

Kursus Kerja Pengorekan Senggara/Baru & Penebusgunaan Tanah

18 April 2018

**Tempat:
Akar Beach Resort
Port Dickson, Negeri Sembilan**

Introduction to Land Reclamation Works

Penceramah:

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**Bahagian Pengurusan Zon Pantai
Jabatan Pengairan dan Saliran Malaysia**



INTRODUCTION

Coastal is part of our natural environment, some countries gain their economy through promoting their white sandy beaches and crystal clear water.

Some have developed their coastal areas as commercial and industrial, ports, airports, storage for industrial products, shipping activities and most recent trend is *reclamation* projects.

LAND RECLAMATION (BS 6349)

The exclusion of the sea, or other mass of water, from areas that were previously submerged, or subject to inundation, by the raising of land levels primarily using materials recovered by dredging processes.

DREDGING



CUTTER SUCTION DREDGER





FLOATING LINE



HYDRAULIC FILLING

4.04.98

TRAILER HOPPER SUCTION DREDGER





RAINBOWING



RAINBOWING



CONVEYOR

RECLAMATION IN PROGRESS...



RECLAIMED AREA



Coastal reclamation

Types of Reclamation

- Island concept
 - Preserves mangroves
 - Drainage patterns maintained
 - Separation channel needs maintenance
- Peninsular concept
 - Extension of original coastline
 - New sea frontage
 - Loss of beaches



Island concept: Tanjung Tokong Land Reclamation Project, Penang (980 h



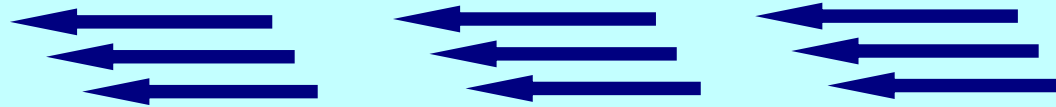
Reclamation in Langkawi: peninsular concept



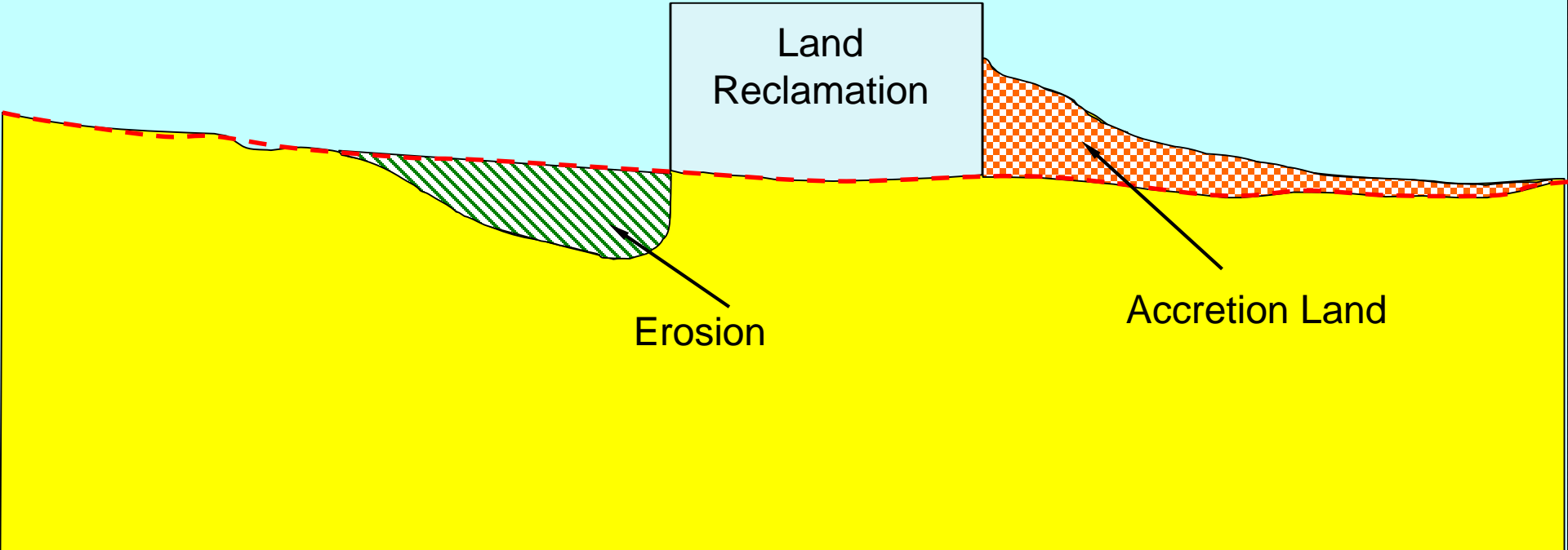
Peninsular concept: Reclamation For Airport Runway - Kota Kinabalu, Sabah

SEA

Net Longshore Sediment Transport



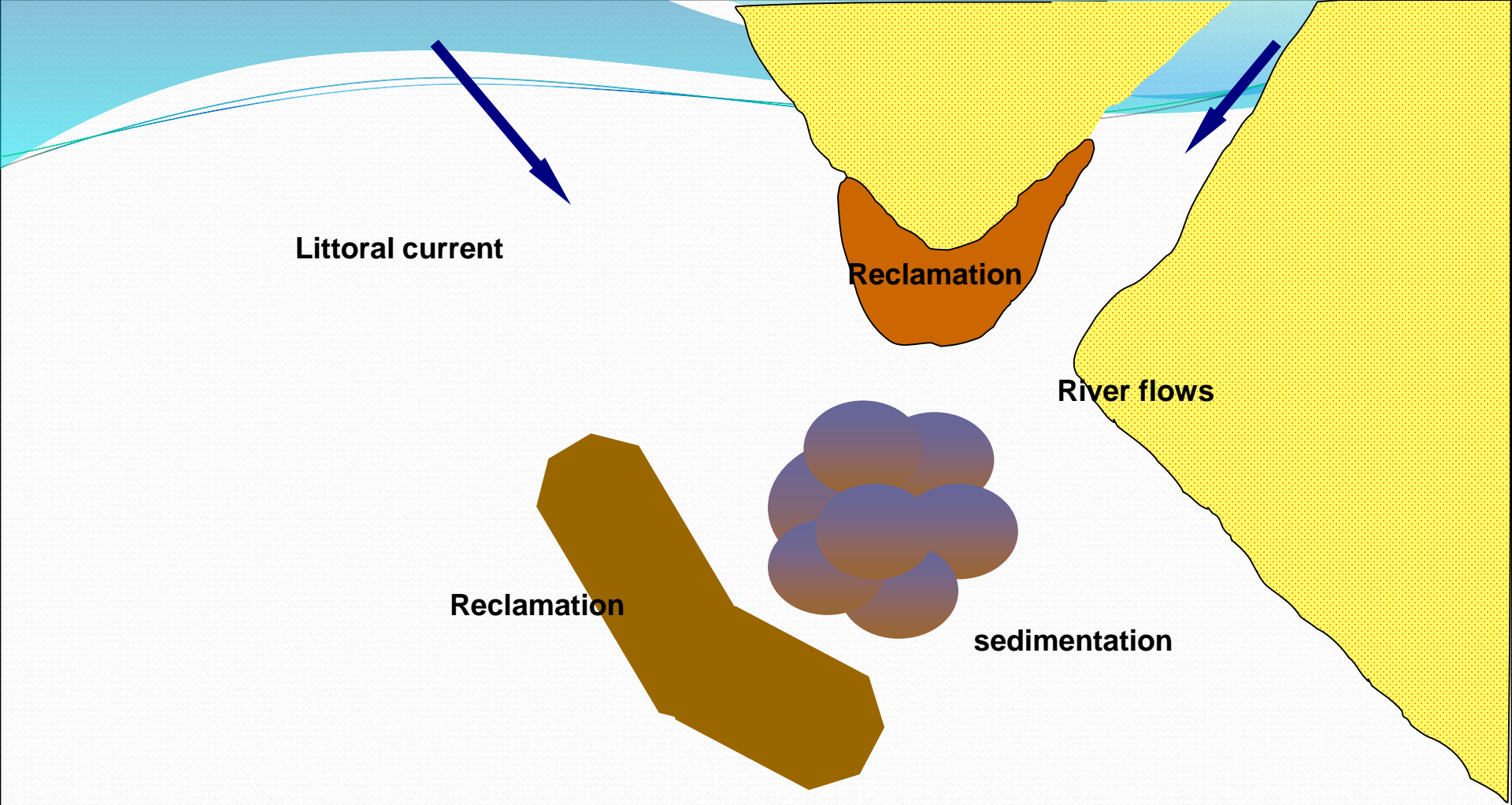
Land Reclamation



Erosion

Accretion Land

LAND



Reclamation effects: rivermouth sedimentation

DESIGN OF LAND RECLAMATION



DESIGN

- Incorporate findings of EIA study : hydrology, hydraulic, geo-technical, coastal processes, erosion risk, QRA etc.
- Effective mitigating measure.
- *Design with nature*



INITIAL PROPOSAL LAYOUT

15m grid (MSL)
Optimised Layout

(kilometer)

13
12
11
10
9
8
7
6
5
4
3
2
1
0

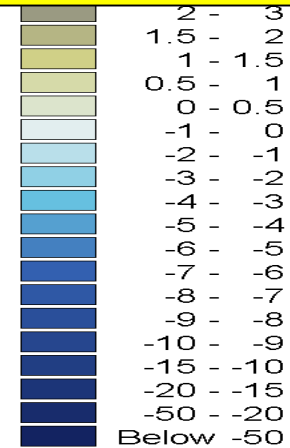
Muddy –
sedimentation

Beach deterior-
ation (no
natural
waves)

Flooding increased
(flow must travel
additional 3-4 km to
the sea)

Water quality
deterioration (no
flushing)

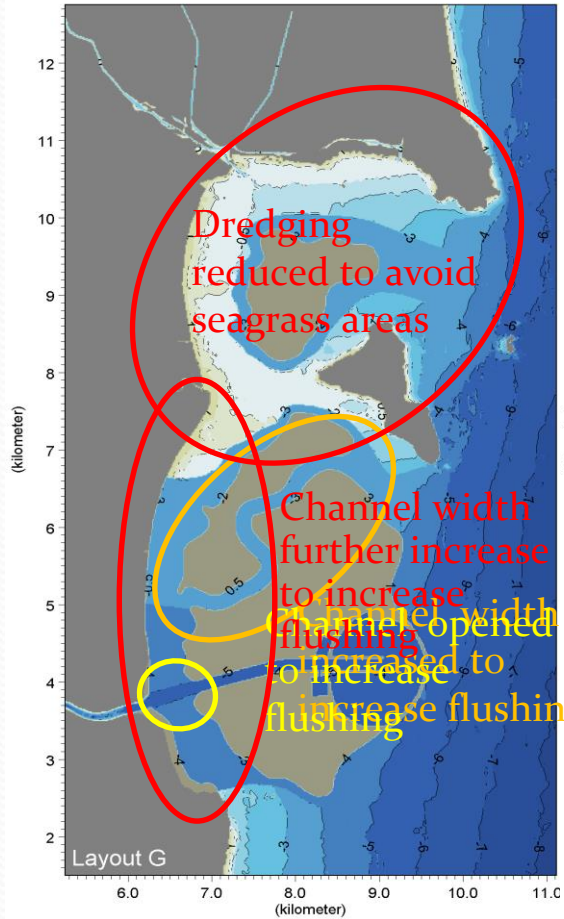
Navigation effect
(current speed
increased)



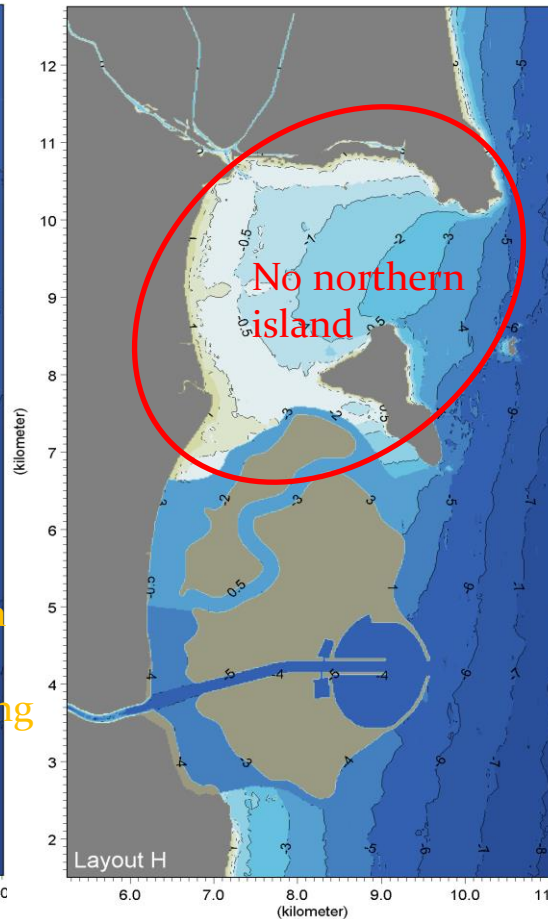
8.0
meter)

Bathymetry for EIA proposal 4C and JPS alternative layout GHI

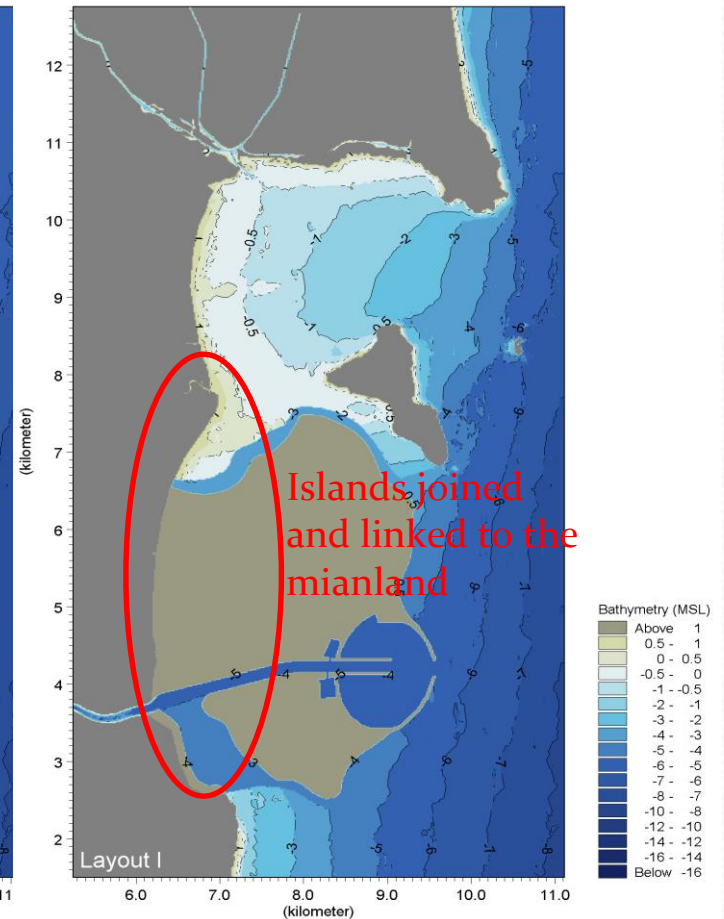
Source: JPS for Mersing Laquna Project



Layout G: Similar with Layout F but width of channel increased to 200m.



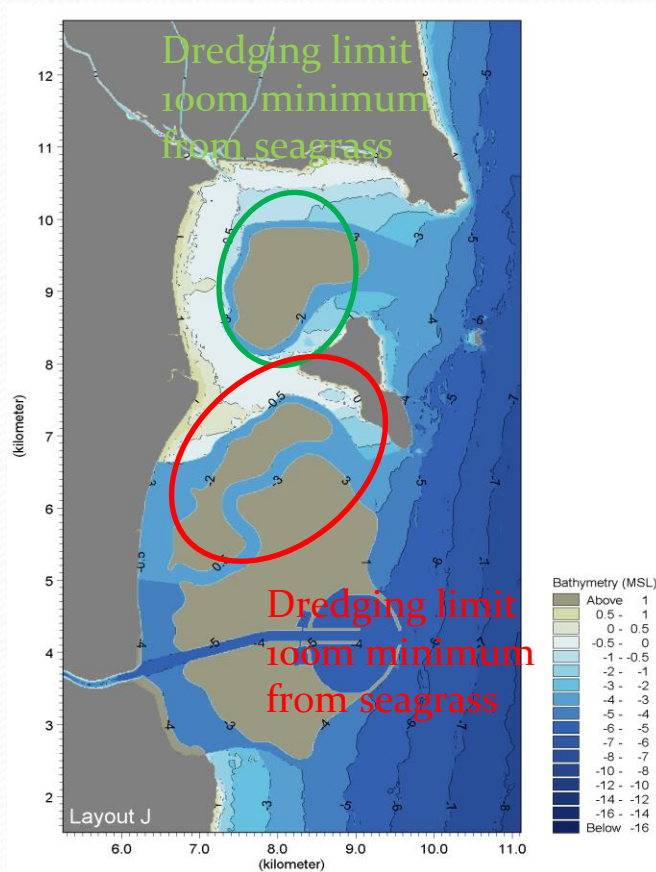
Layout H: Similar to Layout G but without northern island.



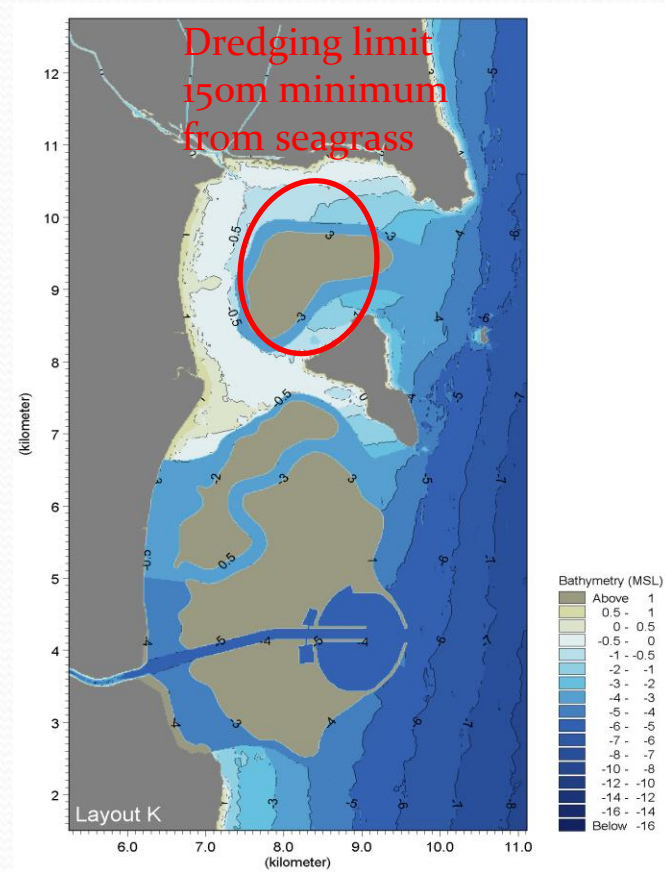
Layout I: As layout H but with islands B and C joined together and linked to the mainland.

Bathymetry For EIA Proposal 4C And JPS Alternative Layout JK

Source: JPS for Mersing
Laquna Project

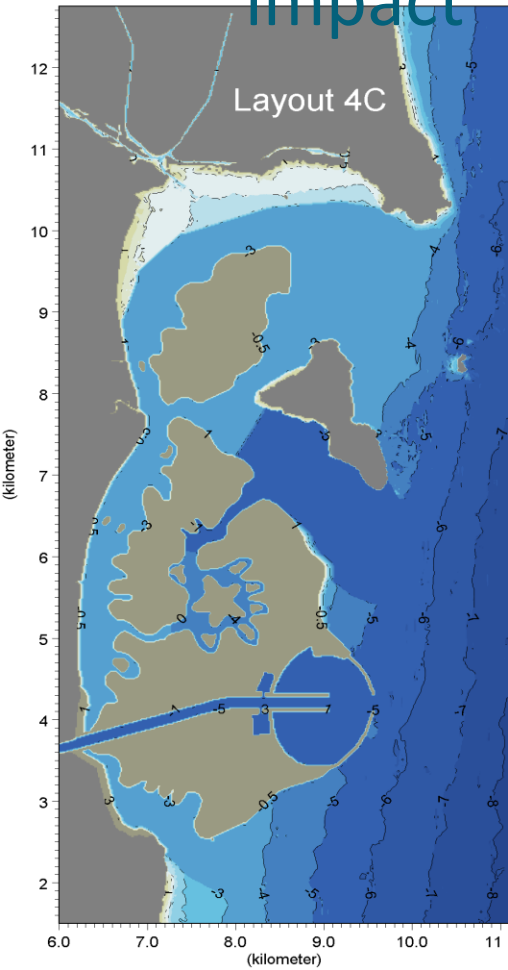
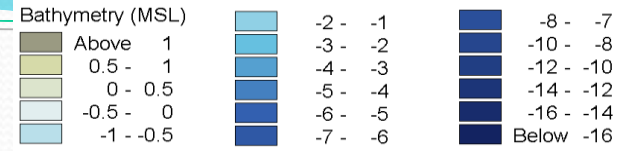


Layout J: As layout G but with the minimum distance between dredging and the sea grass areas increased from 30m to 100m. Minimum dredged channel width in the vicinity of the sea grass is 100m.

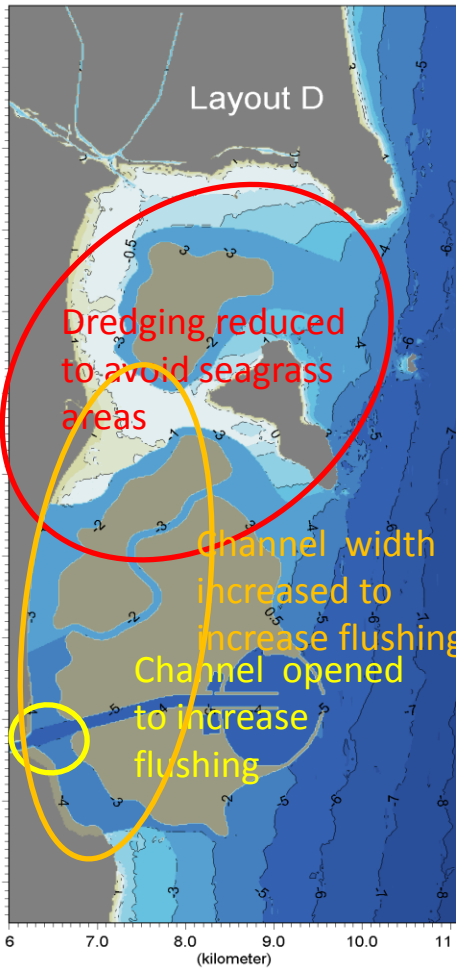


Layout K: As layout J but with the minimum distance between dredging and the sea grass areas around Island A increased from 100m to 150m.

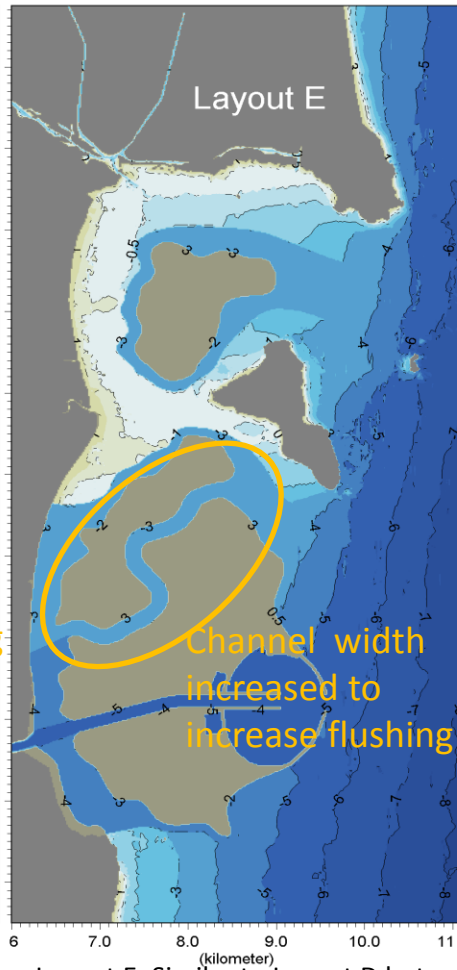
Different stimulation different impact



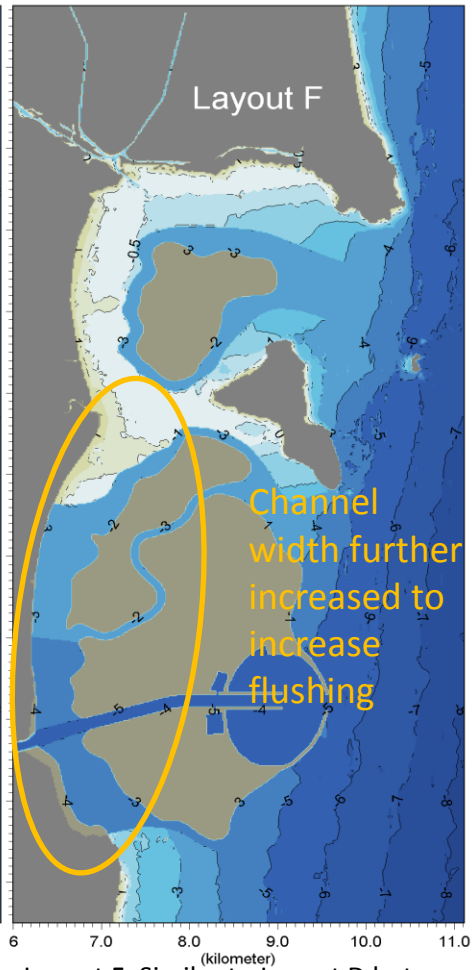
Layout 4C from EIA Report



Layout D: Widened, smoothed channels & reduced dredging.

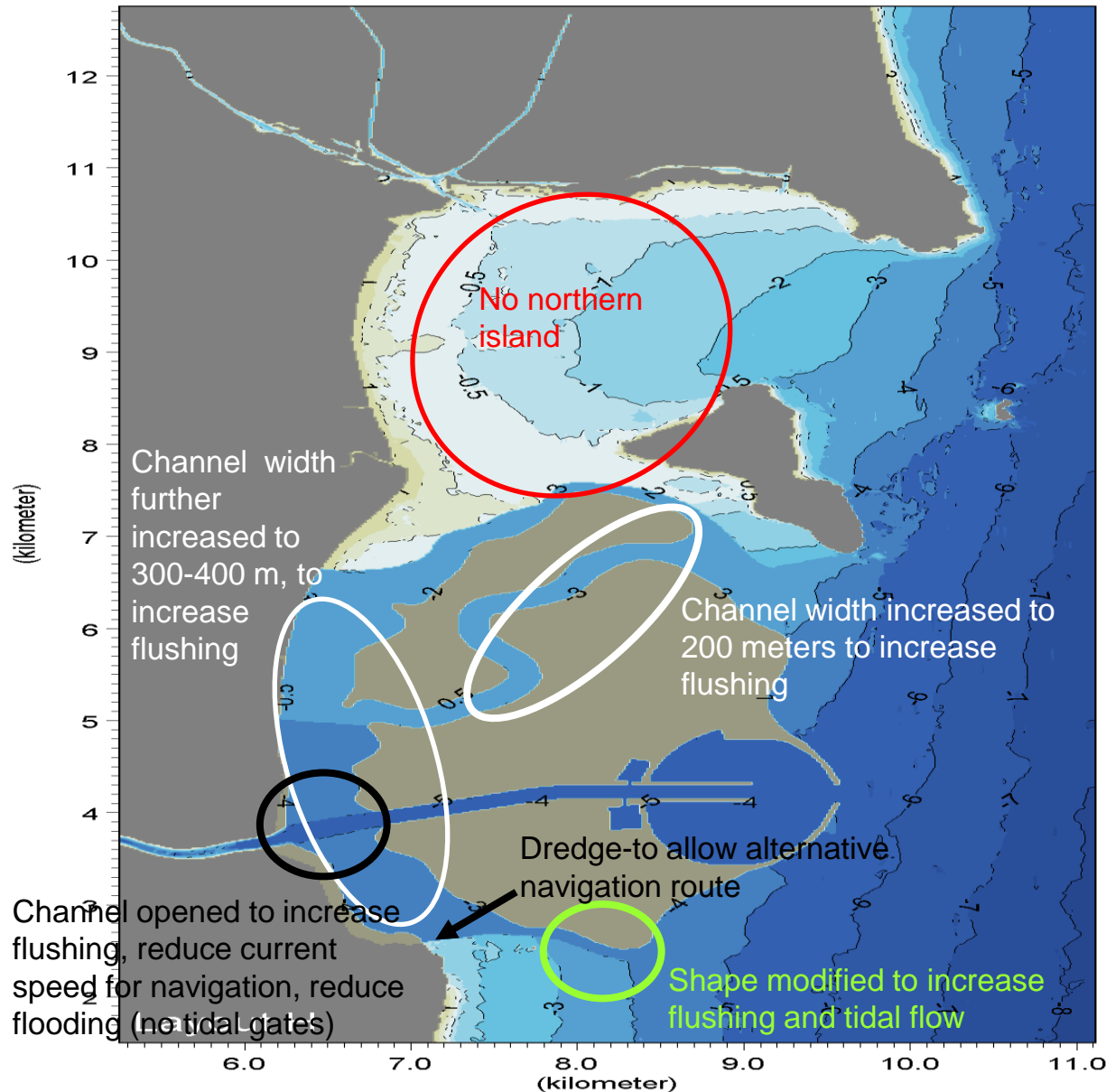


Layout E: Similar to Layout D but with width of channel increased to 200m.



Layout F: Similar to Layout D but with reclamation moved seaward.

PROPOSED FINAL LAYOUT

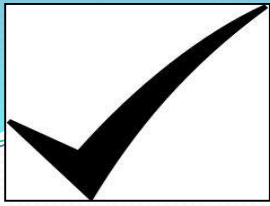


1. No reclamation on sea grass and better pollutant dispersion.
2. Avoid water quality deterioration.
3. Increase flushing for better water quality.
4. Reduce current speed – navigation safety.
5. Increase Channel width – to increase flushing.

Reclamation Method

- Perimeter bunds. (can be sand or rock or geo tube or sheetpile, etc.)
- Stabilised sand bunds on seaward side (rock revetment)
- Sand or any suitable filling material will be pumped into bunds area
- Installation of silt curtain at working area or environmental sensitive receptors
- Controlled discharge of water. The area near outlet shall be installed with silt curtain as secondary measures



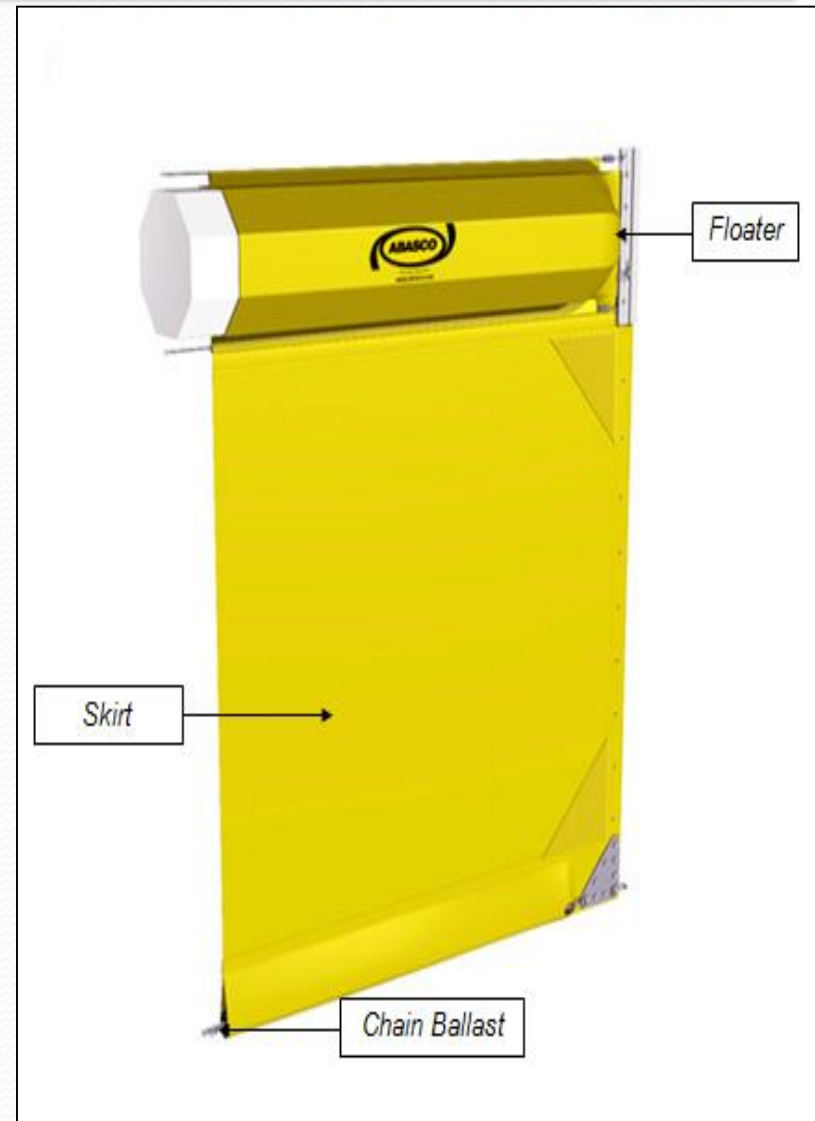
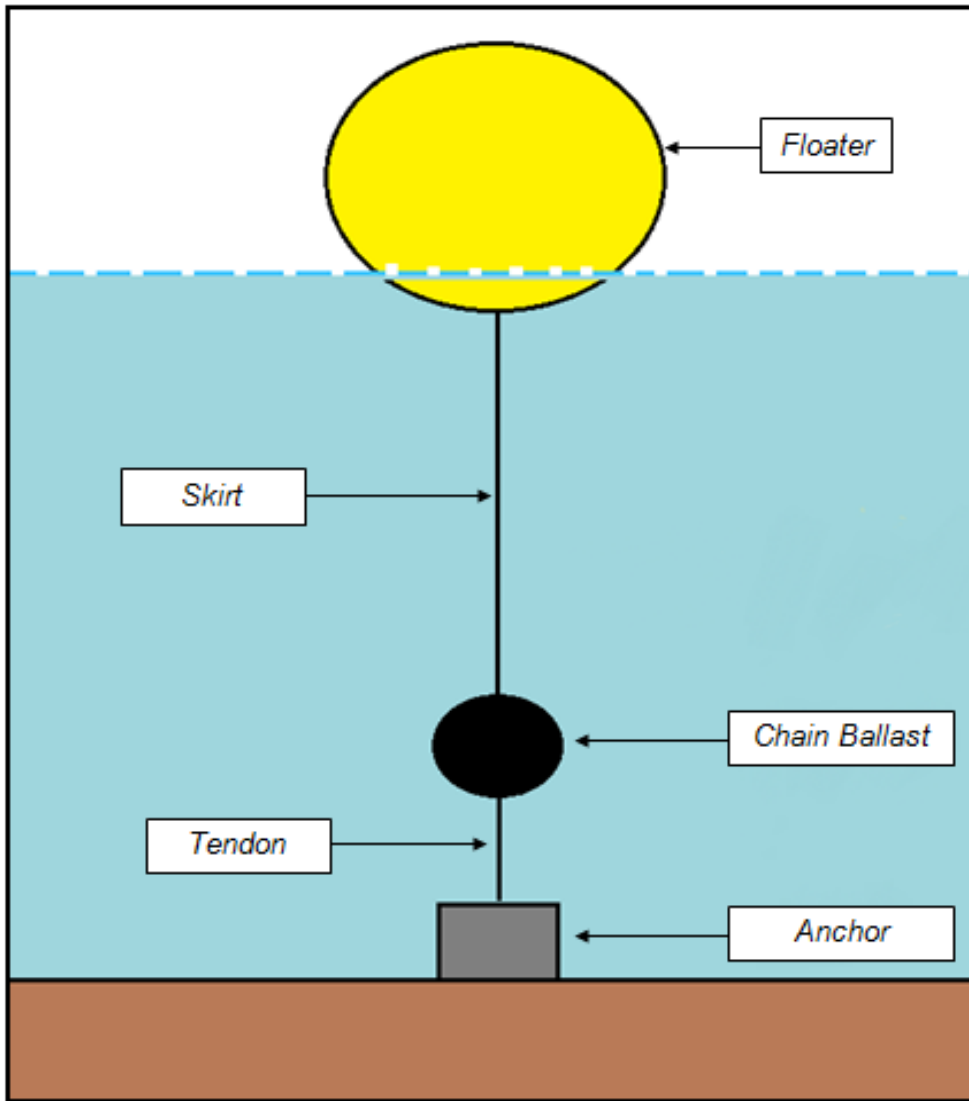


Mitigation Measures







Double layered silt curtain




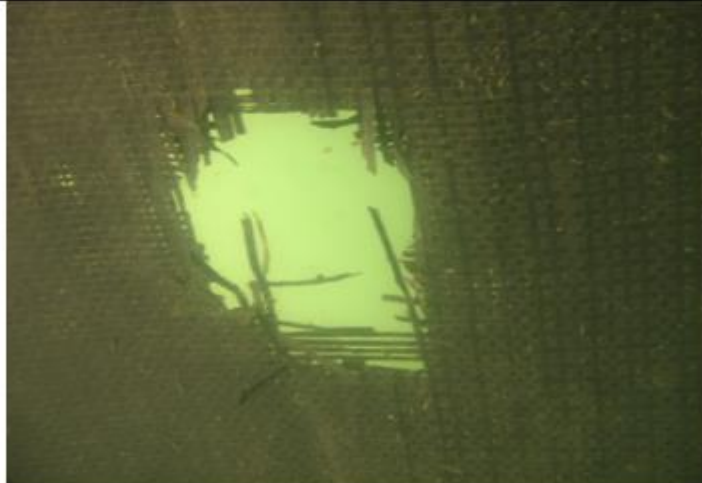

TYPICAL COMPONENT OF *SILT CURTAIN*







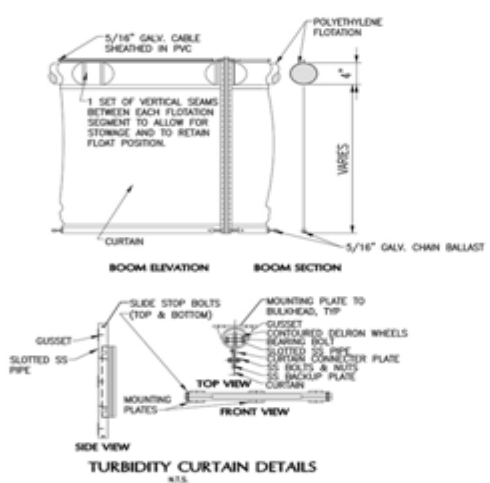

SILT CURTAIN – DOs and DONTs

BIL.	PERKARA	PATUH 	TIDAK PATUH 
1.	<i>Silt curtain</i> dipasang di tapak cadangan projek.		
2.	<i>Silt curtain</i> diselenggara secara berkala bagi memastikan tiada hidupan laut pada <i>skirt</i> .		

SILT CURTAIN – DOs and DONTs

BIL.	PERKARA	PATUH	✓	TIDAK PATUH	✗
3.	<p><i>Skirt</i> berada dalam keadaan yang baik dan tidak koyak.</p>				
4.	<p>Kelim antara <i>skirt</i> diikat dengan kemas.</p>				

SILT CURTAIN INSPECTION

BIL.	PERKARA	PATUH 	TIDAK PATUH 
5.	<p><i>Floater</i> berfungsi dengan baik dan berada pada kedudukan yang betul.</p>	 <p style="text-align: right; color: orange;">30/03/2012</p>	
6.	<p>Memastikan <i>silt curtain</i> yang dipasang berdasarkan kepada spesifikasi yang telah ditetapkan dalam EMP.</p>	 <p style="text-align: center;">TURBIDITY CURTAIN DETAILS K.T.S.</p>	 <p style="text-align: center;">TURBIDITY CURTAIN DETAILS K.T.S.</p>

Silt curtains not maintained

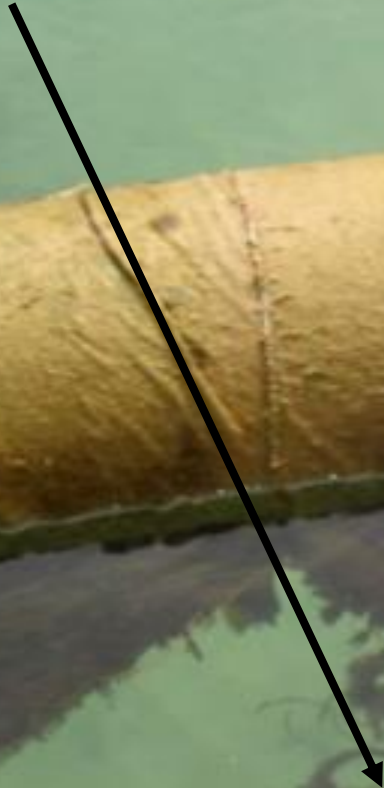
TORN SILT CURTAIN IN
WATER COLUMN

04.07.2006



Silt curtains not maintained

TORN SILT CURTAIN



Silt curtains not maintained

Slide courtesy: DOE Johor



WHAT'S WRONG????



Slide courtesy: DOE Johor

Reasons for dredging?

1. Recover material which has some value or use (form of mining)
2. To create greater depth for navigation (initial or maintenance)
3. Creation of new land by hydraulic fill (Airports of Hongkong and Macau)
4. Beach nourishment
5. Civil engineering construction works (pipelines, etc)
6. Environmental dredging (some sediment are highly contaminated)

THE NETHERLANDS

Total Land Reclamation

6,525 km²

since 1200



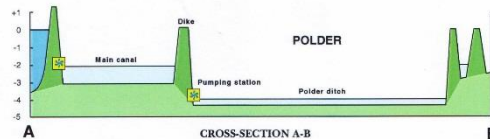
LAND RECLAMATION IN THE NETHERLANDS

- Building with Nature
- Polder System

GENERAL PRINCIPLE OF POLDER SYSTEMS

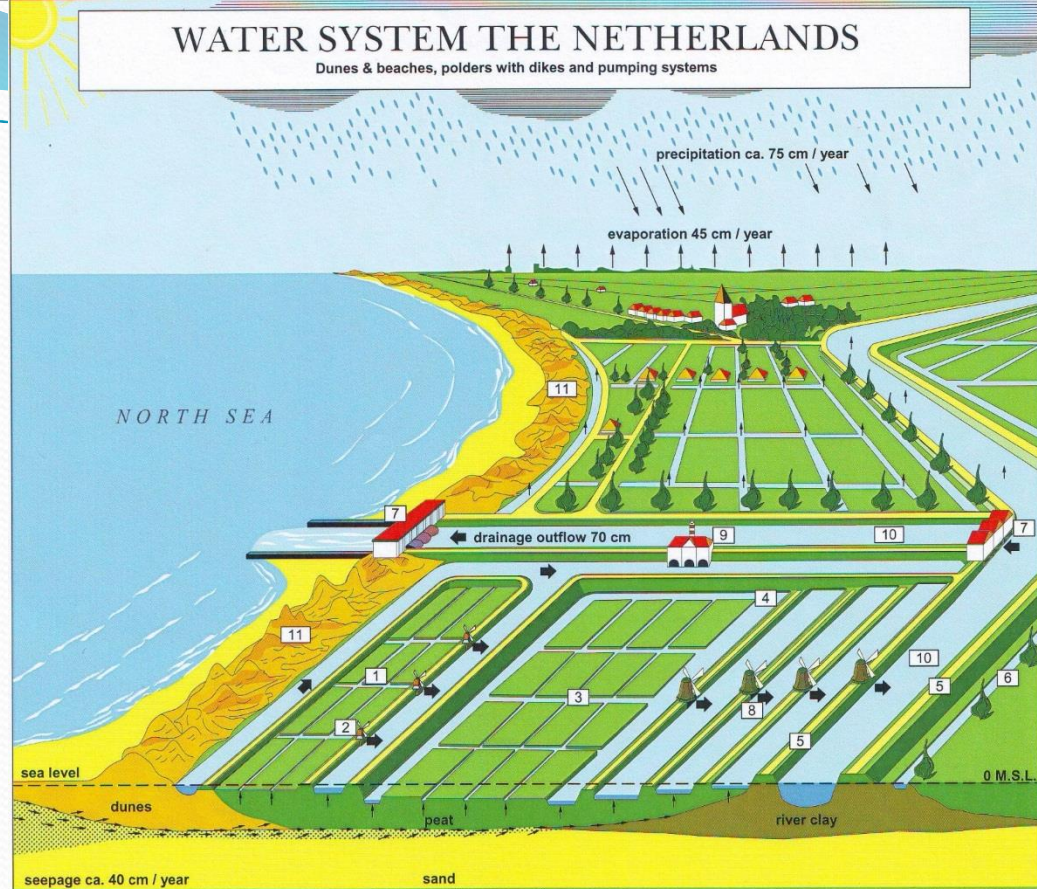


- Dike with road
- Main canal
- Polder ditch
- Pumping station
- Discharge sluice (without pumping station)
- Direction of discharge water
- Depth below sea level (m)
- External water (river and sea)



WATER SYSTEM THE NETHERLANDS

Dunes & beaches, polders with dikes and pumping systems

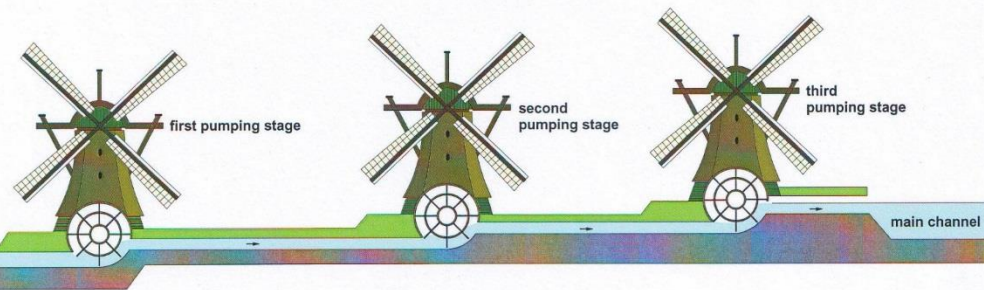


seepage ca. 40 cm / year

sand

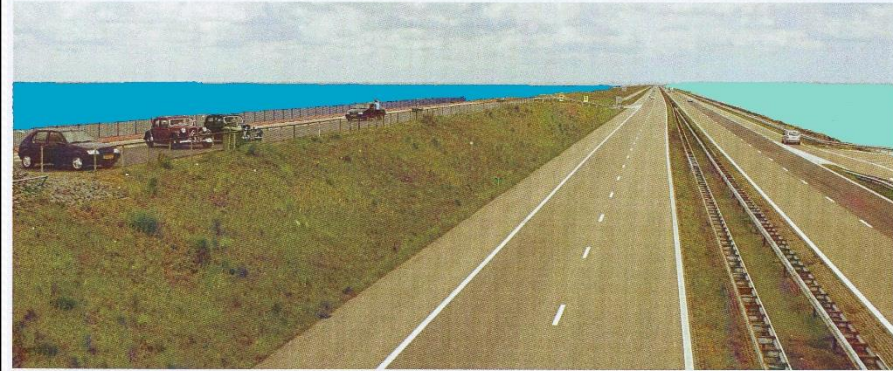
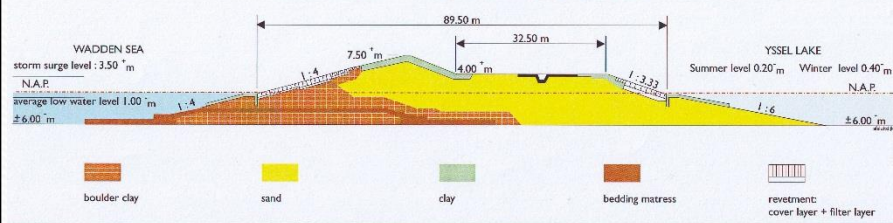
Legend

- | | | |
|-----------------------------|---|--------------------|
| 1 low polder with ditches | 6 drainage ditch | 11 dune protection |
| 2 small windmills | 7 electric pumping station / discharge sluice | |
| 3 lower polder with ditches | 8 pumping sequence using 4 classic windmills | |
| 4 canals | 9 steam driven pumping station | |
| 5 river dike | 10 main channel | |



LAND RECLAMATION IN THE NETHERLANDS

CROSS SECTION : ENCLOSURE DIKE / BARRIER DAM



- Polder System



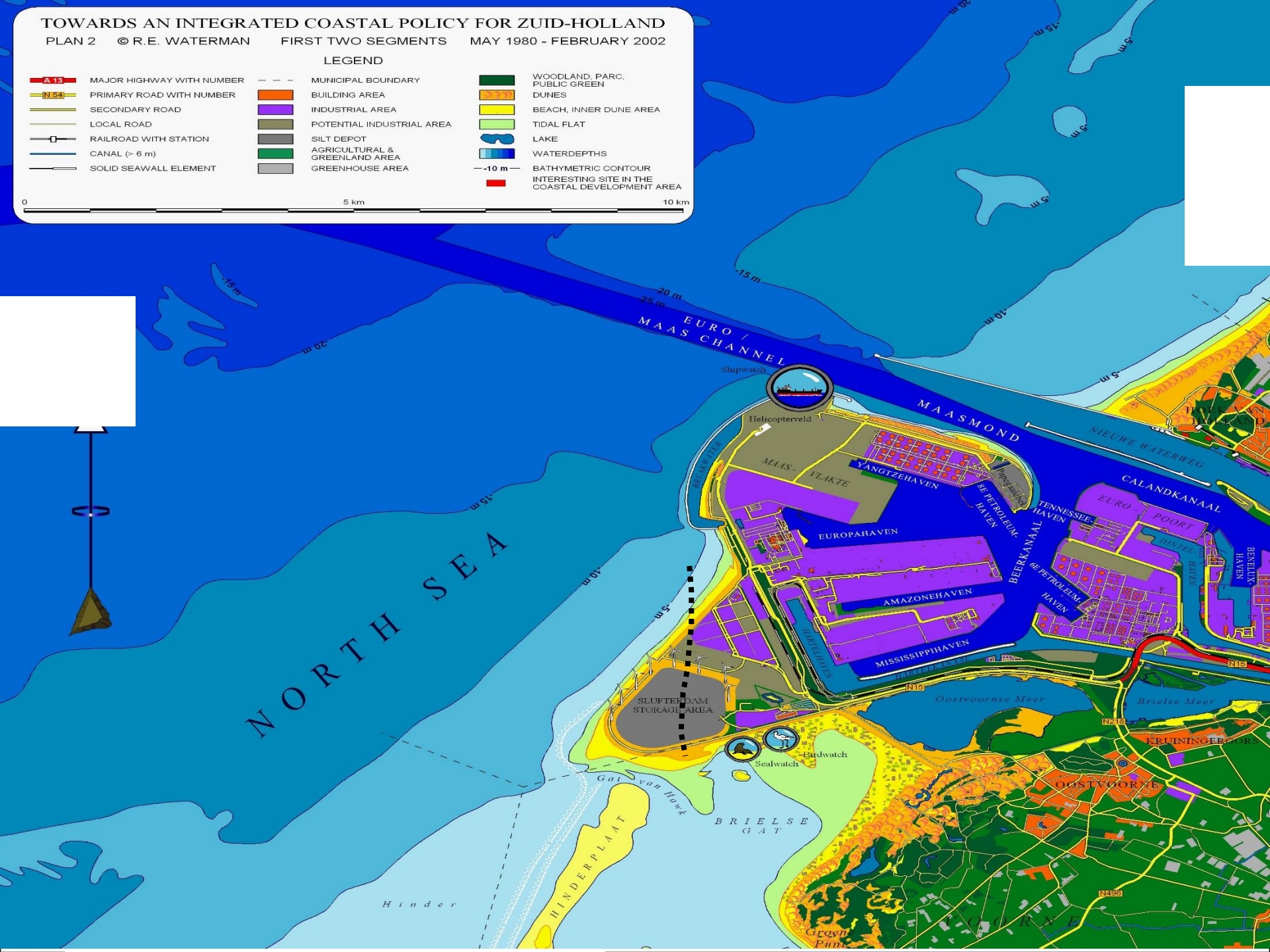
SOUTH SEA PROJECT

TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

PLAN 2 © R.E. WATERMAN FIRST TWO SEGMENTS MAY 1980 - FEBRUARY 2002

LEGEND

	MAJOR HIGHWAY WITH NUMBER		MUNICIPAL BOUNDARY		WOODLAND, PARC, PUBLIC GREEN
	PRIMARY ROAD WITH NUMBER		BUILDING AREA		DUNES
	SECONDARY ROAD		INDUSTRIAL AREA		BEACH, INNER DUNE AREA
	LOCAL ROAD		POTENTIAL INDUSTRIAL AREA		TIDAL FLAT
	RAILROAD WITH STATION		SILT DEPOT		LAKE
	CANAL (> 6 m)		AGRICULTURAL & GREENLAND AREA		WATERDEPTHS
	SOLID SEAWALL ELEMENT		GREENHOUSE AREA		BATHYMETRIC CONTOUR
					INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA



TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

PLAN 2c

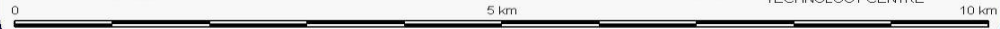
© R.E. WATERMAN

TOPOGRAPHIC MAP

DECEMBER 2005

LEGEND

	MAJOR HIGHWAY WITH NUMBER		BUILDING AREA		BEACH, INNER DUNE AREA
	PRIMARY ROAD WITH NUMBER		INDUSTRIAL AREA		TIDAL FLAT
	SECONDARY ROAD		POTENTIAL INDUSTRIAL AREA		LAKE
	LOCAL ROAD		SILT DEPOT		WATERDEPTHS
	RAILROAD WITH STATION		AGRICULTURAL & GREENLAND AREA		BATHYMETRIC CONTOUR
	CANAL (> 6 m)		GREENHOUSE AREA		INTERESTING SITE IN THE COASTAL DEVELOPMENT AREA
	SOLID SEAWALL ELEMENT		WOODLAND, PARC, PUBLIC GREEN		WIND ENERGY
	MUNICIPAL BOUNDARY		DUNES		SOLAR ENERGY
	FERRY				ENVIRONMENT TECHNOLOGY CENTRE



NORTH SEA



TOWARDS AN INTEGRATED COASTAL POLICY FOR ZUID-HOLLAND

PLAN 2c

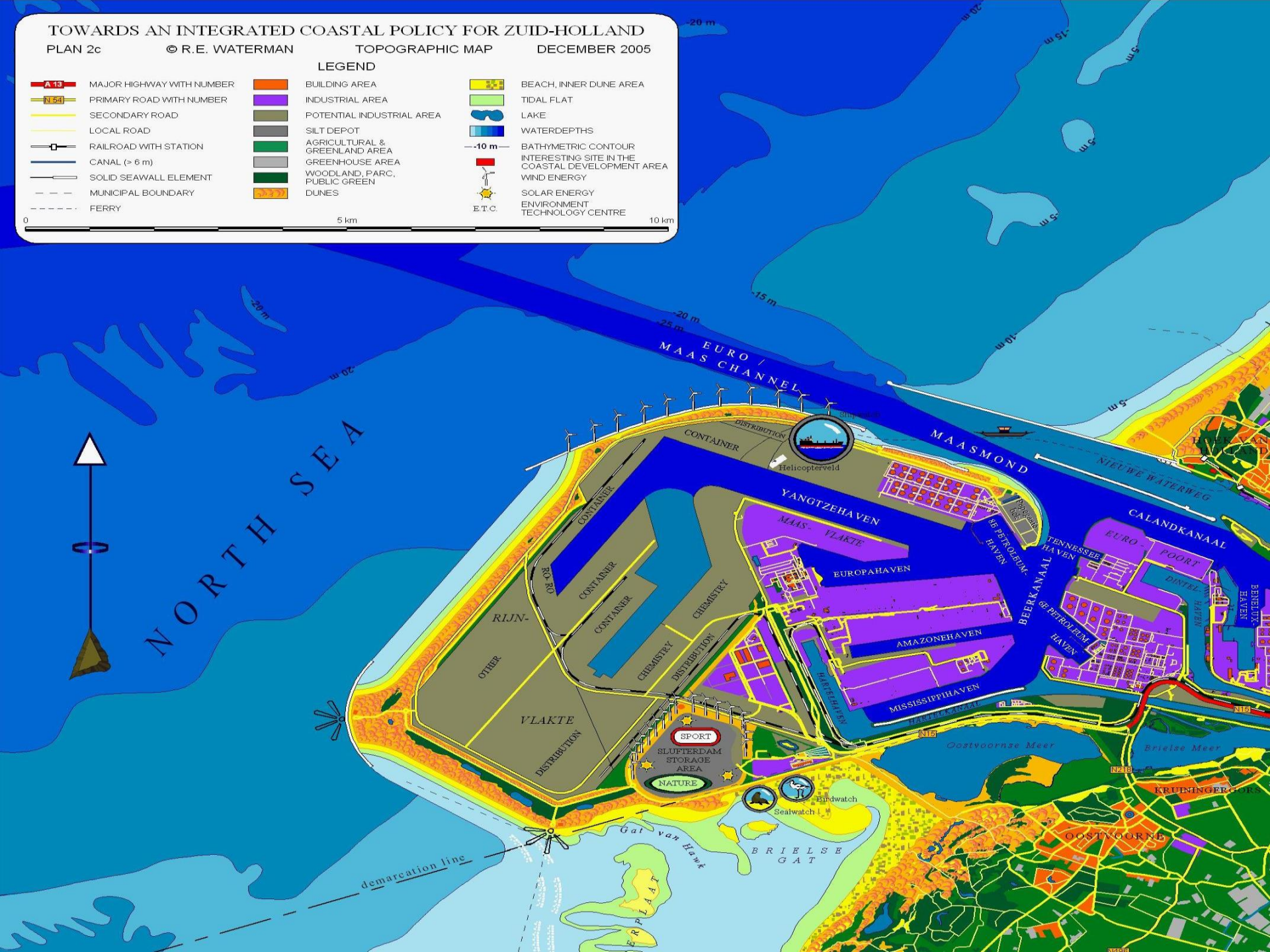
© R.E. WATERMAN

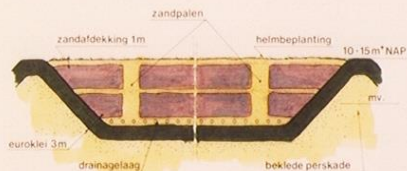
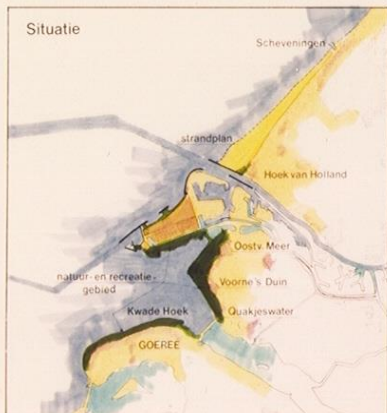
TOPOGRAPHIC MAP

DECEMBER 2005

LEGEND

	MAJOR HIGHWAY WITH NUMBER		BUILDING AREA		BEACH, INNER DUNE AREA
	PRIMARY ROAD WITH NUMBER		INDUSTRIAL AREA		TIDAL FLAT
	SECONDARY ROAD		POTENTIAL INDUSTRIAL AREA		LAKE
	LOCAL ROAD		SILT DEPOT		WATERDEPTHS
	RAILROAD WITH STATION		AGRICULTURAL & GREENLAND AREA		BATHYMETRIC CONTOUR
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	MUNICIPAL BOUNDARY		DUNES		SOLAR ENERGY
	FERRY				ENVIRONMENT TECHNOLOGY CENTRE
					E.T.C.





Semi-permanent opslagbekken

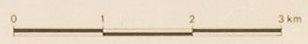


Noordzee

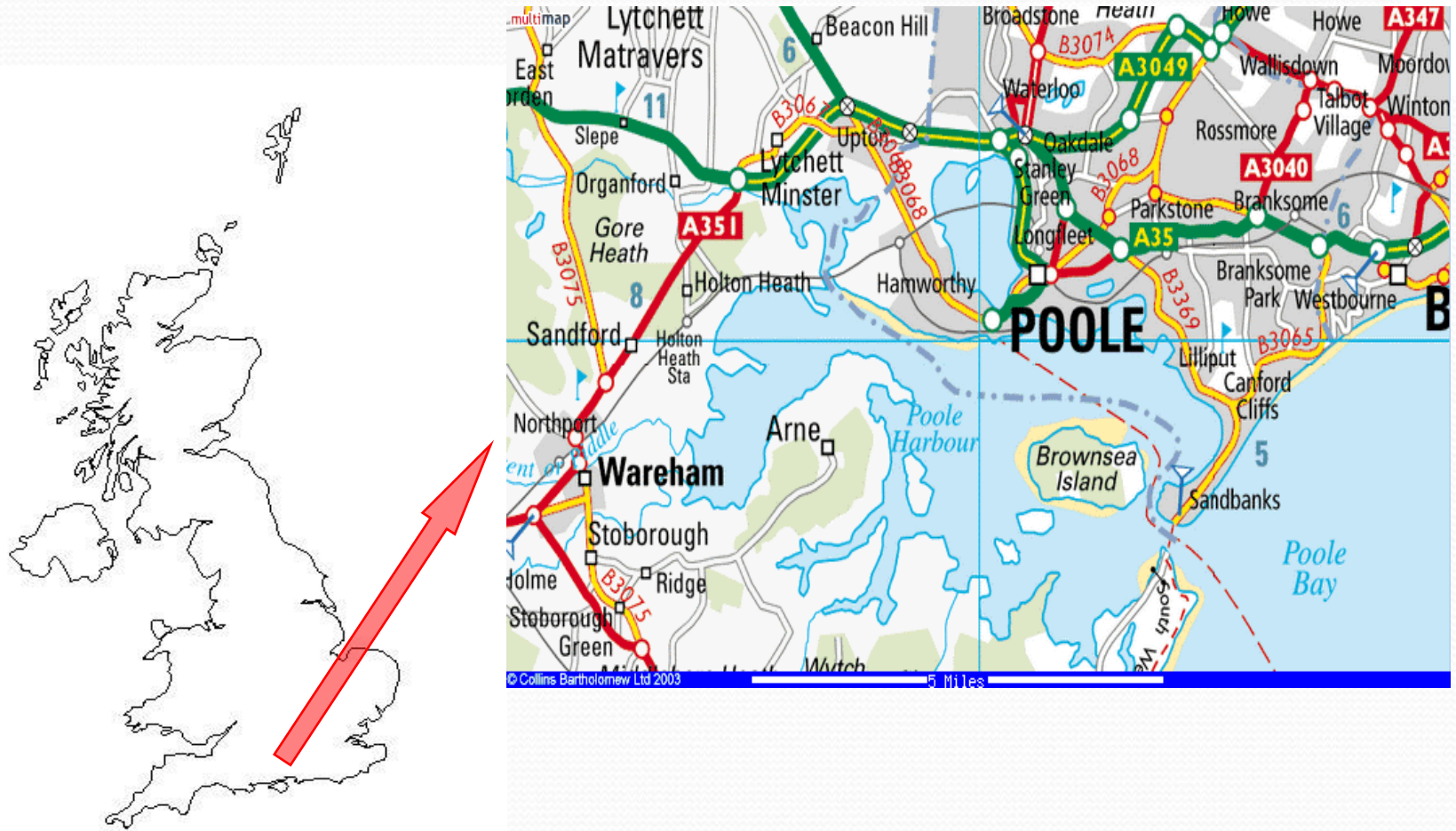
Deelplan 1
voorstel tot
kustuitbreiding
ca 2350 ha



Voorne



UNITED KINGDOM



UK, Poole



UK, Poole

Before the land reclamation



UK, Poole

During the land reclamation



UK, Poole

After the land reclamation



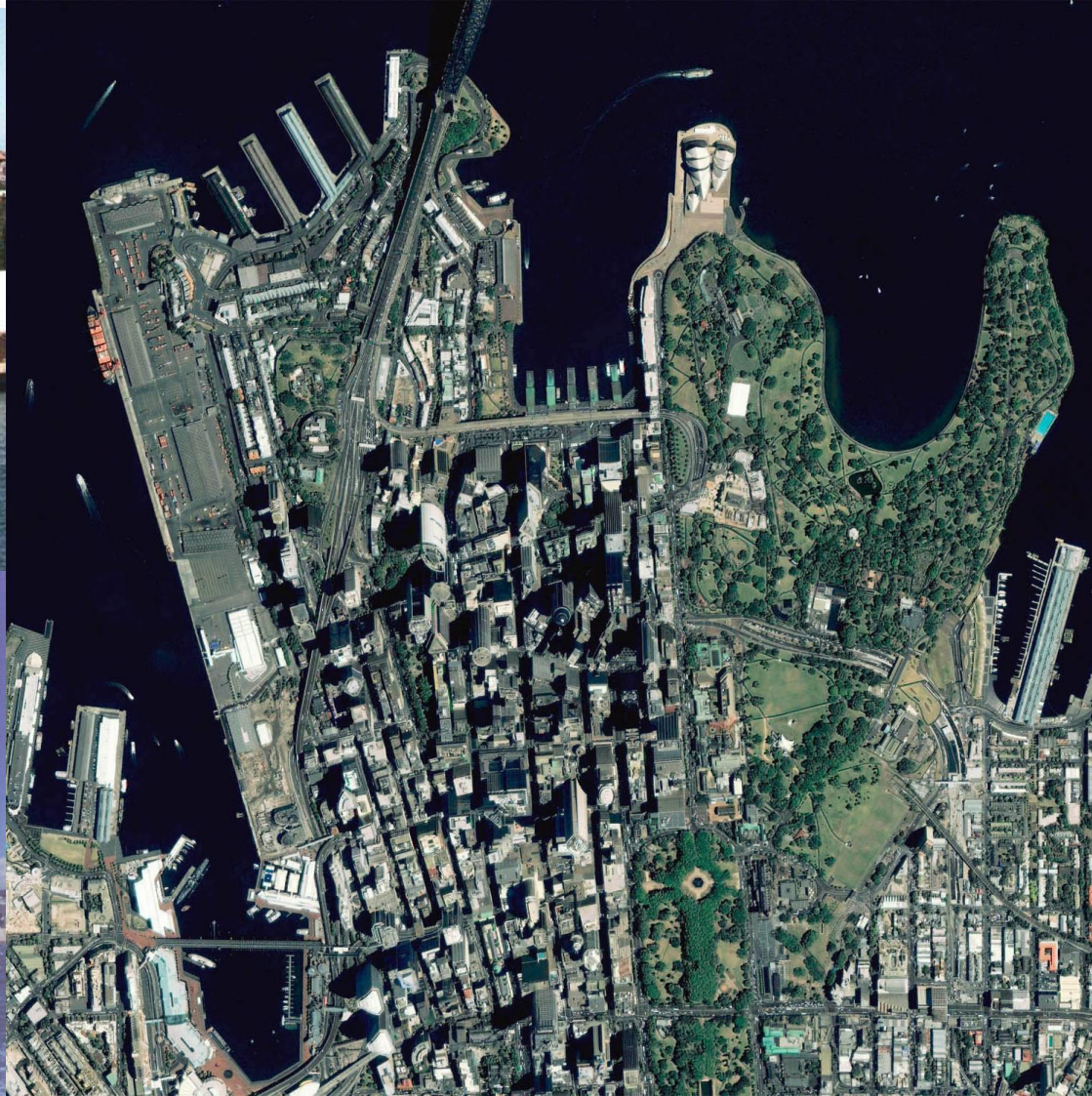
UK, Lincshire, Skegness

Beach nourishment



LAND RECLAMATION IN AUSTRALIA



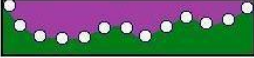
Sydney Opera House



Kingsford Smith Airport



Airport Kingsford Smith Land reclamations

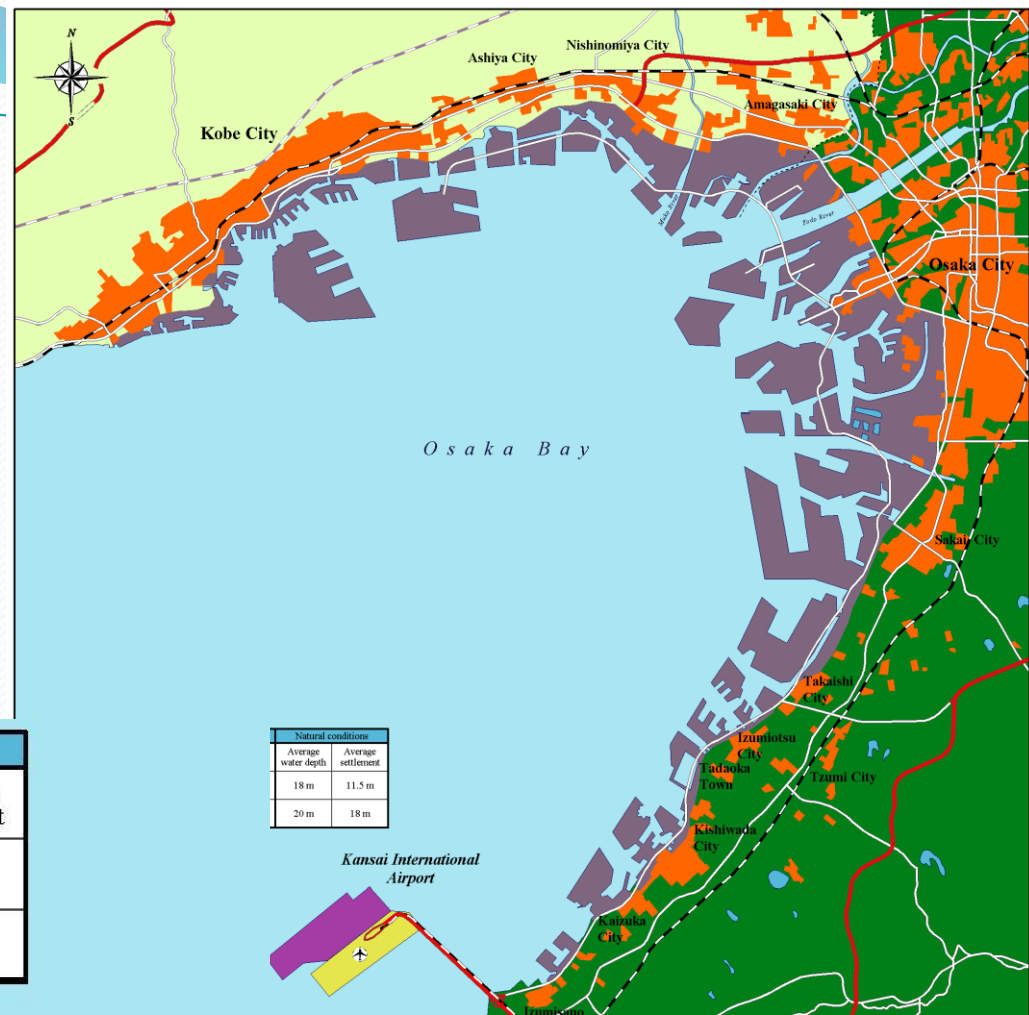
-  *Airport Kingsford Smith*
-  *Reclamation*
-  *Original Coastline*

0 200 400 600 800 1000 m

Kingsford Smith Airport, Sydney, Australia



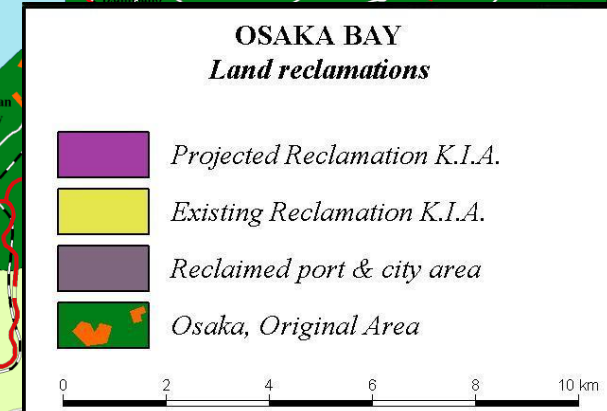
LAND RECLAMATION IN OSAKA-KOBE, JAPAN



	Scale			Natural conditions	
	Landfill dimension	Seawall extension	Amount of landfill soil	Average water depth	Average settlement
Phase I of Island	510 ha	11.2 km	1.8 million m ³	18 m	11.5 m
Phase II of Island	545 ha	13 km	2.5 million m ³	20 m	18 m

Natural conditions	
Average water depth	Average settlement
18 m	11.5 m
20 m	18 m

Kansai International Airport



Osaka - Kobe Kansai Int. Airport





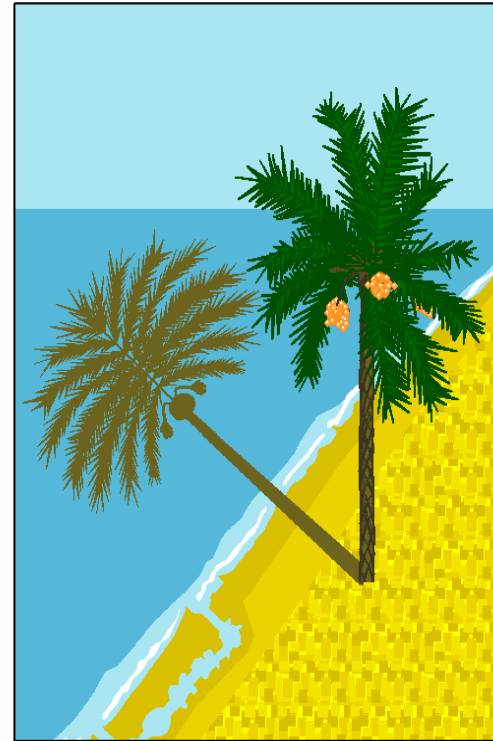
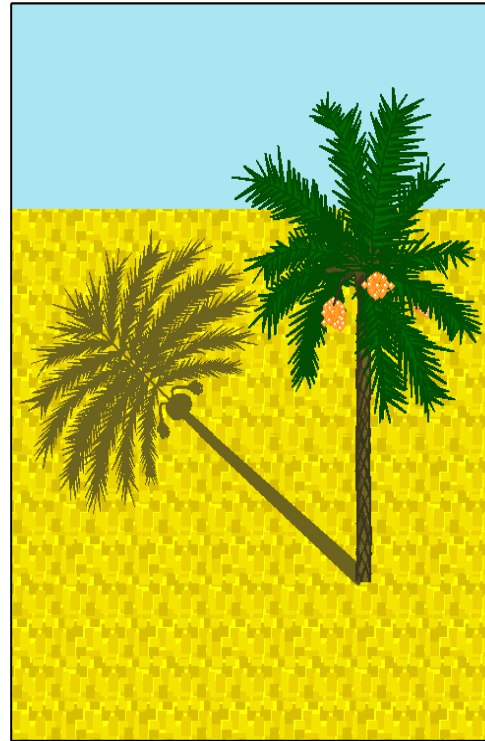
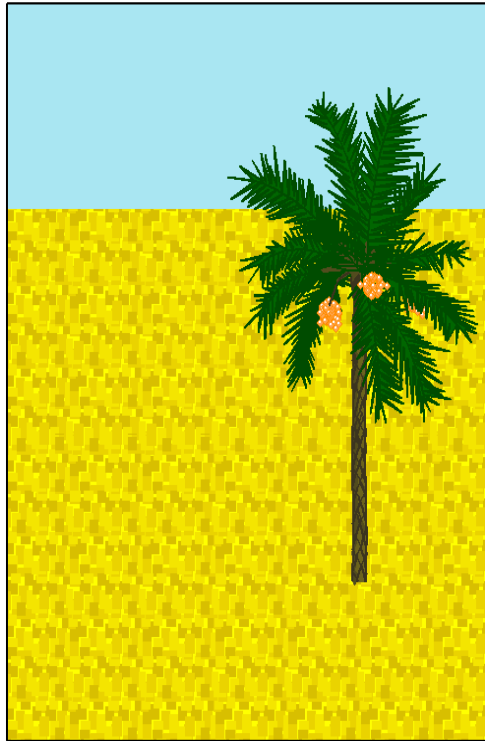
HONG KONG

CENTRAL WATERFRONT DEVELOPMENT CONCEPT PLAN






1999 Swire Properties Ltd. All Rights Reserved



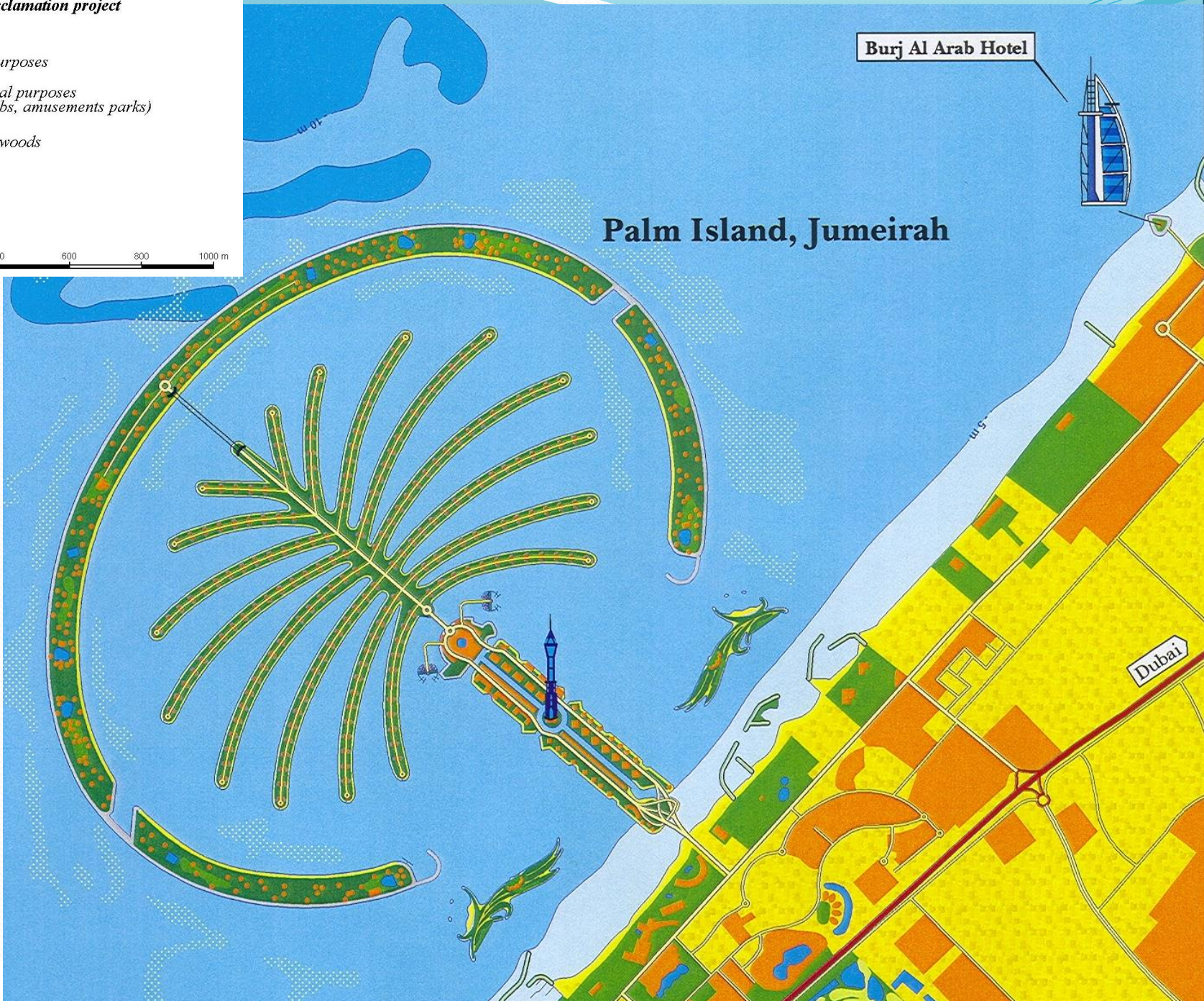
LAND RECLAMATION IN DUBAI, UAE



PALM ISLAND
Land reclamation project

-  *Housing purposes*
-  *Recreational purposes
(shops, clubs, amusements parks)*
-  *Parks and woods*
-  *Beach*
-  *Desert*

0 200 400 600 800 1000 m



Palm Island Jumeirah - Dubai



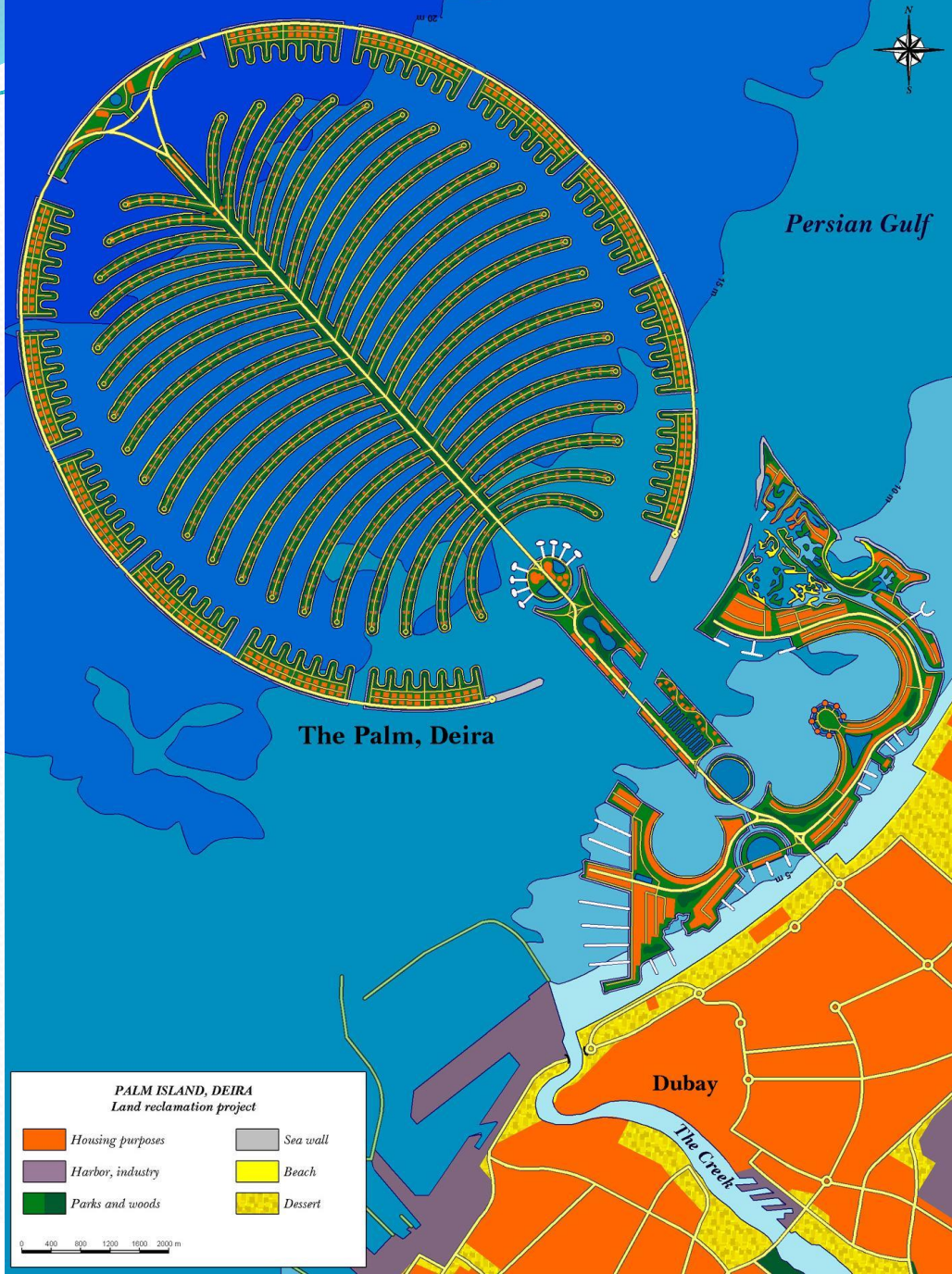
April 2002



September 2002



Mei 2003



The Palm, Deira

approx. 14.3 km x 8.5 km

surface area 80 km²

41 palm leaves

1.3 billion m³ sand






length of outer rim
 berm break water
 ca. 21 km

Palm Island, Jebel Ali

دولة الامارات العربية المتحدة
مجلس الوزراء
مكتب التخطيط العمراني

دولة الامارات العربية المتحدة
مجلس الوزراء
مكتب التخطيط العمراني

PALM ISLAND, JEBEL ALI
Land reclamation project

	<i>Housing purposes</i>		<i>Sea wall</i>
	<i>Recreational purposes (shops, clubs, amusements parks)</i>		<i>Beach</i>
	<i>Parks and woods</i>		<i>Dessert</i>





Persian Gulf

Palm Island, Jebel Ali

Waterfront Dubai

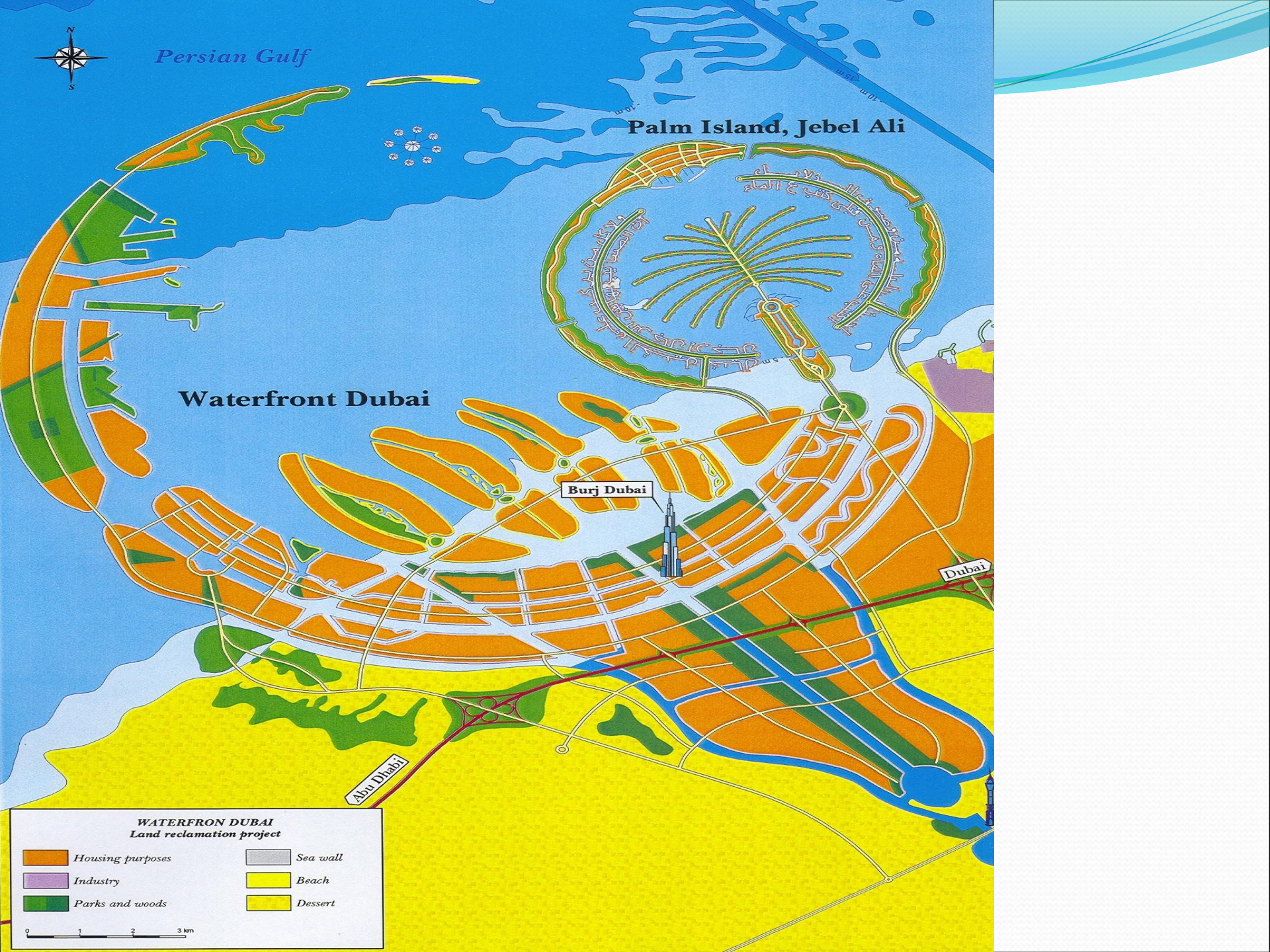
Burj Dubai

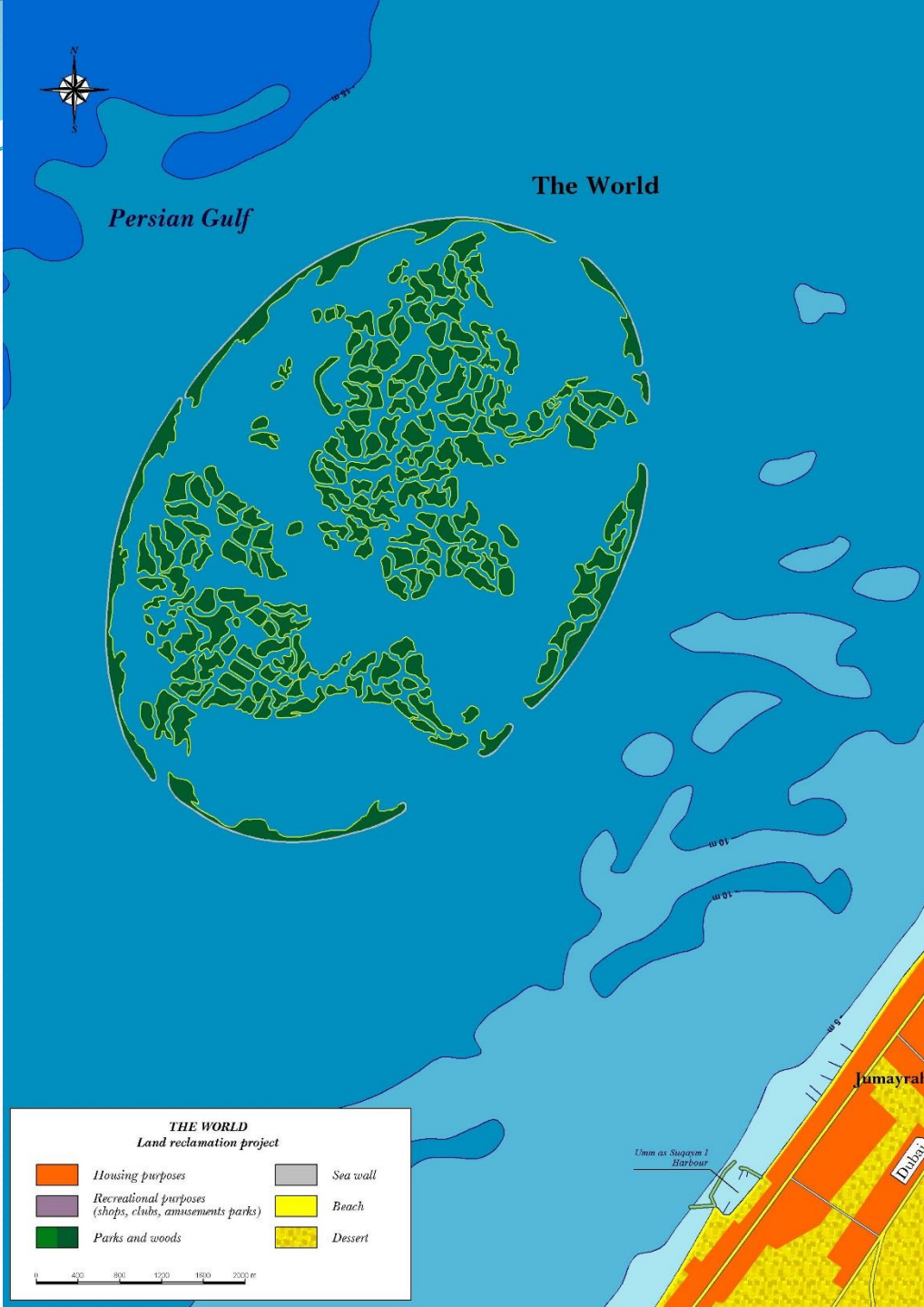
Dubai

Abu Dhabi

WATERFRON DUBAI
Land reclamation project

- Housing purposes*
- Industry*
- Parks and woods*
- Sea wall*
- Beach*
- Desert*





The World







approx. 9 km x 6 km
5 km off the coast
of Dubai

300 Islands

325 million m³ sand

32 million ton stones

RECLAMATION PROJECTS OVERVIEW
Land reclamation project

- | | |
|--|--|
|  Housing purposes |  Sea wall |
|  Harbor, industry |  Beach |
|  Parks and woods |  Desert |

0 2 4 6 8 10 km



Persian Gulf

The Palm, Deira

The World

Palm Island, Jumeirah

Dubai Waterfront

Palm Island, Jebel Ali

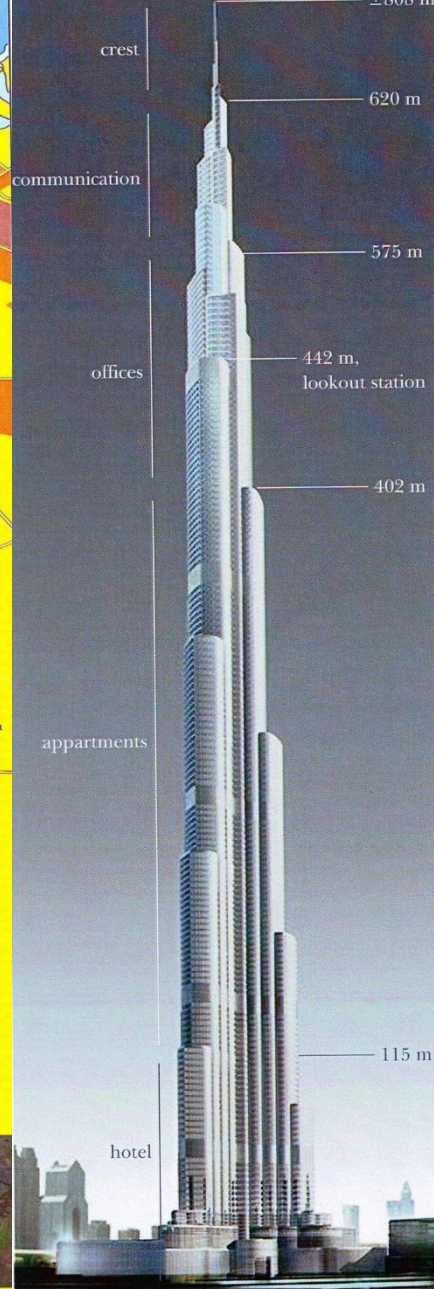
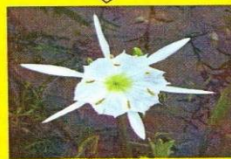
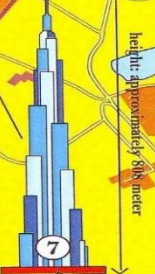
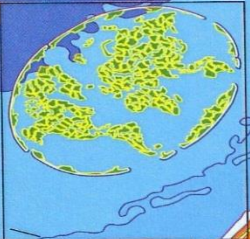
Umm as Suqaym

United Arab Emirates

Arabian Canal

The ground plan of Burj Dubai has the simplified form of much common dessert flower with sharp leaves.

- | | |
|-------------------------|-----------------------------------|
| ① Jumeirah Lake Towers | ⑤ Burj Al Arab Hotel |
| ② Jumeirah Islands | ⑥ Jebel Ali Harbor |
| ③ The Gardens | ⑦ Burj Dubai |
| ④ Gardens Shopping Mall | ⑧ Jebel Ali International Airport |



Sekian,
terima kasih



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Thank You