HAZRUNOFF

PROJECT

Key lessons from past incidents
2008 Loire estuary contamination

CEDRE
Workshop Saint-Nazaire
27 Novembre 2019

Funded by
European Union
Civil Protection
and Humanitarian Aid

A medium spill in Loire estuary (France)

HAZRUNOFF PROJECT

Funded by
European Union
Civil Protection
and Humanitarian Aid

The event and first measures

- **Sunday 16 March 2008 in the Loire estuary at low tide (neap tide coeff. 39), river flow 1000m³/s**
  - 16h 20 : oil reported in the river, close to the ship loading wharf,
  - 30 minutes after, leakage from a pipe was identified and stopped, emergency plan and crisis activated, firefighters and experts mobilised
- **In the overnight**
  - with the rising tide oil slicks and sheen already spread from 10 km upstream to the external part of the estuary at sea,
  - Some oil was already ashore, mostly on the south bank due to wind from the North
- **The spill**
  - 500 tons inside the refinery site,
  - **~ 200 t in the estuary**
  - Intermediate fuel oil (IFO 380) (viscosity)
  - Emulsification afer few days

HAZ PROJECT

Cedr

and Humanitarian Aid

Organisms and authorities involved in response

SDIS 44

Préfecture Maritime Atlantique

DDAF

DRDAM

ONCFS

DIREN

LPO

DDSV

Ddass & Drass des Pays de la Loire

DDASS

PORT AUTONOME Nantes Saint-Nazaire

Gendarmerie nationale

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
Préfecture de la Loire-Atlantique

Ifremer

DDE / Stock Polmar

Lamaneurs

Cedre

FOST Fast Oil Spill Team

COMMISSION D'ETUDES PRATIQUES DE LUTTE ANTIPOLLUTION CEPPOL

TOTAL

Raffinerie de Donges

Douanes

Total reconnaît sa responsabilité et s'engage à prendre en charge la totalité des dépenses

Le plan Polmar n'est pas déclenché mais ses moyens sont mobilisés

HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

Emergency organisation et coordination

- A crisis unit at the Departmental prefecture (Centre Opérationnel Départemental - COD)
- A Command Post (PC) at the refinery (north bank)
- A comand post at Paimboeuf municipality (south bank) under SDIS command with representatives of the oil company, and Cedre experts

- The oil company took the lead for the response operations under the control of Prefecture represented on site by Cedre and SDIS 44

- An enviromental expert group is activated by the environmental administration (DIREN)
- An expert group is set for the follow up of pastures of the Loire flooded plain

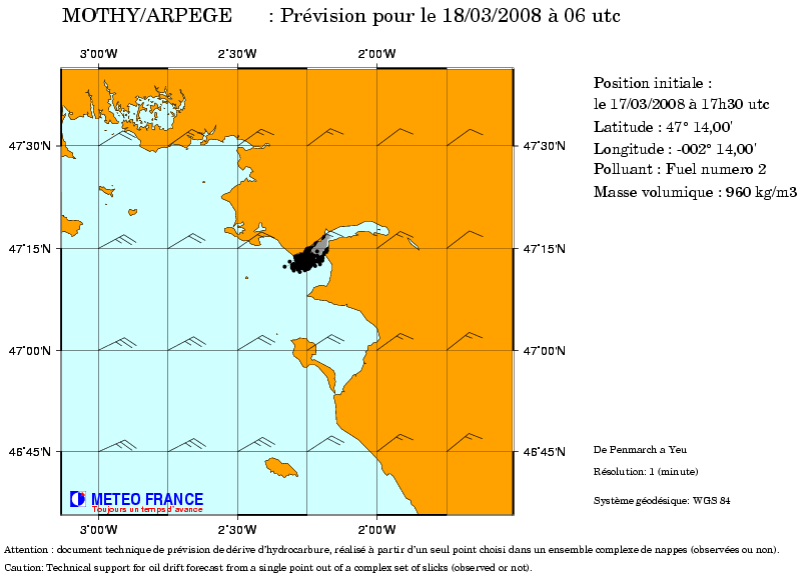
- Daily assessement of the pollution extension by helicopter, boat, walking

Gendarmerie, Civil Security, Oil company, SDIS44, *Cedre*

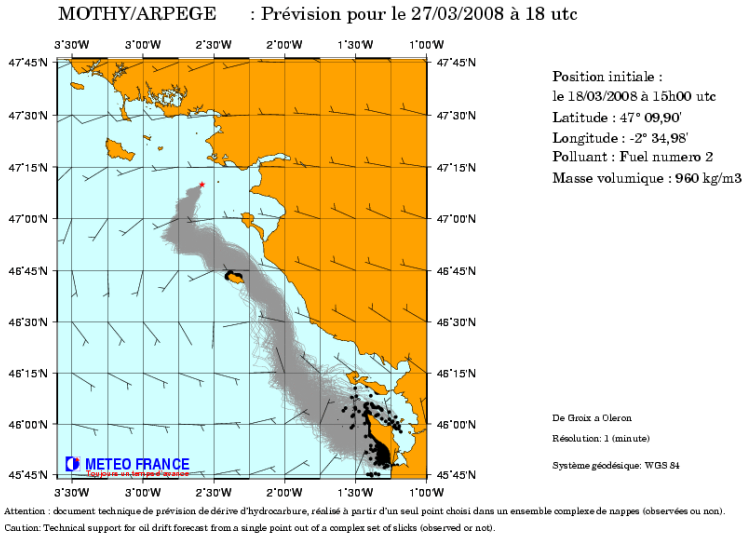
PC de site : SDIS 44

Available model for oil slick drift forecast at the mouth of the estuary and at sea

MOTHY model from Météo France :



not design for estuaries



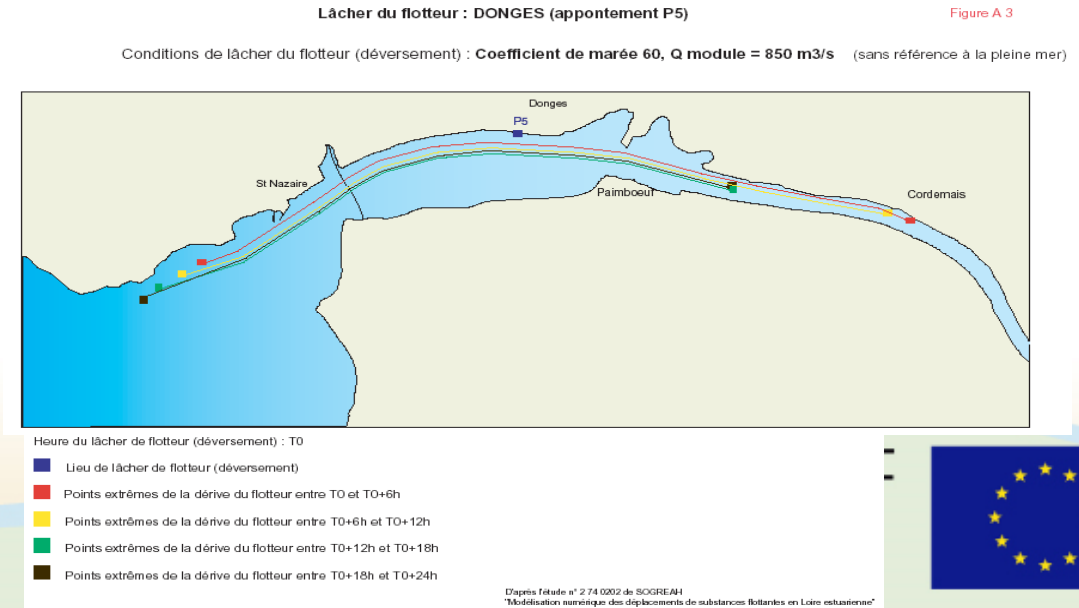
Eefficient for drift forcast at sea : limited contamination of the coastline confirmed to Oléron island

HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

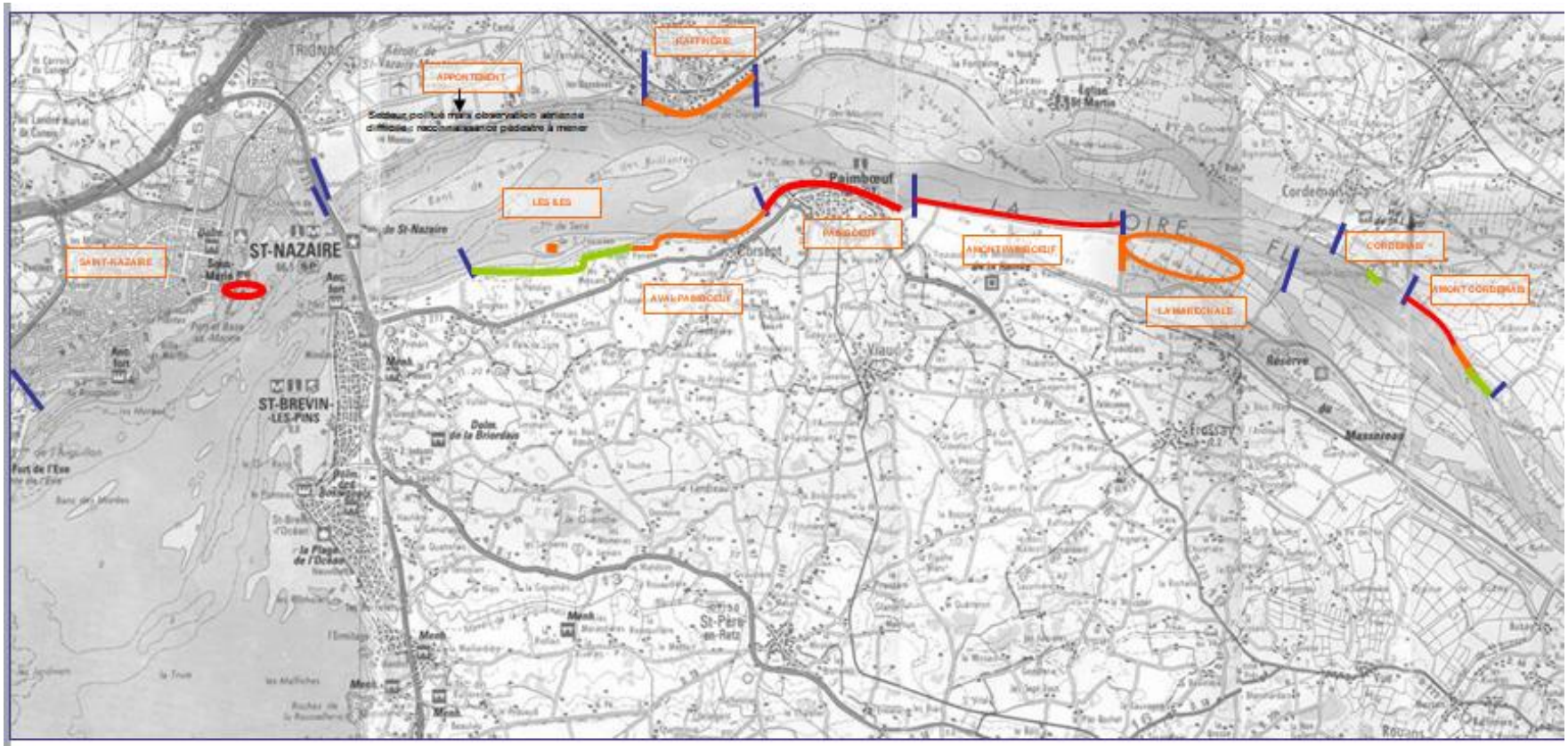
Available model for oil slick drift forecast inside the estuary

- Available hydrodynamic model : 3/4 days to run the model and get results
- To mitigate this difficulty, simulations were prepared in advance for the Contingency Plan of the refinery
- Four scenario were tested (different tide amplitude, river flow and wind conditions) :
- Model results compared to the trajectories of 3 floaters released in the estuary and potential points reached by the pollutant after 6, 8, 18, 24h



Funded by
European Union
Civil Protection
and Humanitarian Aid

Map and pictures prepared for authorities from helicopter flight observations after one overnight



Légende :

- Limites de secteur
- *Accumulations importantes sous forme de galettes et plaques / végétaux pollués*
- *Accumulations de petite dimension sous forme de boulettes et galettes / végétaux souillés*
- *Coloration des végétaux, aucune accumulation*

Bilan de la reconnaissance aérienne SDIS 44
Mardi 25 mars 2008 à 15h00

Marée : Coef: 83
BM : 13h07 / PM : 18h25

First operations: protection by boom deployment :

- Try to protect sensitive areas and strategic ressources in the estuary
- Anchoring difficulties
- Strong currents
  - ➢As expected, limited efficiency

Water intake of the power station

Boom anchorage in the meadow

Moored *Thomsea* trawl nets

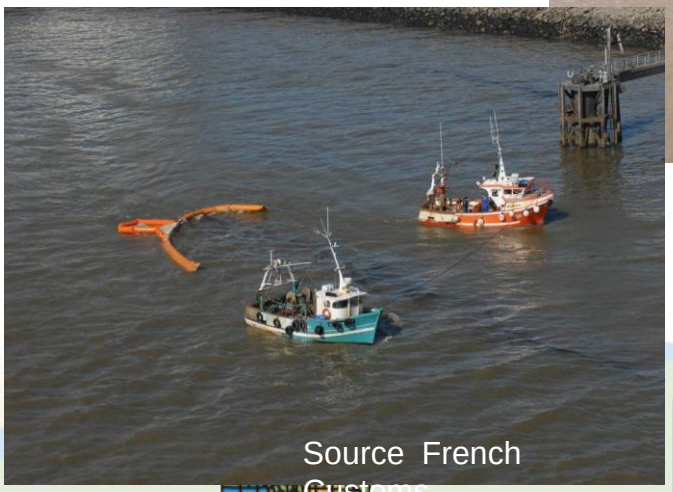
HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

First days oiling conditions and first recovery operations

- Due to neap tides oil remains on water and on low part of the banks or in shallow water
- *Oil spill Response vessel Argonaute* was tested with *Thomsea* trawlnet (too large vessel, and fluid oil)
- Then mobilisation of fishing boats
- Small skimming barges suited for shallow waters were not available

➢ **Low quantity of oil recovered**



PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

Second phase of contamination

On the fourth day after the spill :

- Increase in tide amplitude (coeff 94), changes of direction and strengthening in wind

As a result :

- At high tide, sudden spillover the banks, large extension of contamination
- Oil contaminates new areas,
- Oil penetrates into small creeks and overflows spreading into meadows and wetlands

HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

6 days after the spill, the contamination **reaches** almost its maximum extension in **width** and length (32 km)

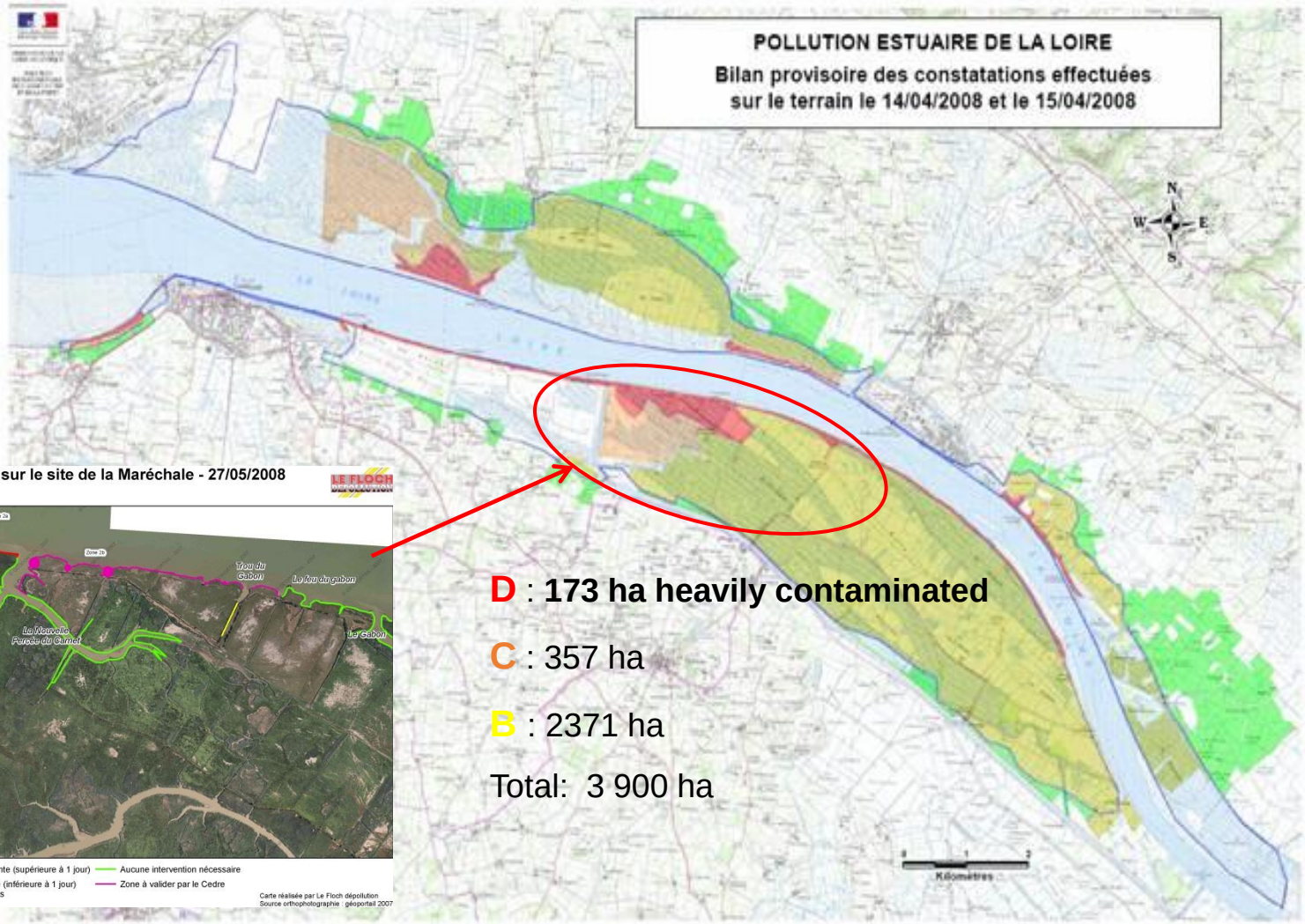
Pointeur 47°18'39.00" N 1°41'40.77" O
Mise au point 100%

PROJECT

d by
ean Union
otection
and Humanitarian Aid

Flooded pastures contamination and monitoring

Prefecture order : grazing ban extension and level of contamination in the flood plain (nearly 4 000 ha)



As a result : 3 months of cleanup operations, 25 000 man day

HAZRUNOFF PROJECT

Funded by
European Union
Civil Protection
and Humanitarian Aid

Response and impact

Reeds heavily oiled,use of mechnical equipment

1 month after

Result of the monitoring :

- Water, sediments
- Birds,
- Vegetation
- Benthos

few weeks to one year no more impact measurable

HAZRUNOFF PROJECT

1er mai 2008

Funded by European Union Civil Protection and Humanitarian Aid

Lessons learnt and future developments

- Model improvement (French authorities, Hazrunoff project) and faster transmission of observations and model forecast (Hazrunoff platform)
- New tools as UAV (SDIS44, and test in the frame of Hazrunoff project)
- Better adapted equipment for recovery in fast currents : since 2013 Cedre organise with the GPMSN, Phare et balises and manufacturers tests of new equipment in the Loire estuary, and in 2018 in the frame of the project

Elastec rapid response system (R3S) can afford current of 3 to 4 knots deployed by the *Bonne Anse* ship of Phares et Balises of Saint-Nazaire

HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

Prototype of hovercraft for operations on mudflats and in shallow waters developped by Italian partners in the framework of a European project

Use of Unmanned Aerial Vehicles to help response

Possible uses:

- Slick detection and follow up / fast transmission of alert to the Command centre (HazrunOff project test)
  - — Optique (oil)
  - —multispectral sensors for HNS soluble in water (in development)
- Support to recovery operations (for recovery boats positioning towards slicks)
- Mapping of oil extension ashore or in flooded areas of difficult access

(*ELASTEC Rapid River Response System (R3S)*

HAZRUNOFF PROJECT

Funded by European Union Civil Protection and Humanitarian Aid

Use of Unmanned Aerial Vehicles to help response

- Operational feasibility, requirements and constraints:
  - — Regulations :
    - timeframe to obtain agreements from aviation authorities, Port authority and industry owners
  - — Technical:
    - Elevated structures in an industrial estuary (e.g. cranes; 100 m high may provide obstacles when establishing a “point zero” on land, in case of loss of drone)
    - Take-off and landing on a vessel : space needded/size of the drone, risk of interference with the metallic structure of the vessel that could affect the GPS of the drone;
    - Short autonomy (battery duration ~20 minutes
  - — Conditions:
    - Wind max 20 knots (40 km)

Use of Unmanned Aerial Vehicles to help response

- Picture export to *GoogleEarth*© (ex : geosetter aplication)

Allow a fast transmission of slick position

  - Only one photo for visualisation
  - Do not allow to include in GIS mapping

Positioning of the slick in the Loire estuary, using Geosetter/Google earth, for fast forwardin information to the authorities

- Georefenced pictures for mapping
  - Processing take few hours to get a map (specialized software)
  - For reasonable timeframe in emergency situations: optimisation of the number of pictures, altitude of flight, scale of the map, definition of the image

HAZRUNOFF PROJECT
Funded by European Union Civil Protection and Humanitarian Aid