

**APPENDIX IV**

**SCIENCE APPLICATIONS INTERNATIONAL CORPORATION**

**REMOTS SURVEY OF SOFT-BOTTOM ENVIRONMENTS IN COASTAL WATERS OF  
HONG KONG, OCTOBER 5-13, 1993**

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**REMOTS® SURVEY OF SOFT-BOTTOM  
ENVIRONMENTS IN COASTAL  
WATERS OF HONG KONG**

**OCTOBER 5-13, 1993**



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## EXECUTIVE SUMMARY

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An extensive REMOTS® data set (n=785 images) was acquired in channels and the marine shelf adjacent to Hong Kong/Kowloon between October 5 to 13, 1993. The purpose of this survey was to 1) test the usefulness of an optical bottom mapping technology (REMOTS®) for mapping bottom gradients in bottom habitat quality on the ambient seafloor, 2) evaluate the effects of dredging, disposal, and organic enrichment on benthic habitat quality, and 3) provide rapid data turnaround for managers involved with coastal resource management.

The survey area has been arbitrarily subdivided into large mapping units for the convenience of describing habitat quality: East Sha Chau, South Cheung Chau disposal site and adjacent bottoms, the area in and around Hong Kong/Kowloon, Ninepin Islands, and the Mirs Bay disposal site.

Maps were prepared of the following parameters derived from computer image analysis of REMOTS® photographs: major modal grain-size, small-scale boundary roughness, sediment compactness, and the depth of oxidized surface sediment (mean apparent redox depth). The successional status of the bottom was inferred from imaged biological structures of sediment-dwelling invertebrates. Qualitative data were also noted or mapped including evidence of bottom sediment transport, dredged material layers, fluid mud deposits, bottom erosion structures, and organic enrichment (sediment color). A summary statistic called the Organism-Sediment Index (OSI) was used to characterize overall benthic quality within each area or transect. Values of OSI equal to, or less than, 6 are used to identify recently disturbed or ecologically stressed habitats. The highest OSI value (+11) represents the highest habitat quality using this parameter.

Using the OSI ranking system, the overall mapped area is of high benthic habitat quality; most stations have OSI values of +11. However, some local transects show the effects of depressed habitat quality (OSI values less than or equal to +6). These degraded areas include those parts of Fairway transect and Tathong Channel close to Hong Kong/Kowloon. The source of habitat degradation is inferred to be excessive organic loading from the metropolitan area. Another area of organic enrichment is noted near the Soko Islands. The South Cheung Chau disposal site has some locally depressed OSI values related to active disposal activity.

Aside from the above anthropogenic factors that are locally important in degrading the benthic environment, natural physical factors also affect the stability of bottom sediments. The REMOTS® survey was carried out soon after the passage of four typhoons between June and September, 1993. These storms produced bottom sediment transport of sands and stirred bottom muds, producing soft quasi-fluid mud deposits with little shear strength or bearing capacity. Such natural stirring/transport events can result in disruption of benthic community structure and result in wide redistribution and reorganization of benthic biological structure. Because evidence of sediment transport is widespread on the ambient or natural seafloor, it

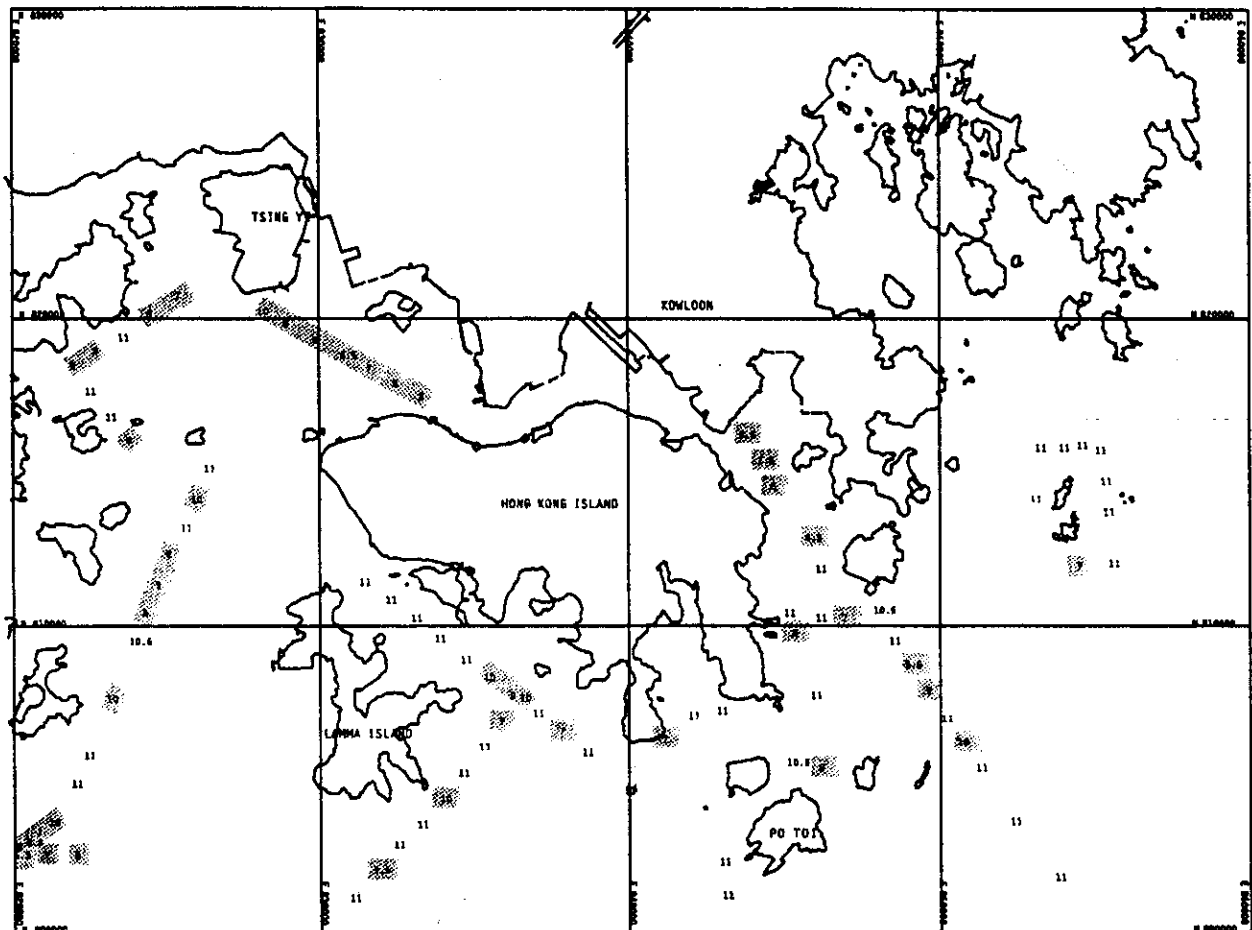
## EXECUTIVE SUMMARY (cont.)

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appears that natural disturbance factors are of greater regional significance than local perturbations related to dredging and disposal.

The REMOTS® survey has successfully defined baseline conditions in the Hong Kong/Kowloon area, identified local sources of ecological stress, and documented the effects of typhoon passage on bottom stability. This data set also has identified areas where additional data are required to fill data gaps. This baseline information is valuable to managers as it can be used to scale the impacts of future projects and set these projects in the perspective of natural disturbances. The GIS format for the data products will allow rapid comparison of the baseline data set described here and changes in the system as documented in future REMOTS® surveys.

# HONG KONG/KOWLOON



## ORGANISM SEDIMENT INDEX

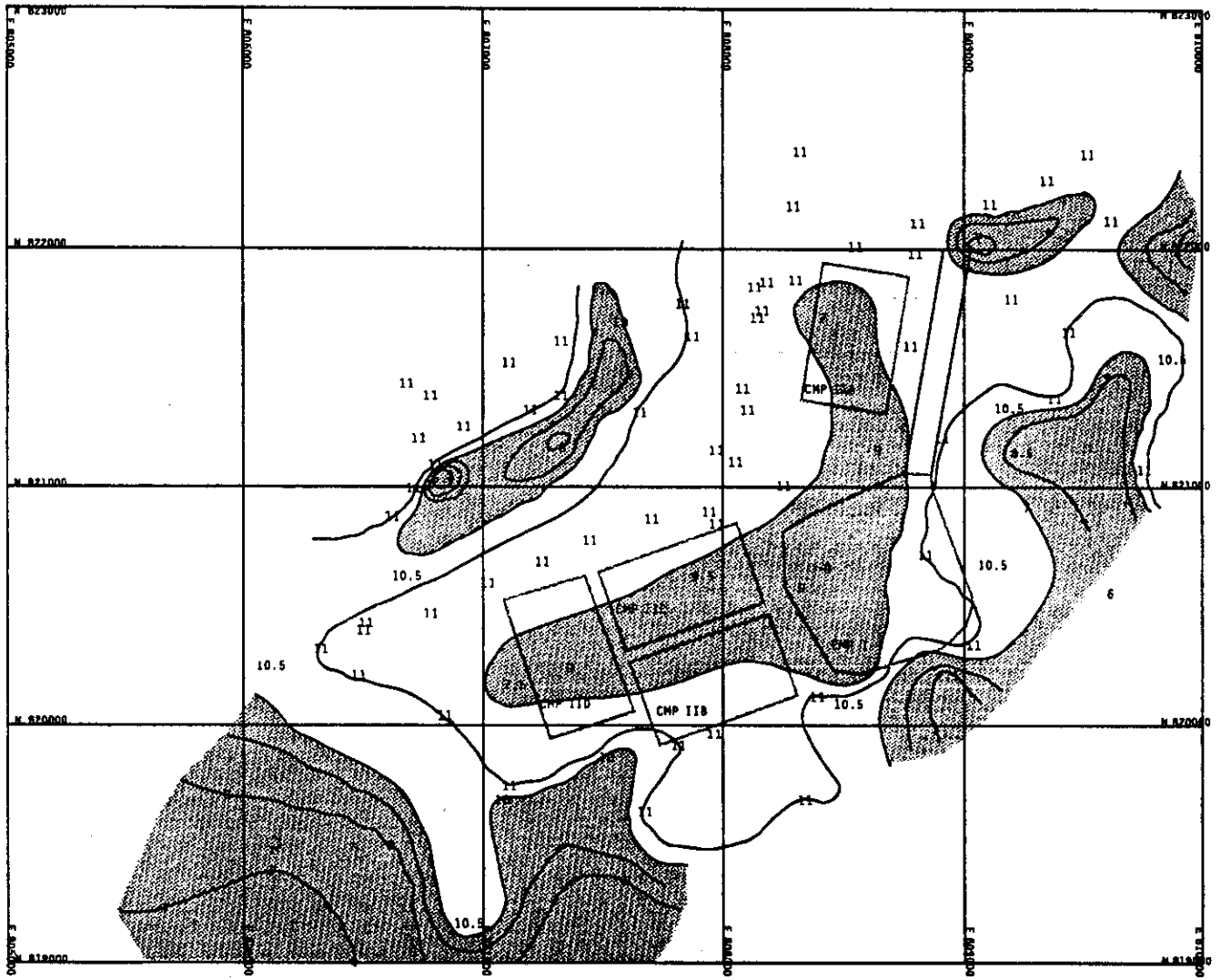


$OSI \leq 6$



$OSI > 6$  to  $\leq 10$

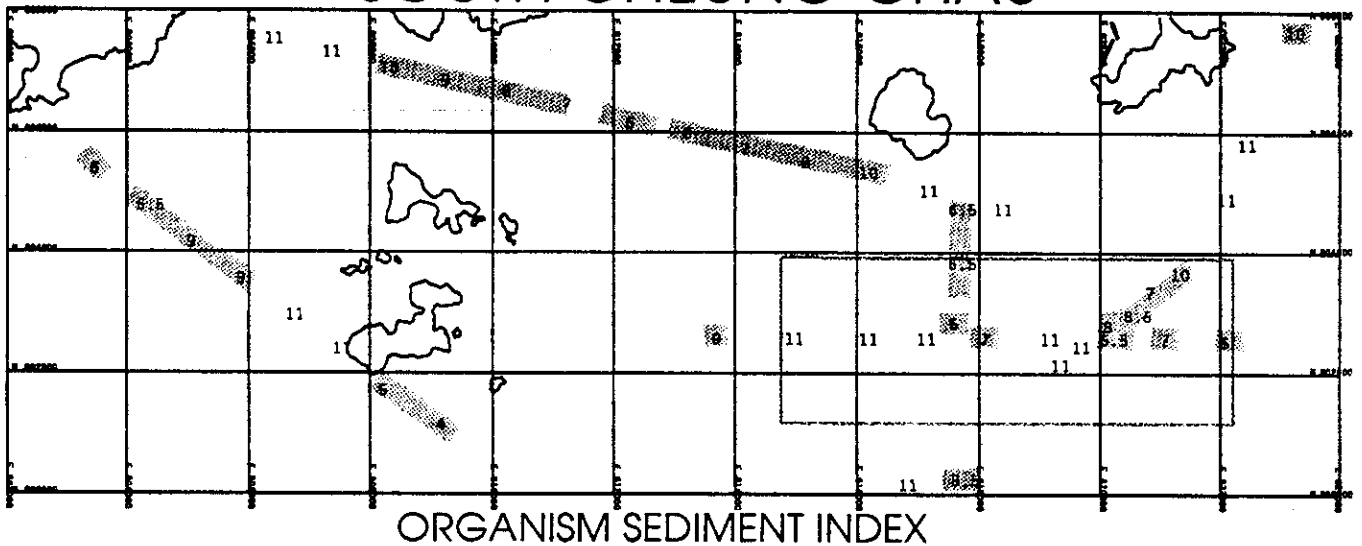
# EAST SHA CHAU





ORGANISM SEDIMENT INDEX

OSI  $\leq$  10

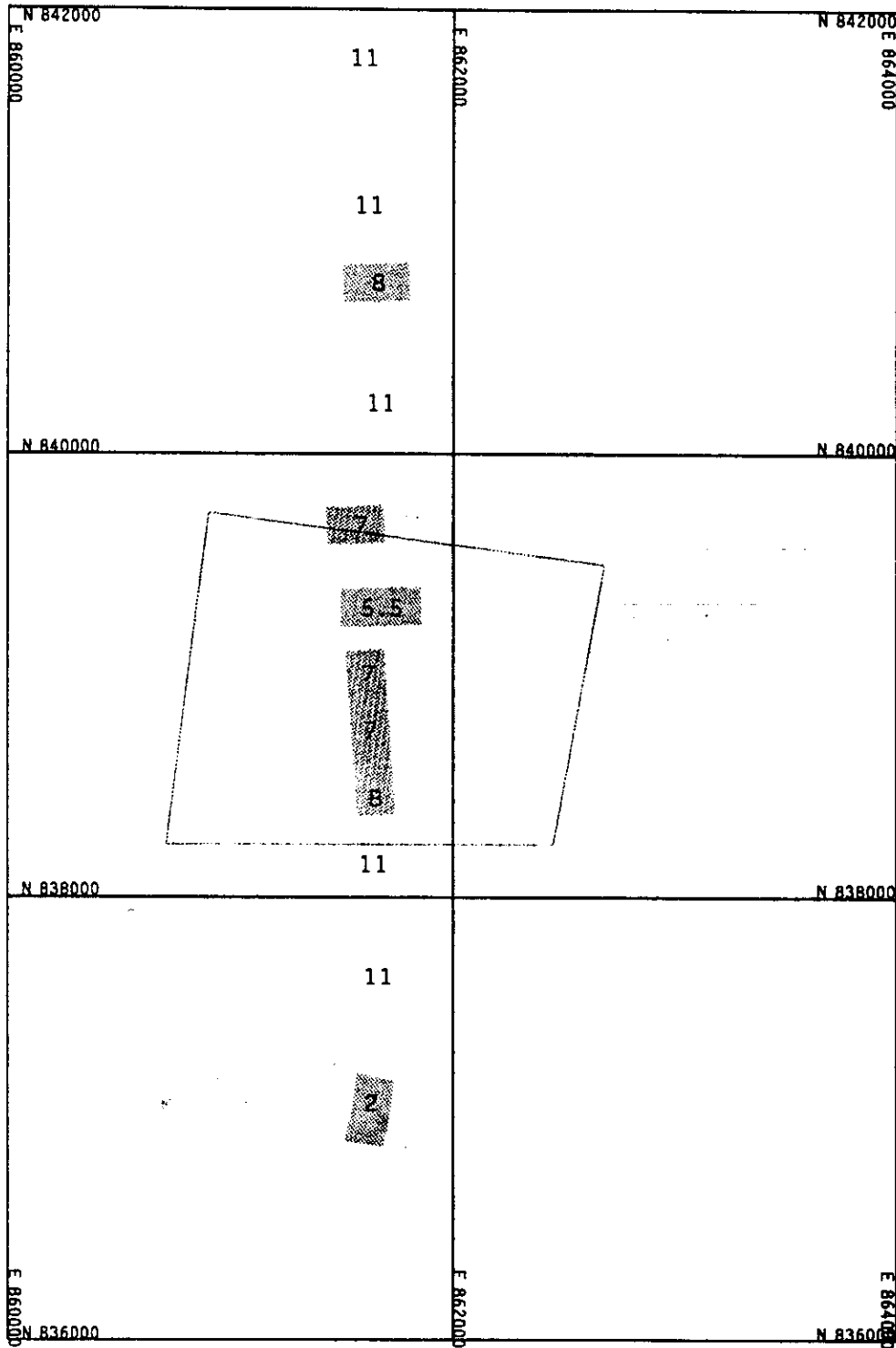
# SOUTH CHEUNG CHAU





ORGANISM SEDIMENT INDEX

-  OSI ≤ 6
-  OSI > 6 to ≤ 10

# MIRS BAY



## ORGANISM SEDIMENT INDEX

-  OSI  $\leq 6$
-  OSI  $> 6$  to  $\geq 10$



# OSI Frequency Distributions

