The Jumeirah Project : first combination of beach dewatering system and sand nourishment

Arnaud Ballay, Feb 14th 2014

Ecoplage


Athènes
Kos
Kriti (Crete)
Nicosia
Beyrouth
Damas
Jérusalem
Amman
Le Caire
Gulf of Suez
Lac Nasser
Mer Rouge
Lac d'Ourmia
Achgabat
Téhéran
Bagdad
Koweït
Golfe Persique
Qushm Island
Manama
pumpstation
Doha
Golfe d'Oman
Riyad
Abou Dabi
Mascate
878 km
Map Data © 2013 AND
© 2013 Google
Image Landsat
© 2013 ORION-ME
Google earth

Dubai coastline

Ecoplage


Sharjah
Dubai
(Dubai)
Al Awir
Lahbab
Mina Jebel Ali
21.9 km
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 GeoEye
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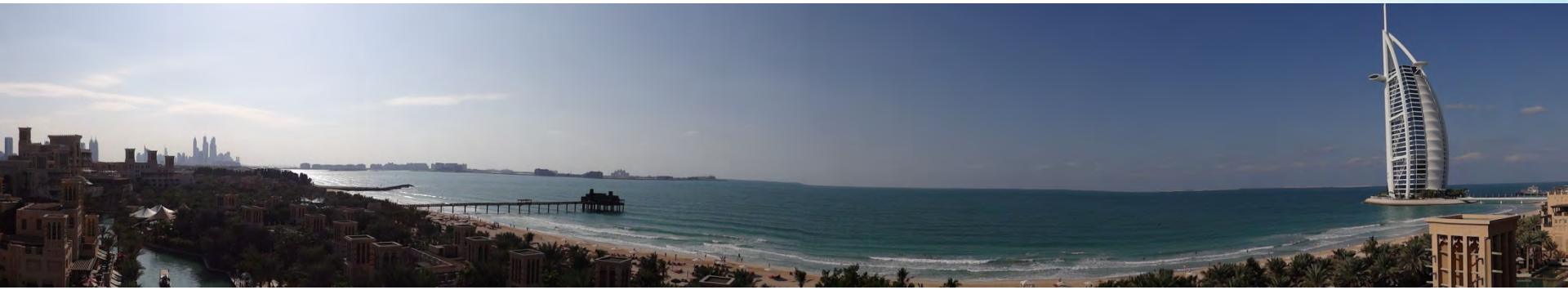
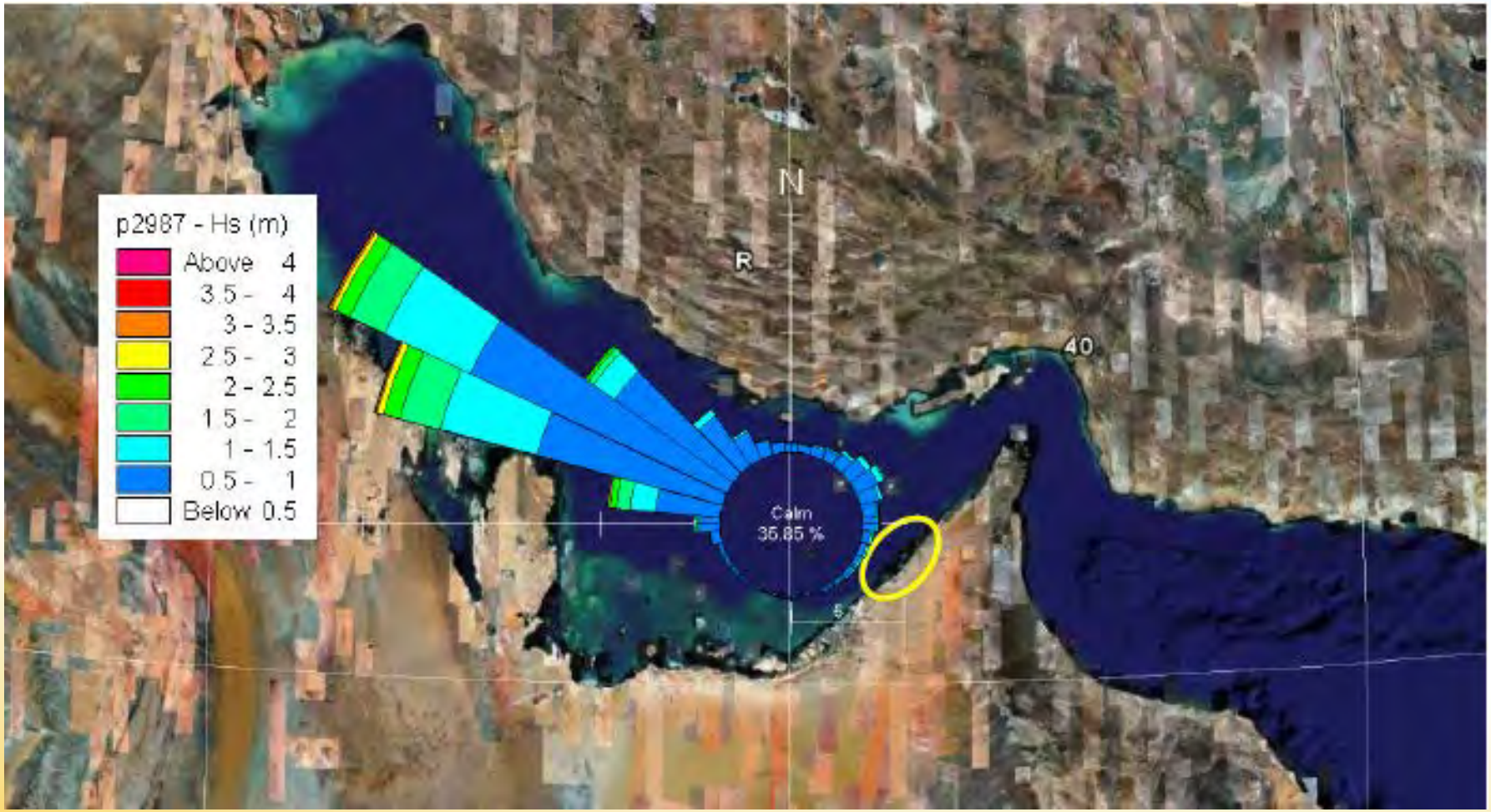
Madinat Jumeirah Beach

Madinat Jumeirah Beach



Conditions at site

Wave roses for Jumeirah (Mangor 2007)



Conditions at site

Return Period (yrs)	Extreme Wave Conditions		
	Nearshore	Offshore	
	Wave Height, H_s (m)	Wave Height, H_s (m)	Wave Period, T_z (sec)
1	3.45	3.50	6.50
10	4.00	4.35	7.10
50	4.15	4.95	7.50
100	4.15	5.10	7.60

Table 1: Wave Conditions

Astronomical Tidal Levels	
	Tidal Elevation (mDMD)
HAT	+2.20
MHW	+1.62
MSL	+1.13
MLW	+0.66
LAT	+0.00

Table 2: Tide Levels

Estimated Extreme Water Levels	
Return Period	Still Water Level (mDMD)
1	2.40
10	2.72
30	2.87
50	2.94
100	3.03

Table 3: Water Levels

O.D.S influence (Deltarès 2008)

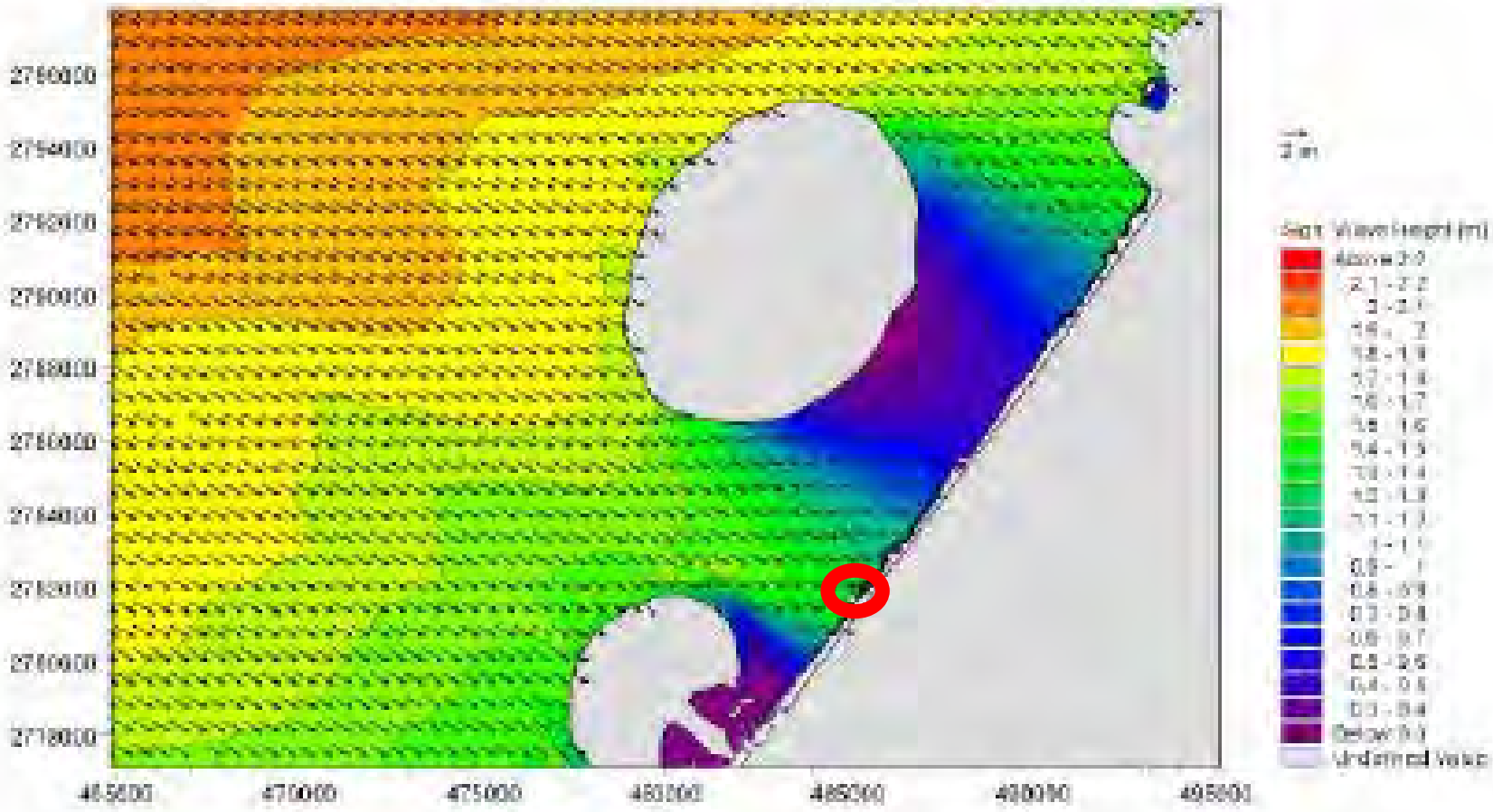
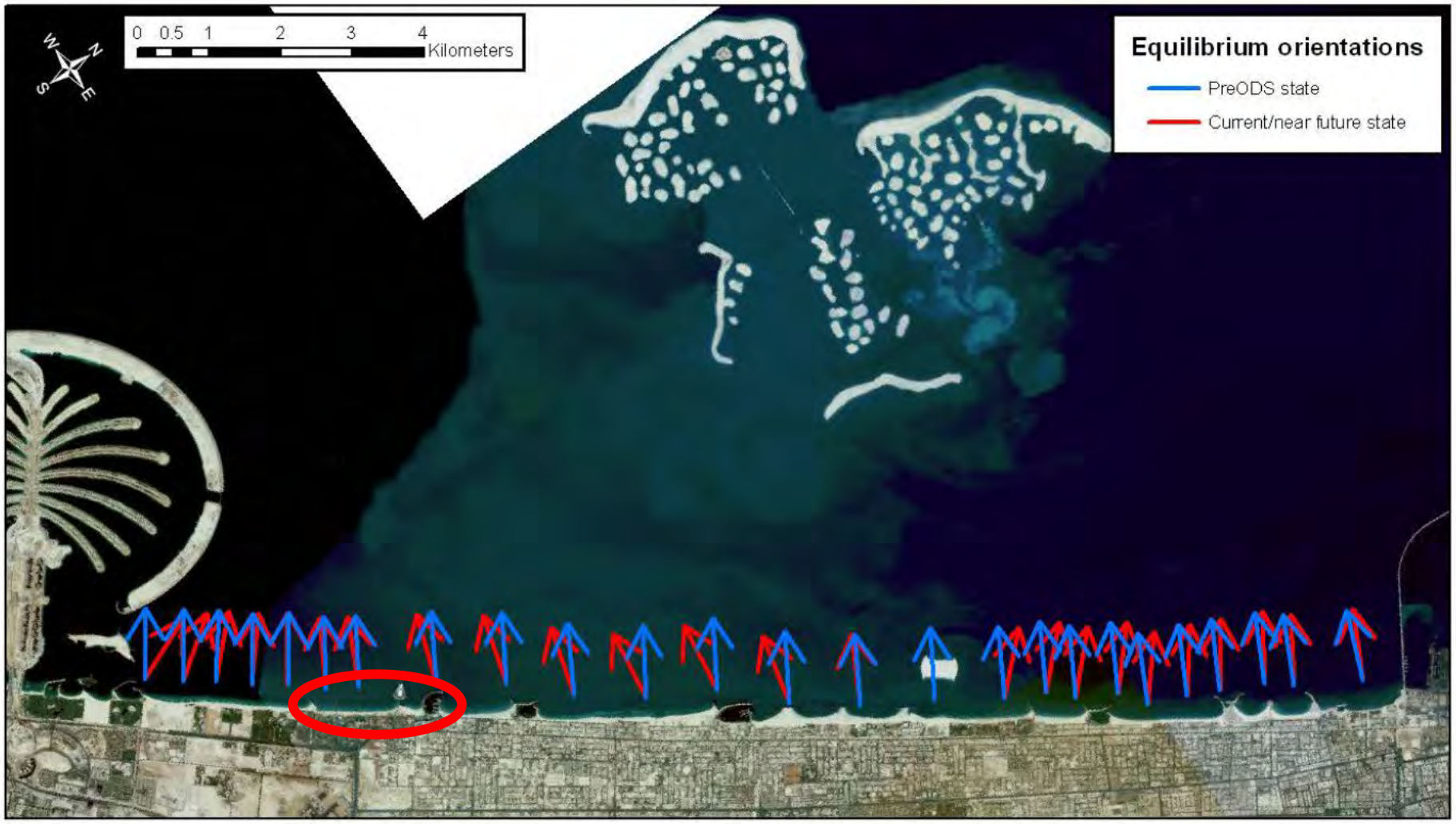


Figure 6: Close-up of waves for Jumeirah area. Wave conditions at model boundary: Hs = 2.25 m, Tp = 8.5 s and MWD = 295° N

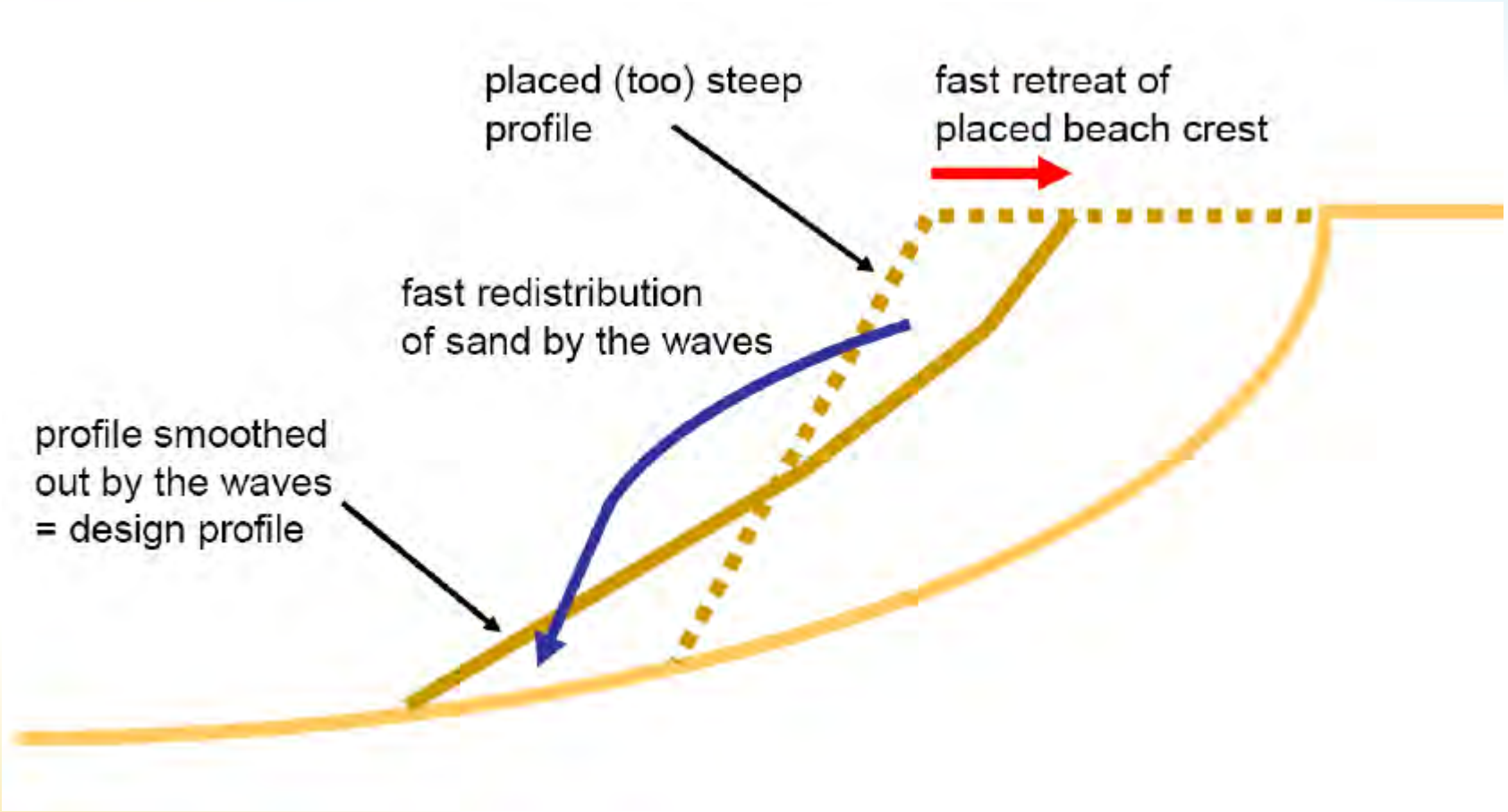
O.D.S influence

(Mangor 2007)



Sediment transport

Erosion at site



Erosion at site

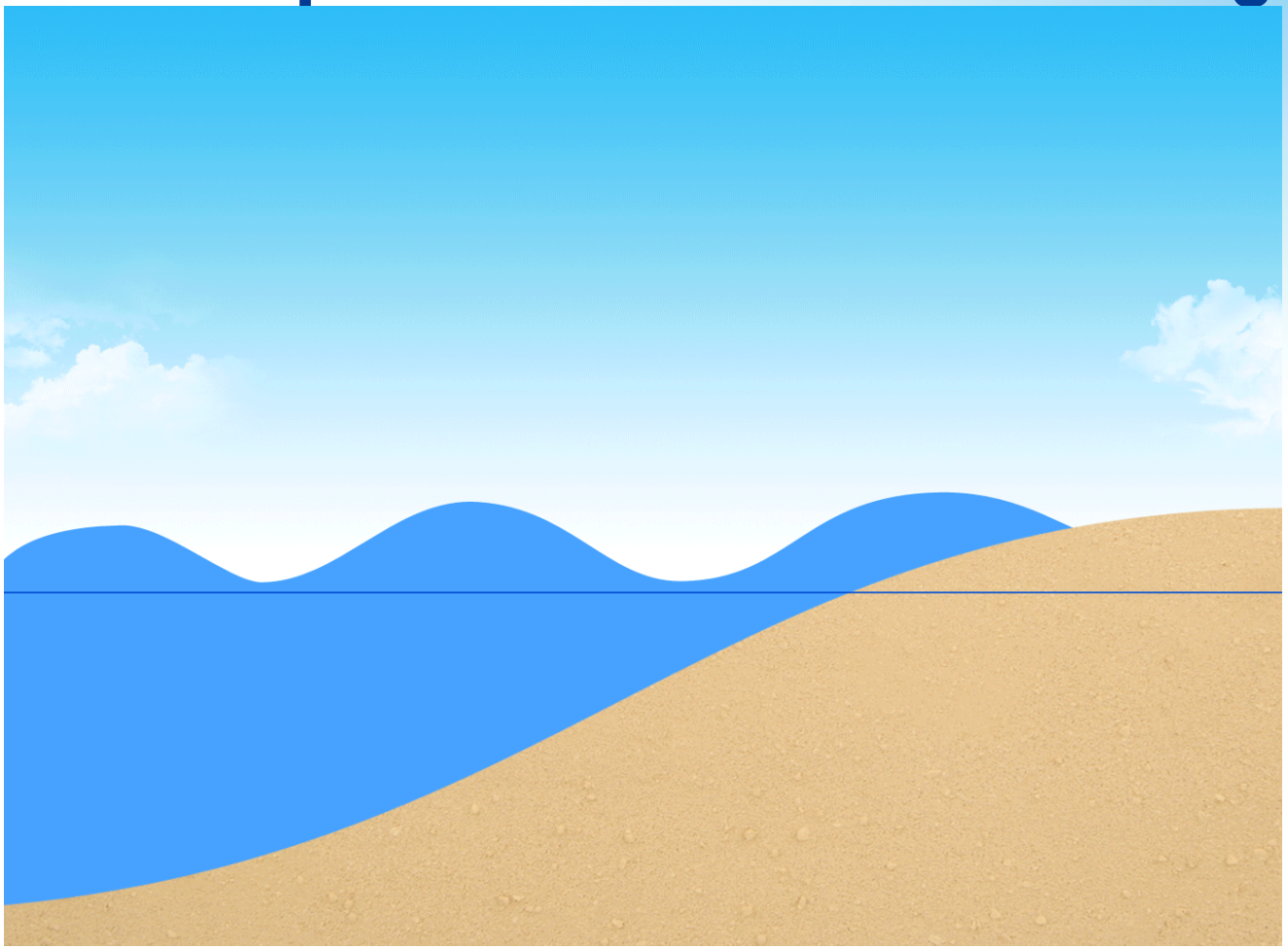
Looking for a substainable solution

- Hard engineering

- Soft engineering

2 M US$ every 2 years . approx. 80000m3

Principle of beach dewatering



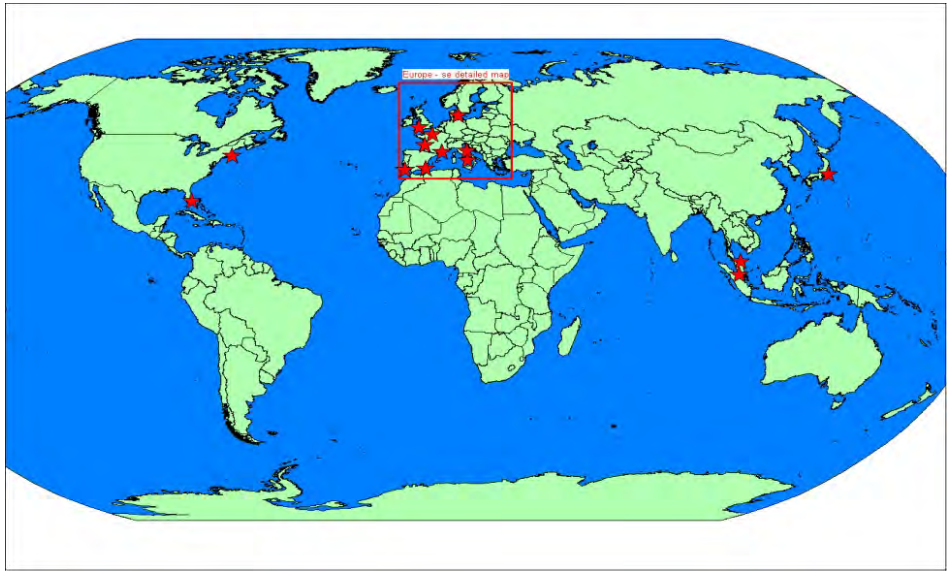
- Facilitate deposit of sediments
- Make sand more cohesive
- Absorb part of the energy of the wave
- Reduce water runoff toward the sea

Principle

About Beach Dewatering

- discovered in 1983 by DGI (GEO) in Hirshtals (H.Vesterby)

- **1984 - 1999 : implementations by DGI / GEO**
  - Denmark, Sweden, Germany
  - Florida, USA
  - Italy, Spain
  - Malaysia, Japan…



- **1999 – 2004 : 3 pilot projects** in France
- Since 2006: 5 new implementations

The System

Evacuation pipe

Pumping station

Collector pipe

Drains

Sables d'Olonne
(France)

November 2001 – Before implementation

November 2002 – After implementation

Quend Plage
(France)

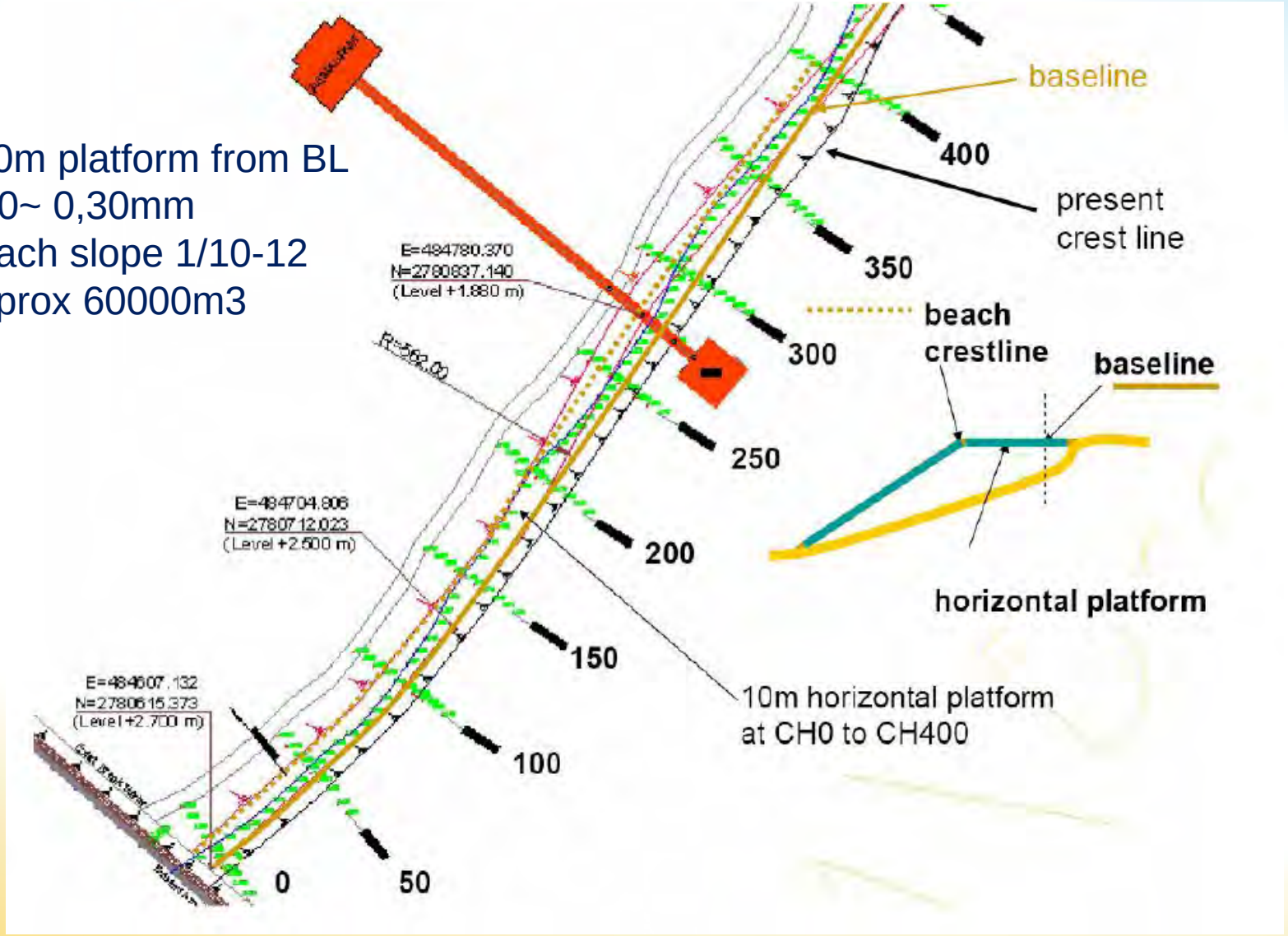
Mach 2008 – Before implementation

Mach 2009 – After implementaiton

project : ecoplage® + nourishment

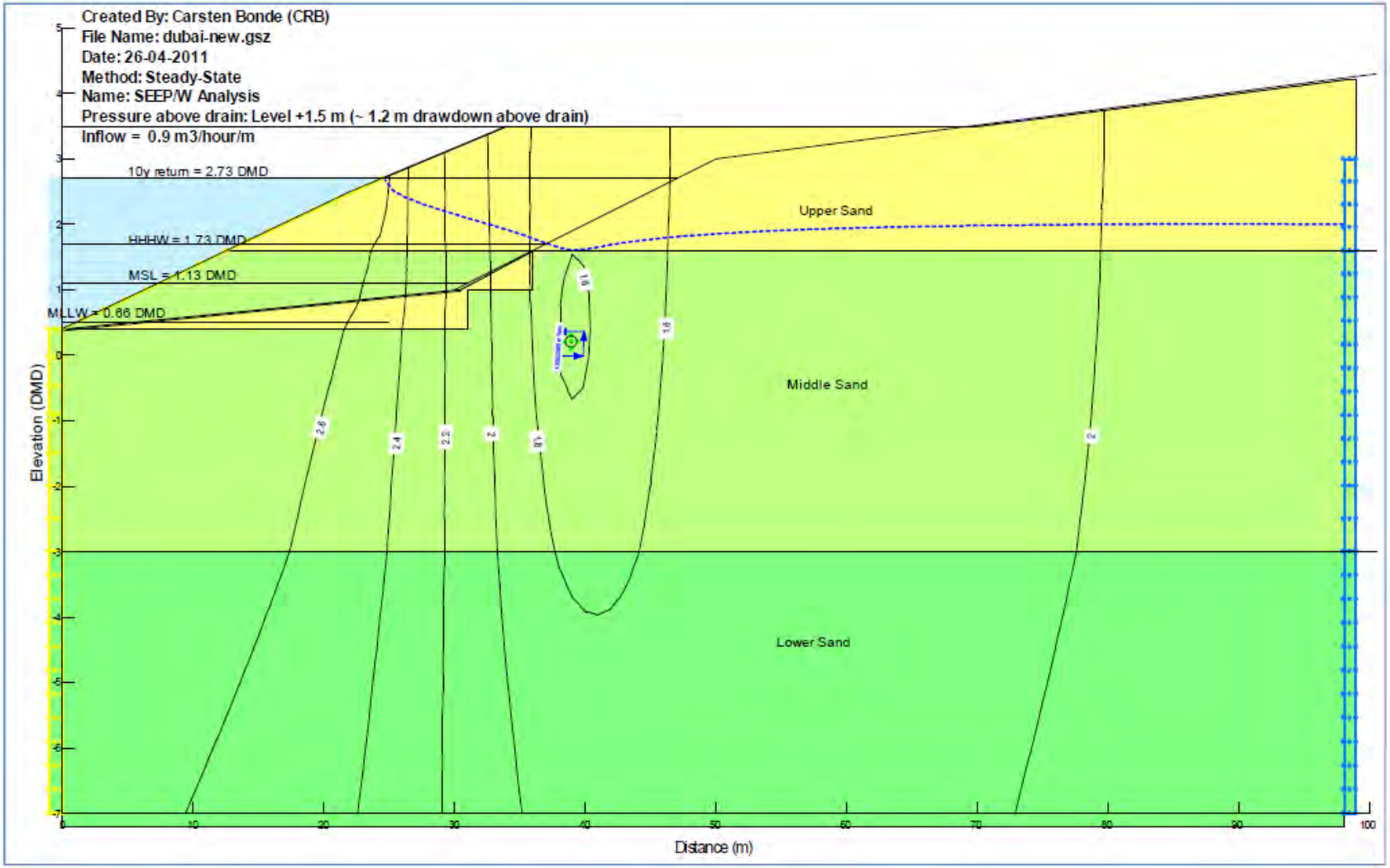
Beach reclamation

- +10m platform from BL
- D50~ 0,30mm
- Beach slope 1/10-12
- Approx 60000m3



Dewatering system design

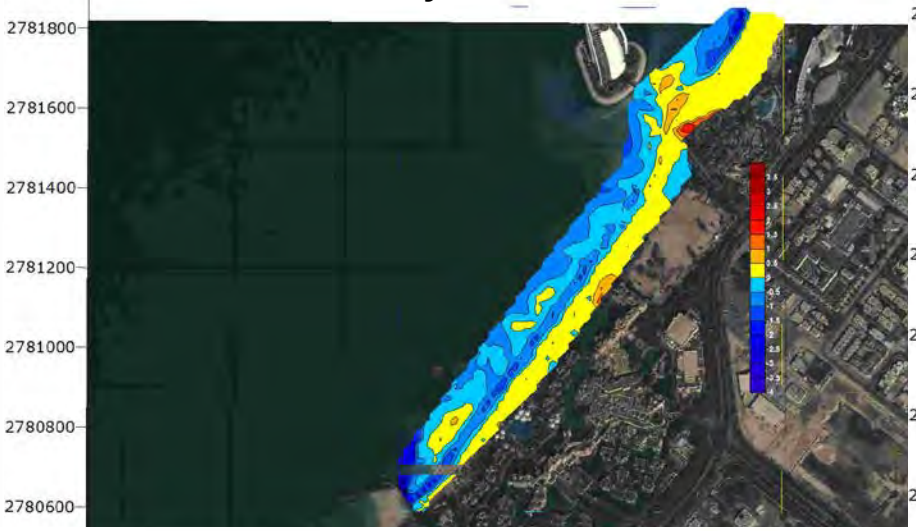
After nourishment. 10 Year Return High Water. Pressure above drain ~1.5 m. Inflow 0.9 $m^3/h/m$



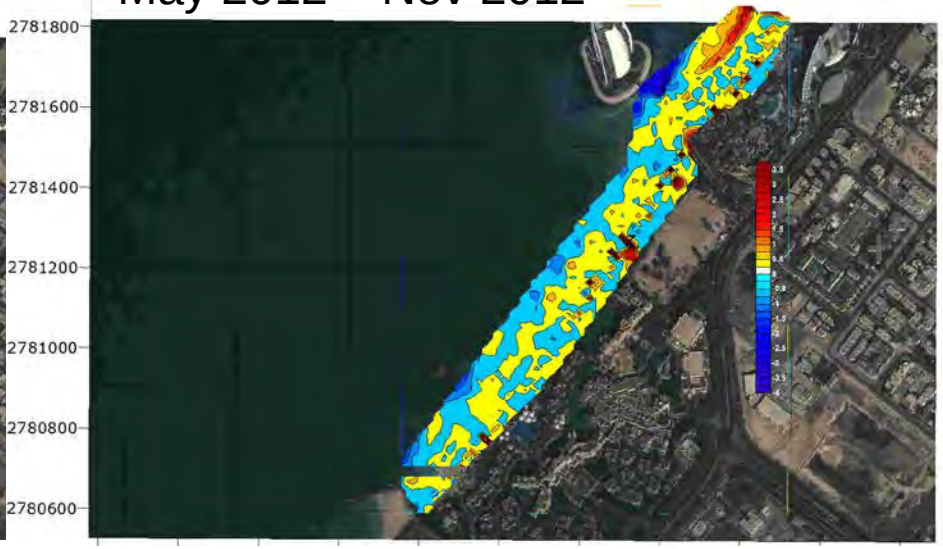
Works : Aug-Oct 2011

Monitoring

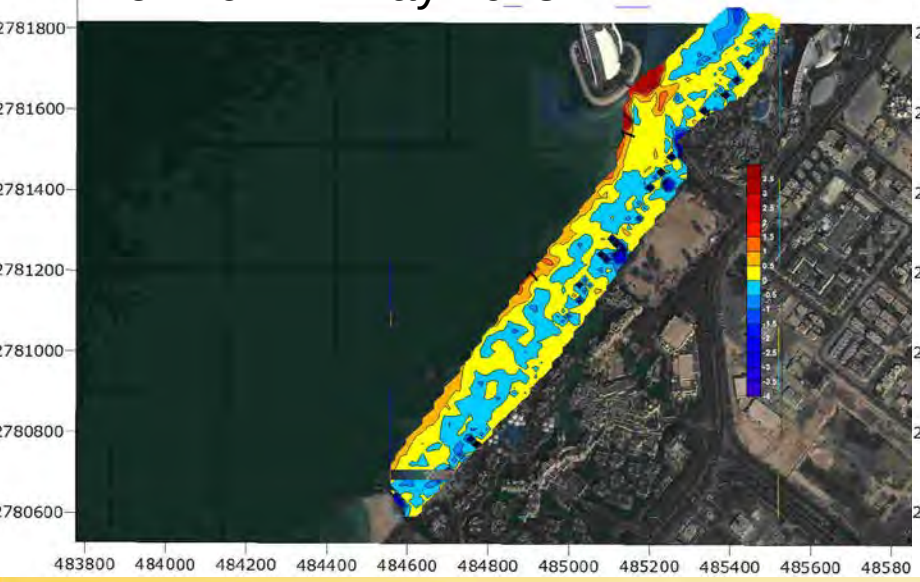
Nov 2011 – May 2012



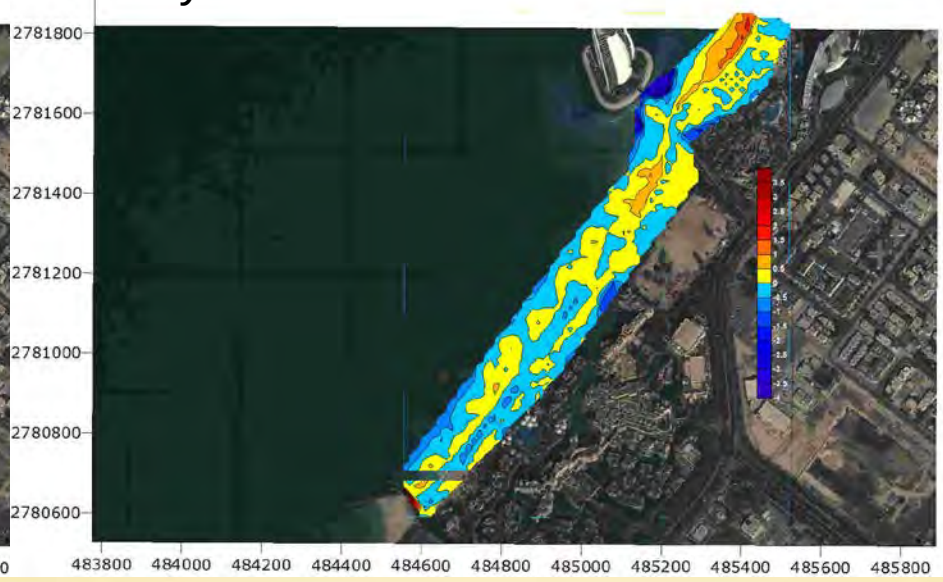
May 2012 – Nov 2012



Nov 2012 – May 2013

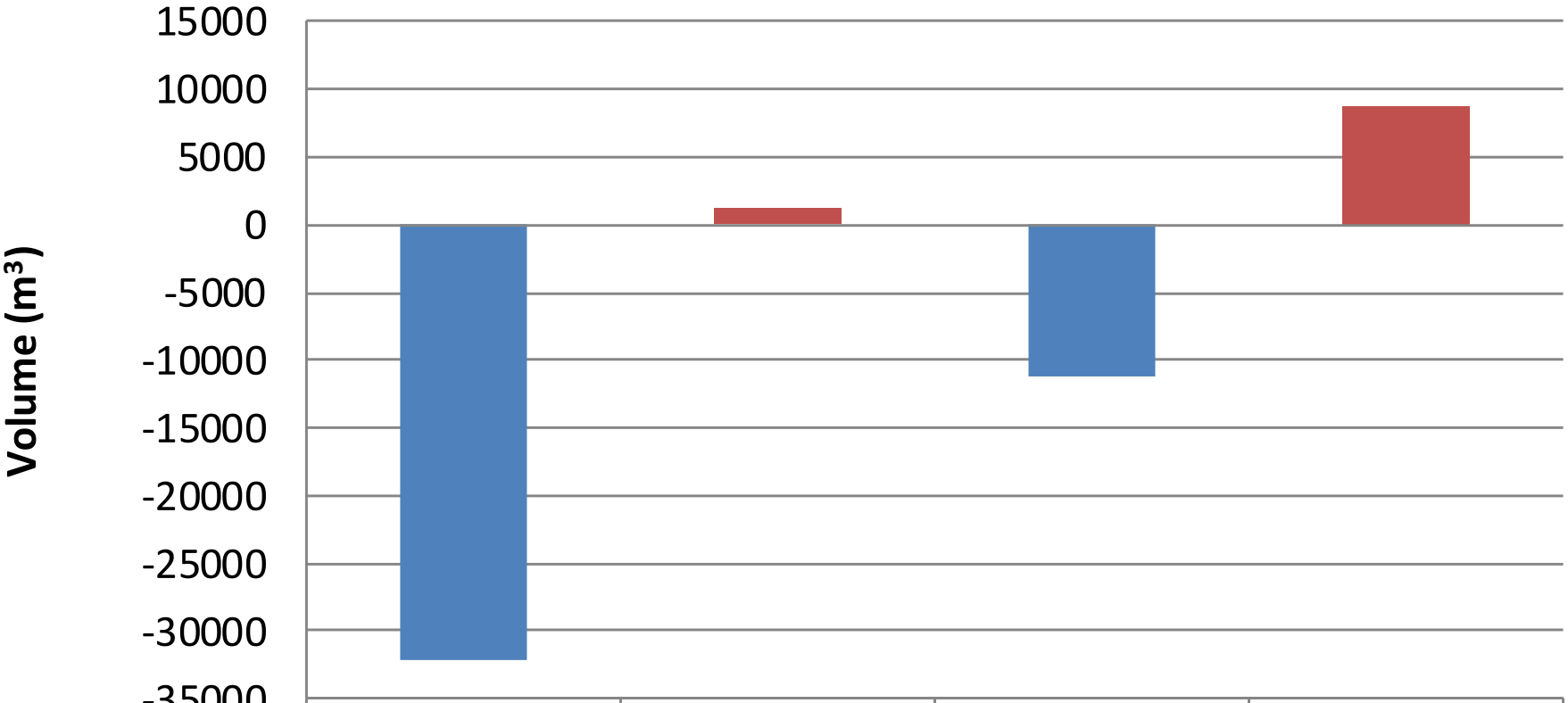


May 2013 – Nov 2013



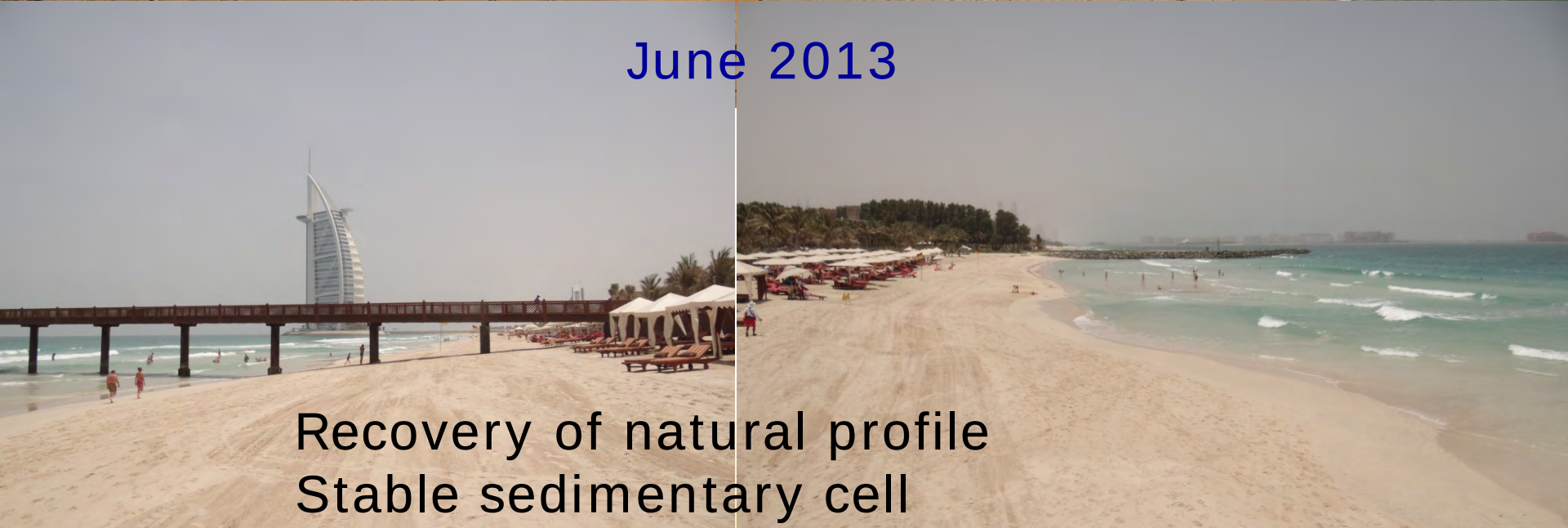
Monitoring

Sand displacement volume calculations



	Nov 2011 - May 2012	May 2012 - Nov 2012	Nov 2012 - May 2013	May 2013 - Nov 2013
Volume (m3)	-32047	1245	-11146	8846

Before / After



Beach tends to stability

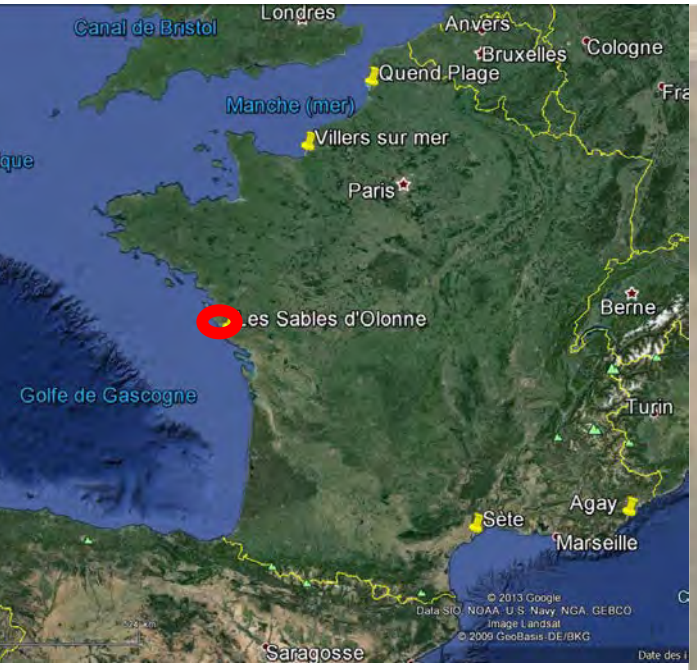
- **Before : 40 000m3/yr min**
- the first year (Nov 2011—Nov 2012: - 30 000m3) despite the rebalancing after nourishment.
- 2nd year, beach almost stable (-2300m3)
- Tombolo is a sufficient stock (~15 000m3/y)
- No need for nourishment yet
- No external input for next nourishment
- Monitoring survey yet another 2 years…

A cost effective method ! ?

+ water for waterway oxygenation

Production of highly filtered sea water

Enerplage®



Filtered seawater

Hot Fresh water

discharge

Thank you for attention!

Ecoplage

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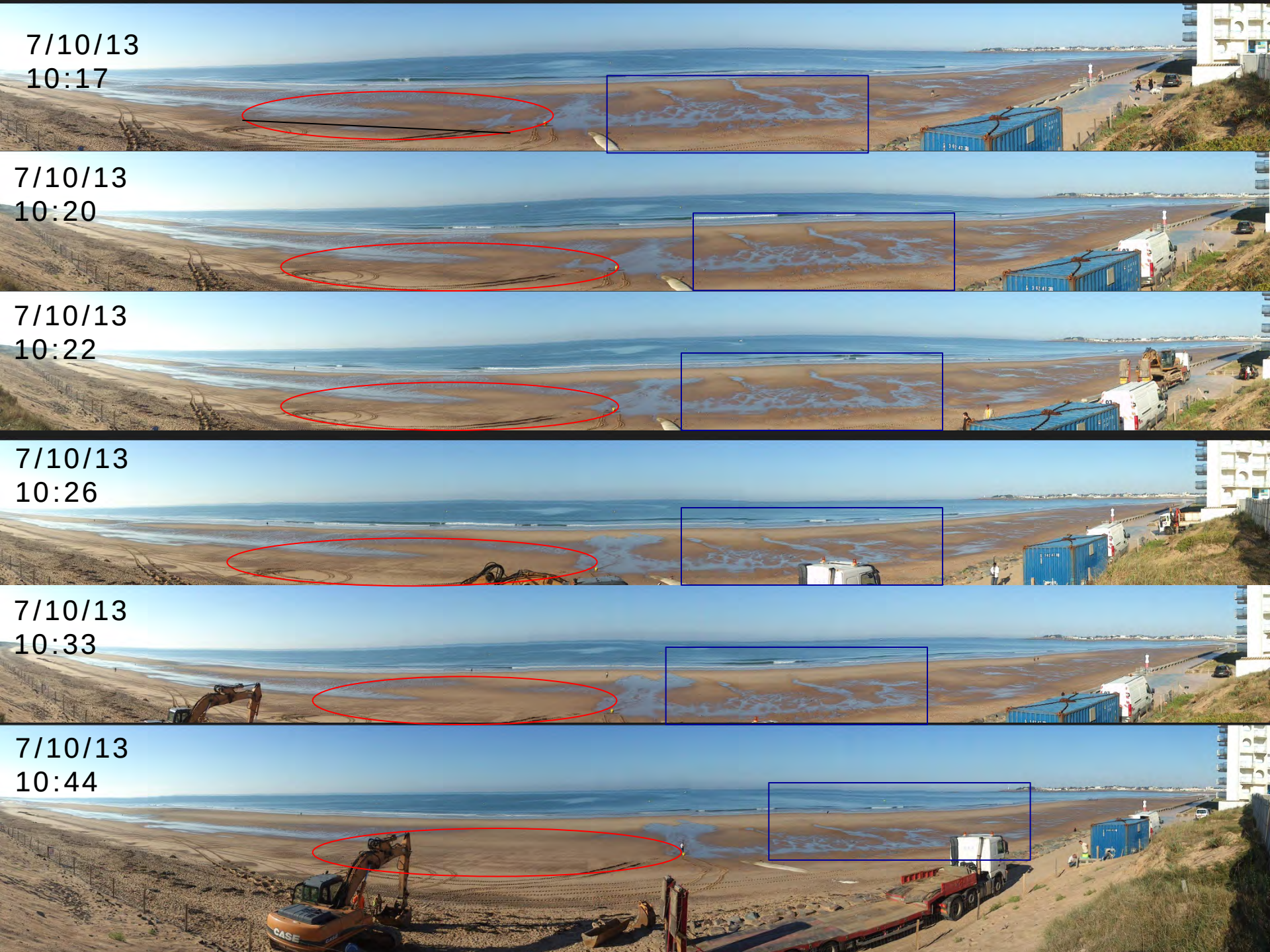
7/10/13
10:17
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CASE