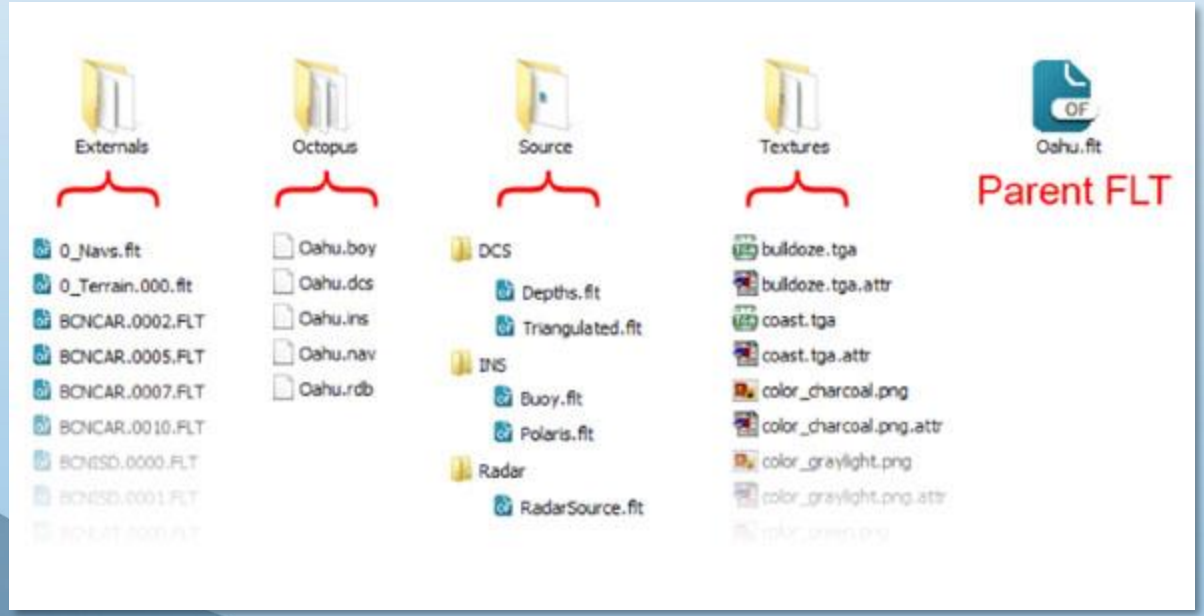
Allows interaction between ships and the database:

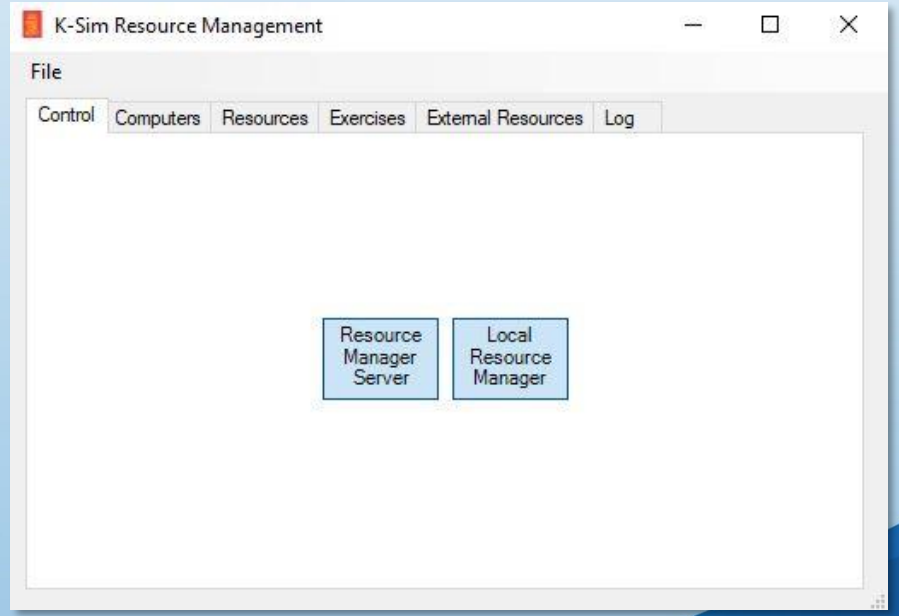
- Collision with the docks
- Mooring ships to a dock
- Lock gates and drawbridges in channels

Deploying the Database

Two software, two ways to deploy a database:

- Polaris -> Copy and disperse files manually to all computers
- K-Sim -> Deploy and place the database on a server manager

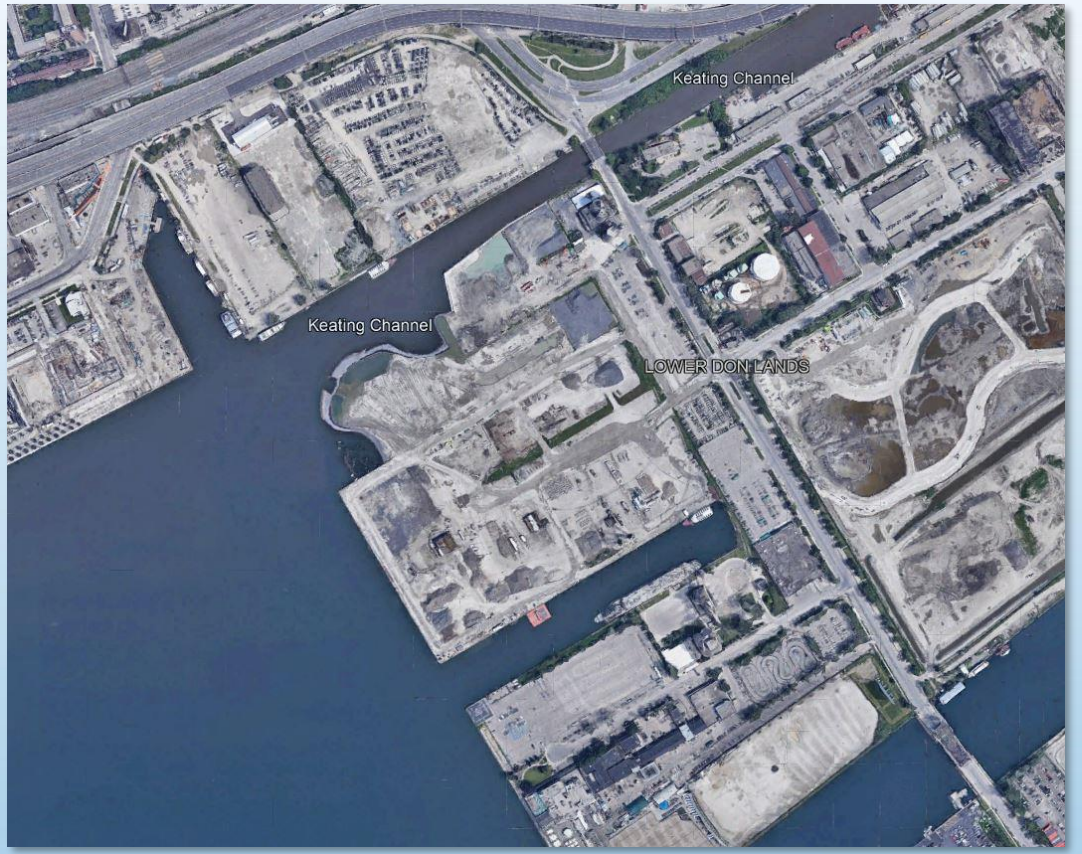




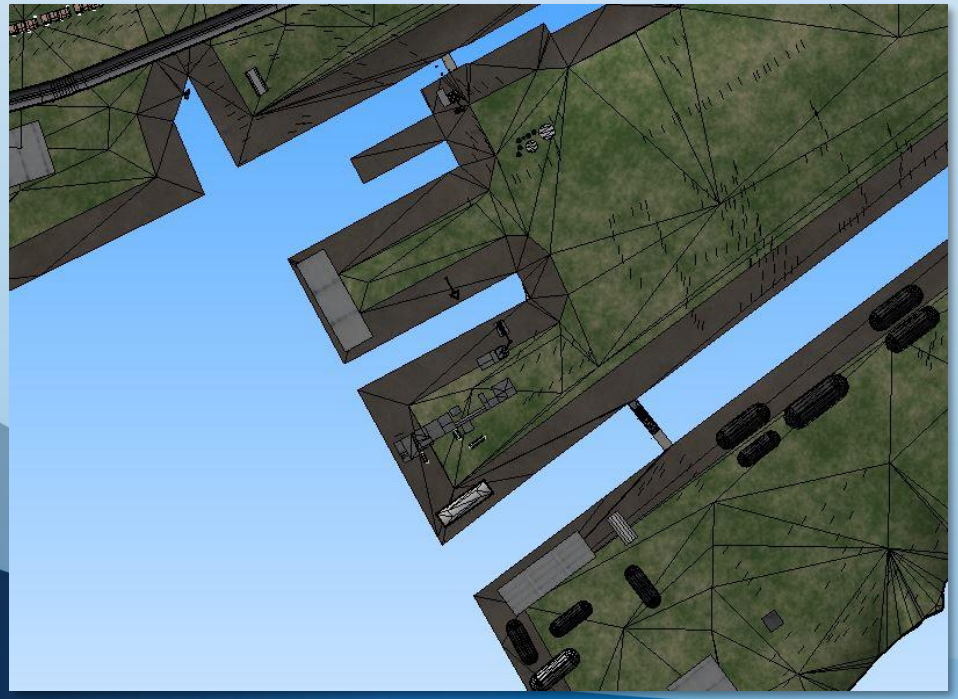
Source : Kongsberg Digital Simulation, 2017

Updating the Database

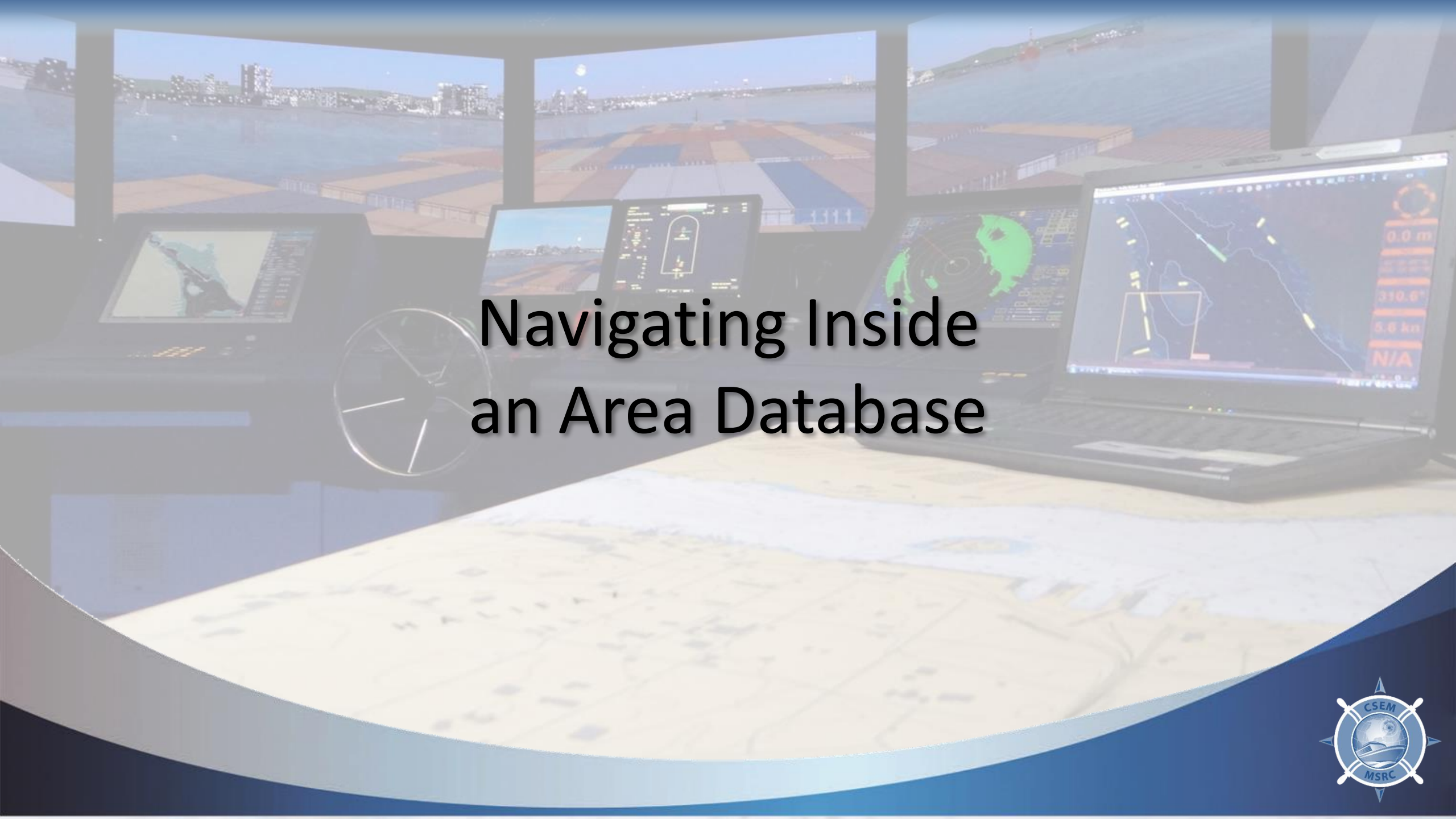
- Add new buildings
- Add or change NAVAIDS
- Configure new docks
- Make changes to the bathymetry



Source : Google Earth Pro (06/2019)



New Keating Channel in Toronto



Navigating Inside an Area Database

Environmental Data

- Waves
- Wind
- Currents
- Tides
- Ice
- Fog and rain

Currents and Tides Files

- Issued from surveys and observations
- Varying over a period of time
- Can be created/edited manually
- Conversion to K-Sim -> Set the 0 to the local Main Sea Level

```
Explicit Time Varying Current
Version 1
[Cycle]
Time length=840
[Tile]
North Lat=N46.48.913
South Lat=N46.48.391
West Lon=W071.11.543
East Lon=W071.11.142
[Tidal Diamond]
Lat=N46.48.536
Lon=W071.11.543
SpringTideHeight=0,3.6,30,3.1,60,2.7,90,2.2,120,1.8,150,1.4,180,1.1,210,0.7,240,0.4,270,0.2,300
Depth=0.0
SpringCurrent=0,1.0,14,30,1.2,15,60,1.2,15,90,1.2,15,120,1.2,15,150,1.1,15,180,1.1,15,210,1.1,1
Depth=2.0
SpringCurrent=0,1.0,14,30,1.2,15,60,1.2,15,90,1.2,15,120,1.2,15,150,1.1,15,180,1.1,15,210,1.1,1
Depth=4.0
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Depth=8.0
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[Tidal Diamond]
Lat=N46.48.643
Lon=W071.11.539
SpringTideHeight=0,3.6,30,3.1,60,2.7,90,2.2,120,1.8,150,1.4,180,1.0,210,0.7,240,0.4,270,0.2,300
Depth=0.0
SpringCurrent=0,1.1,13,30,1.2,14,60,1.3,14,90,1.2,15,120,1.2,15,150,1.2,15,180,1.2,15,210,1.1,1
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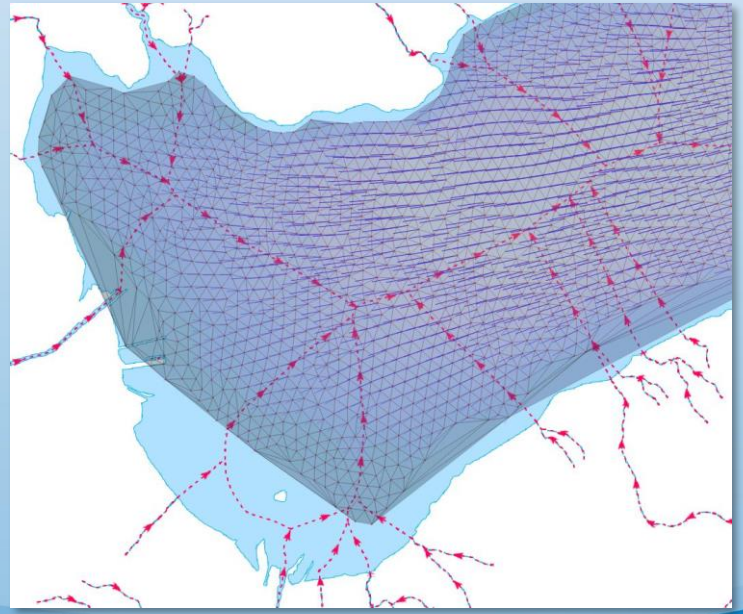
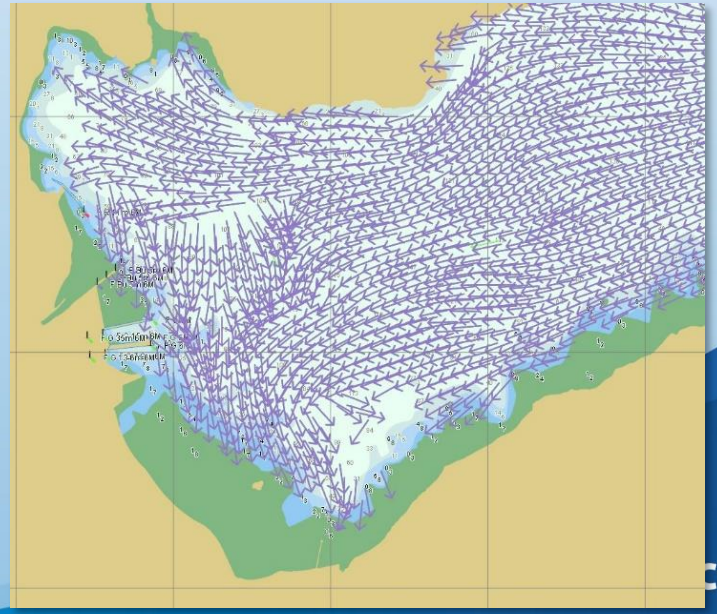
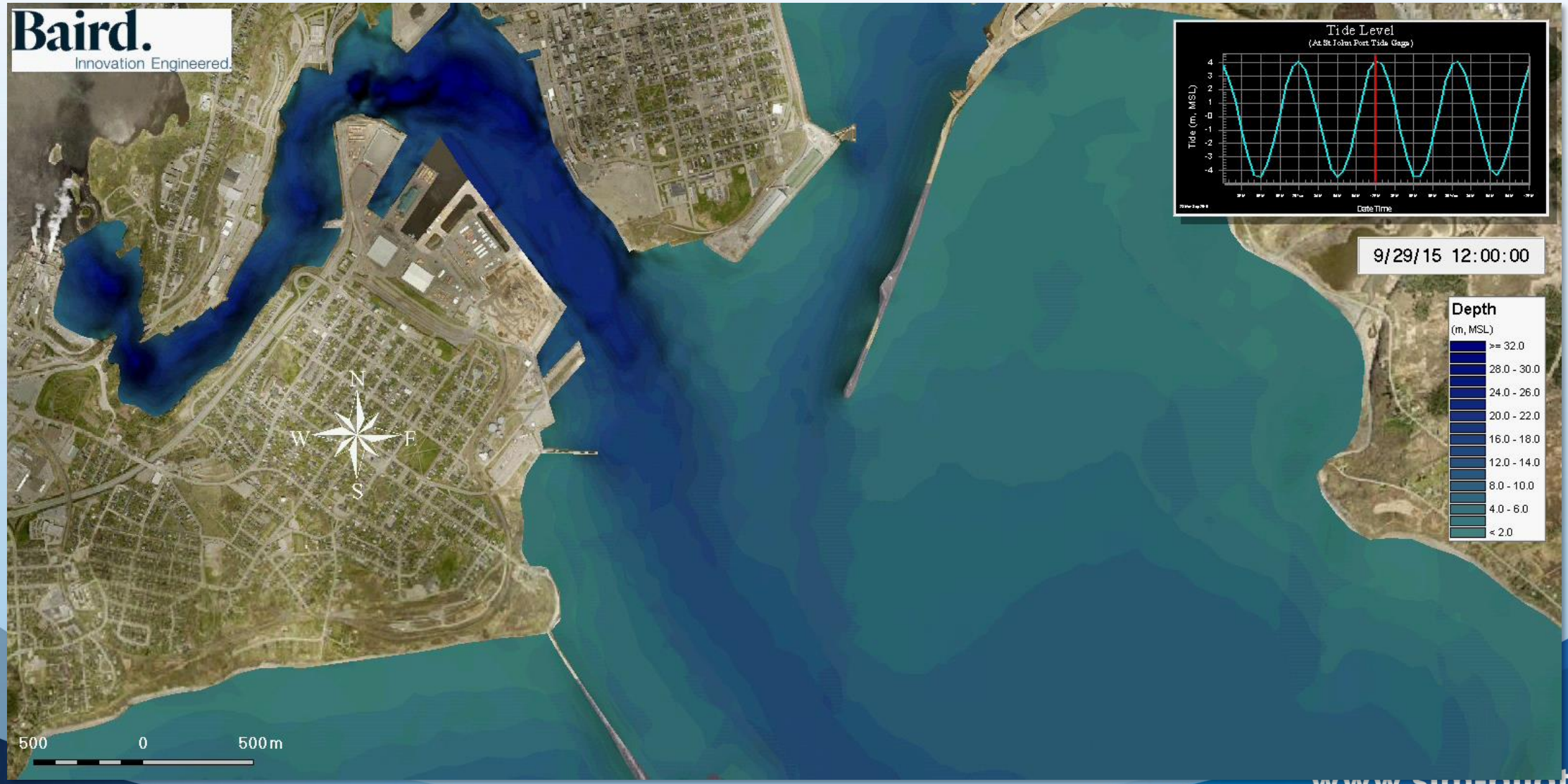
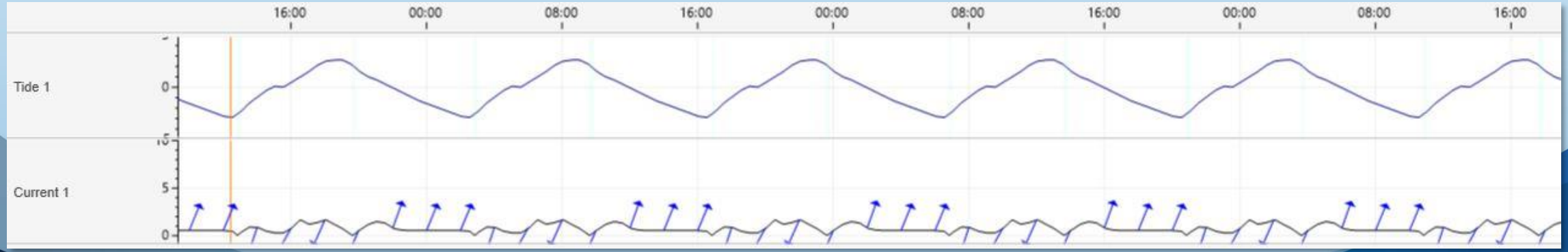




CURRENTS

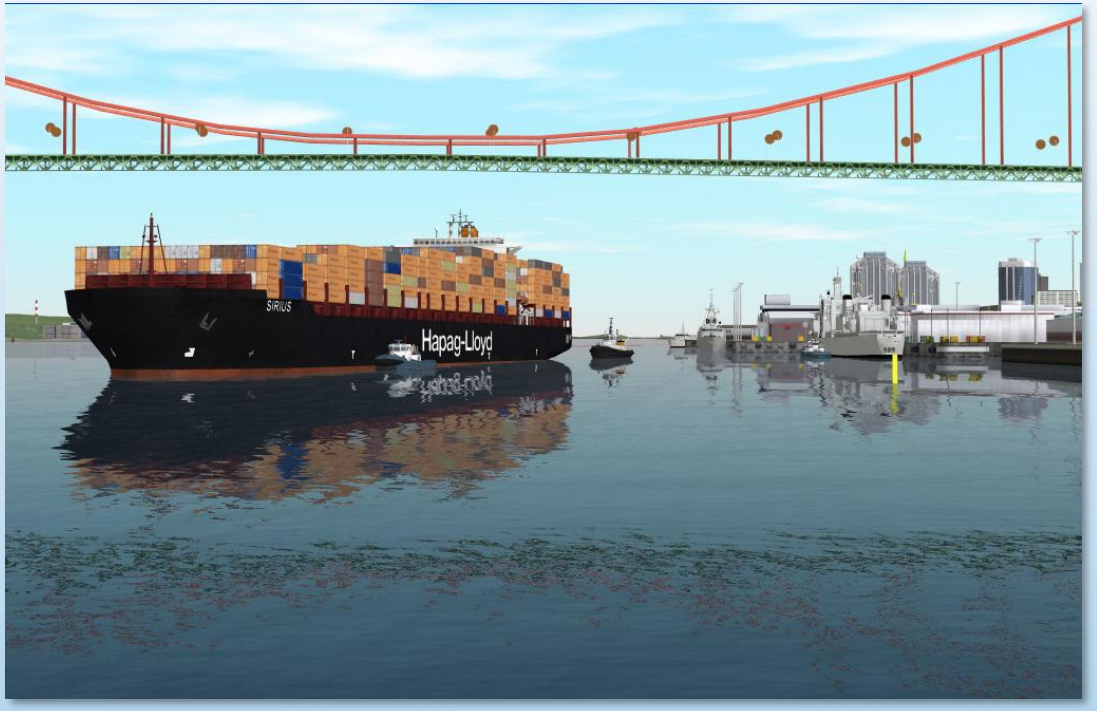

Baird.
Innovation Engineered.
Tide Level
(At St John Port Tide Gage)
Tide (m, MSL)
Date Time
9/29/15 12:00:00
Depth
(m, MSL)
>= 32.0
28.0 - 30.0
24.0 - 26.0
20.0 - 22.0
16.0 - 18.0
12.0 - 14.0
8.0 - 10.0
4.0 - 6.0
< 2.0
N
W
E
S
500
0
500 m

TIDES


16:00
00:00
08:00
16:00
00:00
08:00
16:00
00:00
08:00
16:00
Tide 1
0
Current 1
5
0

Various Simulation Purposes

- Teaching and training vessel manoeuvres in specific ports and environmental conditions
- Engineering projects for ports
- Investigating accidents



CONCLUSION

SIMULATOR EXPERIENCE:

Enables participants to:

- Manoeuvre in geographical areas using real vessel equipment
- Interact with other vessels (up to 300 per exercise)
- Navigate in conditions affecting ship handling, such as currents, tides, wind, bank effect, squat, etc.
- Perform complex manoeuvres with or without tugs

Expertise:

- Database design (existing or planned)
- Ship model design
- Validating the operational feasibility of a port project
- Creating realistic conditions, designing or modifying database elements
- Accelerated-time simulation
- Real-time simulation
- Reports and data for port development projects
- Investigating accidents
- Audio-visuals

Thank you

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