# DETERMINATION OF SELECTED TRACE METALS IN KETUS RIVER, TERENGGANU

SITI [illegible]

FACULTY OF SCIENCE AND TECHNOLOGY
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

2003

# DETERMINATION OF SELECTED TRACE METALS IN NERUS RIVER, TERENGGANU.

By

Chew Choon Keat

Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Analytical and Environmental Chemistry)

Department of Chemical Science
Faculty of Science and Technology
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2005

**JABATAN SAINS KIMIA**
**FAKULTI SAINS DAN TEKNOLOGI**
**KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA**

## BORANG PENGESAHAN DAN KELULUSAN SARANAN PROJEK PENYELIDIKAN I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

**Determination of Selected Trace Metals in Nerus River, Terengganu** oleh **Chew Choon Keat**, No.Matrik **UK6755** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kimia sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah **Sarjana Muda Sains (Kimia Analisis dan Persekitaran)** Fakulti sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

.....
Penyelia Utama

Nama: **Prof. Madya Dr. Norhayati Mohd Tahir**

Cop Rasmi: NORHAYATI MOHD TAHIR (Ph. D., PROF. MADYA) Tarikh: .....
PENSYARAH
JABATAN SAINS KIMIA
FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
MENGABANG TELIPOT, 21030 KUALA TERENGGANU

.....
Ketua Jabatan Sains Kimia

Nama: **Prof. Madya Dr. Ku Halim Ku Bulat**

Cop Rasmi: PROF. MADYA DR. KU HALIM KU BULAT
Ketua
Jabatan Sains Kimia
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.
Tel: 09-6683257

Tarikh: 7/4/2005

## ACKNOWLEDGEMENT

I would like to express my gratitude to my supervisor, Prof. Madya Dr. Norhayati Mohd Tahir for her advice, guidance, constructive comment and many valuable suggestions that greatly improved this thesis writing.

Next, I also extend deepest appreciation to the lab assistants especially Mr. Ruzeman, who have been great help in carrying out and completing my lab works. Besides that, I wish to thank to KUSTEM's librarians too. Thank you for their help to find me information needed to complete this mini project.

Not forgetting here to thank my project – mate (Jeswin, Noraini and Bee Bee) and my friend in KUSTEM. Thanks for their helps and unforgettable memories throughout these three years.

Last but not least, thank to my beloved parents who provided a good education for me and my whole families who always support me.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| Al | Aluminum |
| APDC | Ammonium Pyrrolidine Dithiocarbamate |
| As | Arsenic |
| Ba | Barium |
| Cd | Cadmium |
| Co | Cobalt |
| Cr | Chromium |
| Cu | Copper |
| DO | Dissolved oxygen |
| Fe | Iron |
| HCL | Hydrochloric acid |
| HF | Hydrofluoric acid |
| $HNO_3$ | Nitric acid |
| ICP –OES | Inductive Coupled Plasma –Optical Emission Spectrometer |
| INWQS | Malaysia Interim National Water Quality Standards |
| Mn | Manganese |
| MIBK | Methyl Iso- Buthyl Keton |
| $NH_3$ | Ammonia |
| Ni | Nickel |
| Pb | Lead |
| PE | Polyethylene |

| | |
|---|---|
| Sn | Stanum |
| Zn | Zinc |

## ABSTRACT

Dissolve and particulate trace metals (Pb, Cd, Cu, Fe and Zn) were determined in the Nerus River, Terengganu. In this study, sampling was carried out six times at nine stations and water samples were collected with Van Dorn water sampling equipment. Dissolved metals were pre –concentrated by APDC –MIBK solvent extraction and back extracted into dilute nitric acid. Particulate metals were digested in a microwave lab station and both of the dissolve and particulate metals were analyzed using ICP – OES. The result showed that the metals concentration range as follow: dissolved Cd (0.03-0.13 ppb), particulate Cd (0.13-0.97 ppb), dissolved Pb (0.23-1.59 ppb), particulate Pb (0.21-1.85 ppb), dissolved Cu (0.36-2.45 ppb), particulate Cu (0.53-5.29 ppb), dissolved Zn (1.54-20.99 ppb), particulate Zn (0.84- 12.87 ppb), dissolved Fe (4.79-89.26 ppb) and particulate Fe (27-4670 ppb). According to Interim National Water Quality Standards (INWQS) in Malaysia, the concentration of all the dissolved metals studied in Nerus River, Terengganu were classified in Class I indicating a clean status. However, the concentration of dissolved iron, copper and zinc shows increasing trend when compare with previous study. In general, the concentrations of metals studied are affected by anthropogenic input such as runoff from road, domestic waste and also agricultural runoff.

## ABSTRAK

Logam surih terlarut dan partikulat (Pb, Cd, Cu, Fe dan Zn) telah ditentukan di Sungai Nerus, Terengganu. Dalam kajian ini, persampelan telah dijalankan sebanyak enam kali di sembilan stesen persampelan dan sampel air diambil dengan alat persampel Van- Dorn. Logam terlarut talah dipekatkan dengan kaedah pengekstrakan pelarut APDC –MIBK dan diekstrak kembali ke dalam asid nitrik cair. Logam partikulat telah dihadamkan mengunakan 'microwave lab station' dan kedua- dua logam terlarut dan partikulat dianalisis mengunakan ICP –OES. Keputusan kajian menunjukkan julat kepekatan logam seperti berikut: Cd terlarut (0.03-0.13 ppb), Cd partikulat (0.13-0.97 ppb), Pb terlarut (0.23-1.59 ppb), Pb partikulat (0.21-1.85 ppb), Cu terlarut (0.36-2.45 ppb), Cu partikulat (0.53-5.29 ppb), Zn terlarut (1.54-20.99 ppb), Zn partikulat (0.84- 12.87 ppb), Fe terlarut (4.79-89.26 ppb) and Fe partikulat (27-4670 ppb). Berdasarkan Piawaian Interim Kualiti Air Kebangsaan (INWQS) dalam Malaysia menunjukkan semua logam terlarut berada dalam Kelas I iaitu status bersih. Tetapi, kepekatan bagi Zn, Cu dan Fe menunjukkan peningkatan jika dibandingkan dengan kajian dahulu. Secara keseluruhan, didapati kepekatan bagi logam dalam kajian ini dipengaruhi oleh sumber anthropogenik seperti hakisan dari jalan, pembuangan domestik dan juga sumber pertanian.