APPENDIX 4

DEPARTMENT OF FISHERIES AND MARINE RESEARCH

CYPRUS GEOGRAPHY

MAP OF SENSITIVE RESOURCES

CYPRUS GEOGRAPHY

LOCATION:	Eastern Mediterranean Sea, Levantine Basin
Geographic coordinates:	35 00 N, 33 00E
Area:	*Total: 9 250 sq km, of which 3335 sq km are not under the effective control of the Republic of Cyprus (they are illegally occupied by the Turkish army since 1974)* *Land: 9240 sq km* *Water: 10 sq km*
Coastline:	648 km
Maritime claims:	*Continental shelf: 200-m depth or to the depth of exploitation* *Territorial sea: 12 nm*
Sandy	**54 – 56 km**
Rocky	**380 – 400 km**
Cliffs	**200 – 220 km**
Mixed	**60 - 70 km**

LIST OF POSSIBLE LOCATIONS OF OIL SPILLAGES

(LISTED BY SOURCE AS INDICATED IN APPENDIX III)

1.	LARNACA BAY:	Cyprus Oil Refinery
		Mobil
		Esso
		Petrolina
		BP
		Dhekelia Electric Power Station
2.	VASSILIKO AREA:	Vassilikos Electric Power Station
		Vassiliko Cement Factory
3.	MONI AREA:	Moni Cement Factory
		Moni Electric Power Station

CYPRUS SHORELINE CLASSIFICATION

TYPES OF COASTAL FORMATIONS ACCESS TO THEM

COASTAL LINE FROM - TO	T Y P E	ACCESS
Cape Arnaouti-Bath of Aphrodite	Rocks-outcrops, sharp cliffs	Difficult
Baths of Aphrodite-Pomos Point	Sand-flat beach. Loggerhead Turtle nesting beaches.	Easy
Pomos Point -Pyrgos	Rocks-small cliffs	Fairly difficult
Cape Arnaouti - Cape Yeronissos	Rocks with rocks outcrops small bays with sand needing special protections (i.e Lara - Toxeftra Green Turtle nesting grounds)	Difficult (Easier in parts)
Yeronissos - Paphos	Sharp cliffs	Fairly difficult
Paphos - Petra Romiou	Shingle beaches	Easy
Petra Romiou -Cape Aspro	Shingle beaches	Difficult
Cape Aspro - Avdimou Bay	Cliffs with some sandy beaches	Difficult (easier in parts)
Avdimou bay - Kourris outlet	Sandy beaches. Tourist Area	Easy
Kourris outlet - Cape Zeygari	Shingle beaches. Sandy beaches and cliffs in the south.	Easy - but more difficult in the south
Cape Zeygari - Cape Gata	Sharp Cliffs	Impossible
Cape Gata - South end of Ladies Mile	Cliffs with some beaches	Easy in parts
South end of Ladies Mile - Limassol New Port	Sand and shingle beaches	Easy
Limassol New Port - Moni Power Station	Sandy beaches mainly Tourist area	Easy
Moni Power Station - Cape Dolos	Rocks outcrops cliffs	Fairly difficult
Cape Dolos - Vassiliko	Cliffs with some sandy beaches. Tourist and Industrial areas	Easy in parts - more difficult in others

Vassilico - Cape Kiti	Shingle and small sandy beaches - some cliffs	Easy generally
Cape Kiti - Larnaca Airport	Shingle beaches change to sandy beaches in the east	Easy
Larnaca Airport - Dekhelia	Sandy beaches. Tourist use	Easy
Dekhelia - Potamos Xylophagou	Shingle beaches and Cliffs	Difficult in the area of the cliffs
Potamos Xylophagou - Ayia Thekla	Low rocky shore	Easy
Ayia Thekla - Cavo Greco	Rocky shore with some cliffs with sandy beaches of tourist use	Easy - difficult in parts
Cavo Greco - Dherynia	Rocky shore with small sandy bays of tourist use. Some cliffs	Easy - difficult in parts

Installations using oil

1. Dhekelia Power Station
2. Petrolina Oil Company
3. Esso Oil Company
4. B.P. Oil Company
5. Mobil Oil Company
6. Cyprus Petroleum Refinery
7. Vassiliko Cement Factory
8. Vassiliko Power Station
9. Moni Cement Factory
10. Moni Power Station

ENVIROMENTAL DATA

A. WINDS IN COASTAL AREAS

(a) Northern Coastal Areas

In winter the prevailing surface winds are the westerly to easterly gradient winds. With very light gradient winds the local winds become the predominant feature. These are the southerly land breezes during the night, which are enhanced by the catabolic winds along the northern slopes of the Kyrenia range, and the weak sea breezes from the north which are developed in the afternoon hours on clear days.

In summer the northerly sea breezes during the day, which are enhanced by the north-westerly to north-easterly gradient winds, are the predominant features. Land breezes are developed during the night enhanced by catabolic winds.

In spring and autumn the westerly to easterly gradient winds enhance the weak sea breezes during the day. Land breezes enhanced by catabolic winds are prevailing during the night.

Wind forces are mainly lights (up to 10 knots) to moderate (11-16 knots) throughout the year. Strong winds (22 knots and over) occur occasionally in association with unstable weather conditions.

(b) Western Coastal Areas

In winter the prevailing surface winds are the southerly to northerly gradient winds. With very light gradient winds the local winds become the predominant feature. These are the easterly land breezes during the night, which are enhanced by the catabolic winds along the western slopes of the Troodos range, and the weak sea breezes from the west, which are developed in the afternoon hours on clear days.

In summer the westerly sea breezes during the day, which are enhanced by the south westerly to northwesterly gradient winds, are the predominant features. Land breezes are developed during the night enhanced by catabolic winds.

In spring and autumn the south westerly to north westerly gradient winds enhance the weak sea breezes during the day. Land breezes enhanced by catabolic winds are prevailing during the night.

Wind forces are mainly light (upped 10 knots) to moderate (11-16 knots) throughout the year. Strong winds (22 knots and over) occur occasionally in association with unstable weather conditions.

At Paphos Airport the recorded highest hourly wind in the period 1983-1995 was 34 knots (direction 280 degrees from true north) and the highest gust was 64 knots (direction 250 degrees). The frequency distribution of the mean hourly wind (speed in m/s) is shown in Table No. 1.

(c) Southern Coastal Areas

In winter the prevailing surface winds are the easterly to westerly gradient winds. With very light gradient winds the local winds become the predominant feature. These are the northerly land breezes during the night, which at the western site are enhanced by the katabatic winds along the southern slopes of the Troodos range, and the weak sea breezes from the south, which are developed in the afternoon hours on clear days.

In summer the southerly sea breezes during the day, which are enhanced by the south westerly to westerly gradient winds, are the predominant features. Land breezes are developed during the night.

In spring and autumn the easterly to westerly gradient winds enhance the weak sea breezes during the day. Land breezes are prevailing during the night.

Wind forces are mainly light (up to 10 knots) to moderate (11-16 knots) throughout the year. Strong winds (22 knots and over) occur occasionally in association with unstable weather conditions.

At Larnaca Airport the recorded highest hourly wind in the period 1976-1995 was 44 knots (direction 200 degrees) and the highest gust 71 knots (direction 240 degrees). The frequency distribution of the mean hourly wind (speed in m/s) is shown in Table No. 2.

(d) Eastern Coastal Areas

In winter the prevailing surface winds are the northeasterly to easterly and southerly to southwesterly gradient winds. With very light gradient winds the local winds become the predominant feature. These are the westerly land-breezes during the night and the weak sea-breezes from the east, which are developed in the afternoon hours on clear days.

In summer the southwesterly gradient winds reinforce sea-breezes from the southwest (Larnaka Bay) and suppress the easterly sea-breezes. Land-breezes are prevailing during the night.

In spring and autumn the northeasterly to easterly and the southerly to southwesterly gradient winds either suppress or reinforce the land and sea-breezes depending on their direction.

Wind forces are mainly lights (up to 10 knots) to moderate (11-16 knots) throughout the year. Strong winds (22 knots and over occur occasionally in association with unstable weather conditions.

C. CURRENT DATA

1. Sea Surface circulation south of Cyprus. Taken from:

   Oceanographic Studies on the Sea surface circulation South of Cyprus and Preliminary numerical flow simulations. G. Zodiatis et al.

2. Long term current meter observation 1 Dec 1989 - 30 Sept, 1990 at Moni area form:

   Oceanography Section.

3. Surface current data at Larnaca bay - opposite Larnaca Airport from:

   Oceanography Section F.D.

SITES - PROPERTIES - COASTAL INSTALLATIONS NEEDING SPECIAL PROTECTION

A) Bathing Places

B) Water Intakes

C) Marinas and Fishing Shelters

D) Fish Farms/ Hatcheries

E) Sensitive Areas of Special Protection

A) BATHING PLACES

Limassol Area

1. Ladies Mile
2. Limassol Front Beaches (Up to Amathus Hotel)
3. Amathus to Moni Beaches
4. Governors Beach

Larnaca Area

1. Kiti beach
2. Mackenzie beach
3. Larnaca Bay Beaches (Up to C.T.O. Tourist beach)
4. Dekhelia beaches (East of C.T.O beach)

Famagusta Area

1. Protaras
2. Kalamies
3. Nissi beach
4. Pernera
5. Macronissos
6. Ayia Napa Beach

Paphos Area

1. Coral bay beaches

2. Potima
3. Kato-Paphos beaches (Port to CTO beach)
4. Small beaches between Port and Potima
5. Asprokremmos beach (West of Halavron)
6. Latchi beaches (East and West of Fishing Shelter)

More details can be found at the website of the Department of Environment, Ministry of Agriculture, Rural Development & Environment
www.moa.gov.cy/moa/environment/environment.nsf/0/1d1f9531d9c13ae3c22579180037063b?OpenDocument&ExpandSection=6#_Section6

B. WATER INTAKES

There are few onshore installations, which draw water from the sea. Arrangements are made so that these installations to be informed in cased of accident in their vicinity.

No	Name of installations	**Type of installation**
2.	Dhekelia Power Station	Electrical Power Station
3.	Moni Power Station	Electrical Power Station
4.	Vassiliko Power Station	Electrical Power Station
4.	Dhekelia	Desalination Plant
6.	S B A – Dhekelia	Desalination Unit
7.	Telia Aqua Marine Ltd Xylophagou	Fish Hatchery Unit
8.	Aquaculture technologies Limassol	Fish Hatchery Unit
9.	Sagro Aquaculture, Paphos	Fish Hatchery Unit
10.	A.P.Z Aquarium Ltd, Limassol	Shrimp Farm

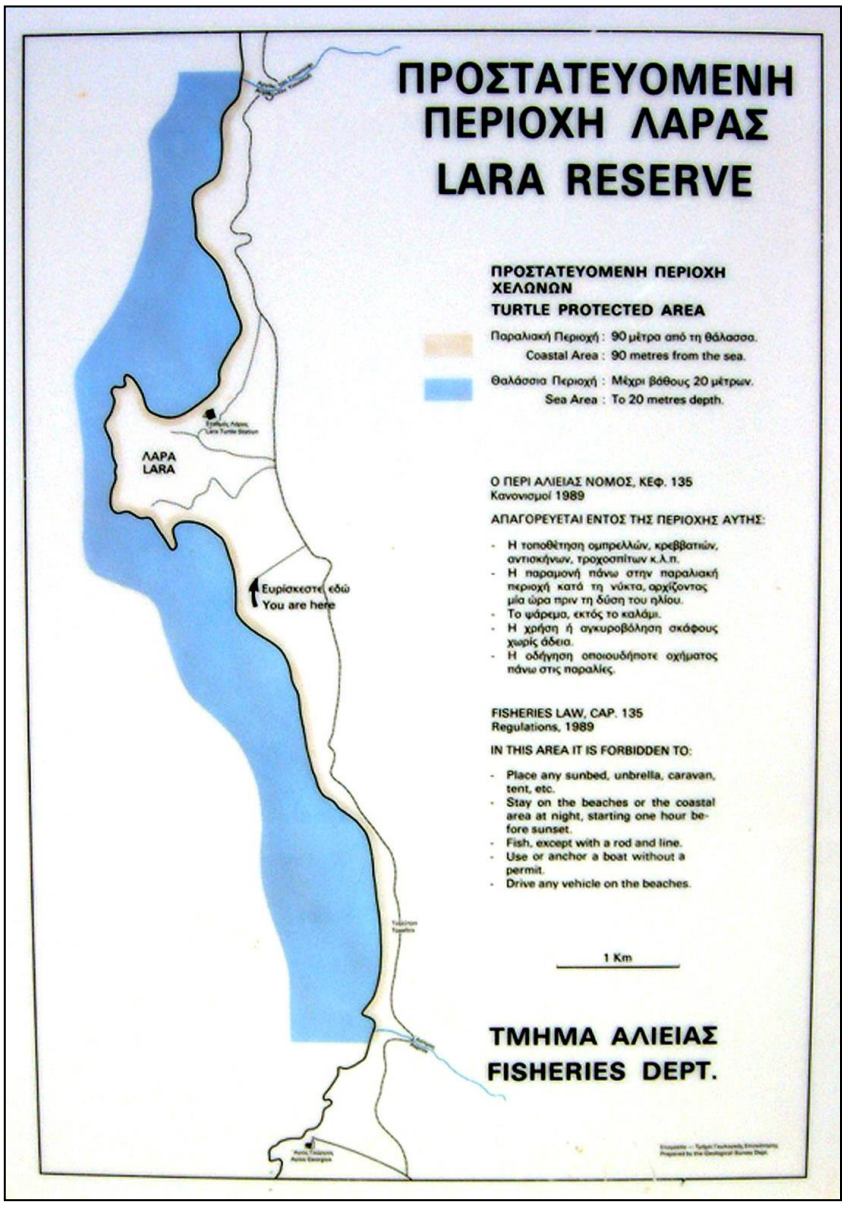
C. MARINAS AND FISHING SHELTERS

Marinas and fishing Shelters are vulnerable to oil pollution as oil can cause damage to fishing gear and boats. Such places with the approx. number of resident boats are shown in the table that follows.

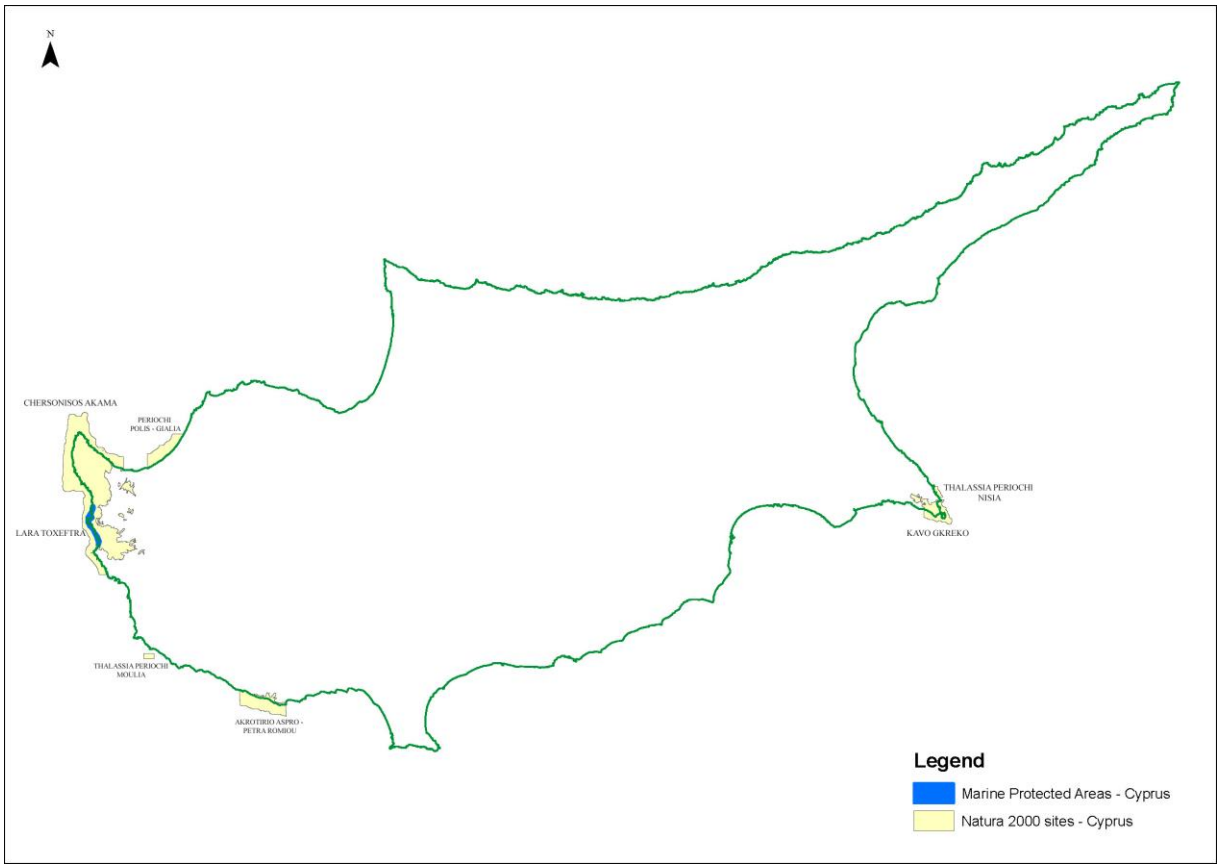
Stations	Number of boats
Ayia Napa Fishing Shelter	30
Laranca Fishing Shelter	160
Larnaca Marina	80
Latchi Fishing Shelter	15
Old Port Limassol	100
Ormidhia Fishing Shelter	20
Paralimni Fishing Shelter	20
Paphos Port	33
Pomos Fishing Shelter	4
Potamos Fishing Shelter	18
Pyrgos Fishing Shelter	20
St Raphael Marina	50
Zygi Fishing Shelter	200

E) PROTECTED AREAS IN NEED OF SPECIAL PROTECTION

Lara Toxeftra Marine Protected Area: The Lara-Toxeftra area has been protected (for turtle conservation purposes) since 1989, under the Fisheries Legislation as a coastal/marine reserve for turtle conservation. Both Green (*Chelonia mydas)* and Loggerhead (*Caretta caretta*) turtles nest there. The protected area covers a 10 km stretch of coastline and extends 95 meters inland and out to sea up to the 20 meters isobaths. The management regulations for this area are spelled out in the Fisheries Regulations (273/90). The Foreshore Protection Law was also amended at the same time (1989) incorporating into it the notion of Ecologically Important areas. An Order was issued on the basis of the Foreshore Protection Law also declaring this area as Ecologically Important and giving effect to some of the provisions of the Fisheries law.



<u>Marine Natura 2000 Areas</u>: Within the Natura 2000 framework, six (6) marine areas have been included, comprising important types of habitats and species, included in the E.U. Habitat's Directive (92/43/EEC). These areas are: 1) Thalassia Periochi Nisia, 2) Kavo Gkreko, 3) Akrotirio Aspro - Petra Romiou, 4) Thalassia Periochi Moulia, 5) Chersonisos Akama and 6) Periochi Polis – Gialia.



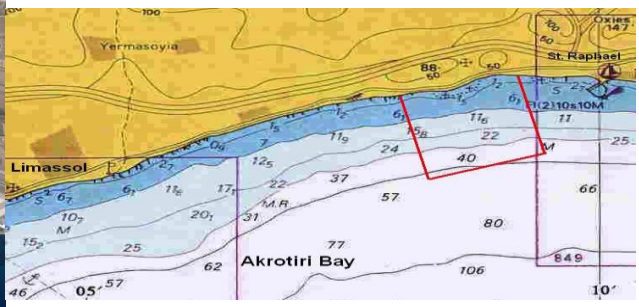
Artificial Reefs / Wrecks:

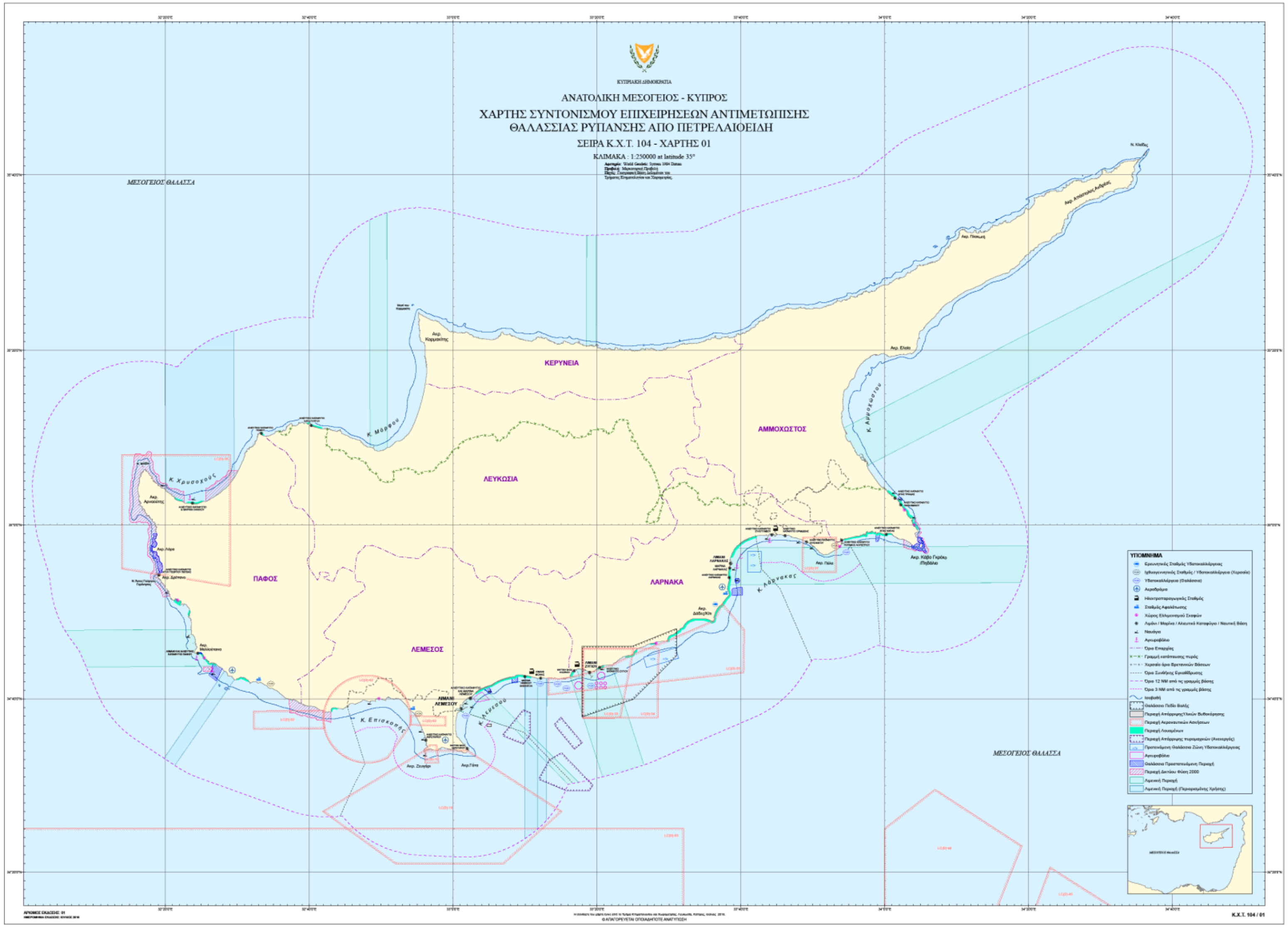
- Amathous Marine Protected Area: With a total area of 175 ha, it includes the Ancient Port of Amathous, Posidonia meadows and the Amathous Artificial Reef. It stretches from the coastline up to the 35 m isobath.

- Zenobia Wreck: No fishing is allowed by any means, 500 meters around the Zenobia Wreck in Larnaca, between the coordinates 34º53'.6 N και 33º39'.5 E, for conservation and development of biodiversity in the area.

- Four additional Artificial Reefs are being developed around Cyprus, with the deployment of vessels and other structures, establishing four marine protected areas:
    a) In the marine area of Paralimni, two vessels have been deployed, *"Liberty"* in 2009 and *«NEMESIS III»,* in 2013.
    b) *«COSTANDIS»* and *«LADY THETIS»* are the two vessels that were deployed in the marine area of Limassol, during February 2014.
    c) In June 2014, the vessel *«LABOE»* was deployed in the marine area of Kato Pafos, near the Moulia Marine Natura 2000 area.
    d) Lastly, the vessel «*KERYNEIA»,* was deployed in February 2015, in the marine area of Ayia Napa.

Marine Protected Areas with Artificial Reefs

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ΛΕΜΕΣΟΣ
Κ. Μόρφου
Κ. Χρυσοχούς
Κ. Αμμοχώστου
Κ. Λάρνακας
Κ. Επισκοπής
Ακρ. Κορμακίτης
Ακρ. Ελαία
Ακρ. Πύλας
Ακρ. Γάτα
Ακρ. Ζευγάρι
ΛΙΜΑΝΙ ΛΕΜΕΣΟΥ
ΥΠΟΜΝΗΜΑ
Ερευνητικός Σταθμός Υδατοκαλλιέργειας
Ιχθυογεννητικός Σταθμός / Υδατοκαλλιέργεια (Χερσαία)
Υδατοκαλλιέργεια (Θαλάσσια)
Αεροδρόμιο
Ηλεκτροπαραγωγικός Σταθμός
Σταθμός Αφαλάτωσης
Χώρος Ελλιμενισμού Σκαφών
Λιμάνι / Μαρίνα / Αλιευτικό Καταφύγιο / Ναυτική Βάση
Ναυάγιο
Αγκυροβόλιο
Όρια Επαρχίας
Γραμμή κατάπαυσης πυρός
Χερσαία όρια Βρετανικών Βάσεων
Όρια Συνθήκης Εγκαθίδρυσης
Όρια 12 NM από τις γραμμές βάσης
Όρια 3 NM από τις γραμμές βάσης
Ισοβαθή
Θαλάσσιο Πεδίο Βολής
Περιοχή Απόρριψης Υλικών Βυθοκόρησης
Περιοχή Αεροναυτικών Ασκήσεων
Περιοχή Λουομένων
Περιοχή Απόρριψης πυρομαχικών (Ανενεργός)
Προτεινόμενη Θαλάσσια Ζώνη Υδατοκαλλιέργειας
Αγκυροβόλιο
Θαλάσσια Προστατευόμενη Περιοχή
Περιοχή Δικτύου Φύση 2000
Λιμενική Περιοχή
Λιμενική Περιοχή (Περιορισμένης Χρήσης)
Κ.Χ.Τ. 104 / 01

LIST OF POTENTIAL SOURCES OF MARINE OIL

POLLUTION IN CYPRIOT WATERS

1. Accidents inside or outside Cypriot territorial waters (any type of oil)

2. Accidental spillage during terminal operations (crude oil, refined products)

    Moni Power Station

    Dhekelia Power Station

    Vassiliko Power Station

    Petrolina Installations

    Esso Installations

    Mobil Installations

    B.P Installations

    Vasiliko Cement Factory

3. Accidental spillage during bunkering operations (fuel oils)

4. Operational and intentional discharges from ships (slops/ fuel oils)

    - in ports (Limassol, Larnaca, Harbour)

    - Marinas (Larnaca Marina, Saint Raphael Marina)

    - offshore

5. Landbased spills (fuel oils)

A. PROPERTIES AND BEHAVIOUR OF OIL SPILLS

Origin and formulation of oil slicks

Oil around the coastline will arise from one or more of three main sources:

- Accidents due to collision, fire, explosion, grounding, well blow out, etc.
- illegal discharge of oil or oily waste
- Accidental spillage while transferring fuel or cargo from ship to ship or ship to shore, and accidental spillage resulting from incrust operation of valves, etc., on shipboard or at oil terminals.

Oil spilt in any of the above ways can result in contamination of the shore and sea.

Such damage can cause series economic and ecological problems. Therefore steps must be taken to limit the size of the spill.

The size of the spill is dependent on the nature of the accident and the size of the ships/lines involved.

Oil classification

Oils are generally classified either as crude oils and refined products, or according to their viscosity. From oil spill control of view these classes are generally of little interest. The behaviour of a certain crude oil may be very similar to a particular refined product and very different from other crude oils or, due to weathering, the viscosity and other properties of spilt oil may change considerably.

Therefore in many instances traditional oil classifications have little relevance. However, the type of oil spilt permits a prediction of the behaviour of oil at sea and, thus, the type of clean-up equipment, which must be used.

Sources of spills

Source	Cause	Remarks
OIL WELL BLOW-OUT	- Mechanical failure - Human error	The spillage will be large or small according to the well flowrate and the duration of spillage
PIPELINE	- Rupture	Spill limited to area of damaged section unless it occurs close to surface water. Volume of spill dependent on the size of pipe and its effective length, topography, etc.
TANKERS	- Collision - Grounding - Explosion and/or fire	Spill dependent on the size of the ship and extent of damage.
TERMINAL AND DEPOT	- Overfilling - Burst hose - Explosion and /or fire - Leaking valves and glands - Tank washing and deballasting	Spill normally limited and usually small Equipment should be rapidly available to recover oil.