社会開発調査部報告書

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NO. 2

METEOROLOGY AND ENVIRONMENTAL
PROTECTION ADMINISTRATION (MEPA)

THE STUDY ON
AN ENVIRONMENTAL ASSESSMENT AND MONITORING OF ARABIAN GULF IN THE KINGDOM OF SAUDI ARABIA

TECHNOLOGY TRANSFER REPORT

January 2001

CHIYODA-DAMES & MOORE CO., LTD.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

METEOROLOGY AND ENVIRONMENTAL
PROTECTION ADMINISTRATION (MEPA)

THE STUDY ON
AN ENVIRONMENTAL ASSESSMENT AND MONITORING OF ARABIAN GULF IN THE KINGDOM OF SAUDI ARABIA

TECHNOLOGY TRANSFER REPORT

January 2001

CHIYODA-DAMES & MOORE CO., LTD.

Summary

One of the most important objectives of the Study is to strengthen MEPA 's capability for environment management/monitoring along the Arabian Gulf. In order to achieve this objective, the Team has conducted technology transfer on water quality monitoring to the MEPA C/P during the Study.

The main items of the technology transfer on the Study included three, or field monitoring investigation technique, chemical analysis method for water and sediment and satellite image analysis. In addition, at the opportunities of seminars and workshops, the Team made presentations about the contents of the Study, including monitoring result to the governmental organization concerning environmental management of the Gulf, major enterprises in the Eastern Province and various research institutes. These activities aimed to broaden the understanding of necessity of the future environmental management/ monitoring system in the Arabian Gulf into KSA society.

All kinds of technology transfers had been conducted effectively and harmoniously between the Team and MEPA C/P. A broad range of water quality monitoring techniques including basic operations of the monitoring works, such as field sampling works, sample handling methods, laboratory management works, sample analysis works, data analysis measures and estimation measures for the monitoring results, were transferred during all stages of the Study. As the result of these technology transfers, it was recognized that the technology foundations for water quality monitoring activities were fully established in MEPA E. P.

It is strongly recommended that the further efforts to train and/or educate the personals should be needed by means of continuation of the monitoring activities proposed in the Study, since most of the MEPA C/P still has limited experience in the monitoring works. In addition to these efforts of MEPA itself, it is also recommended for JICA to keep continuous technical support for example, by dispatching of specialists.

Contents

Introduction

In accordance with the agenda for mutual cooperation between the Government of Japan and the Government of Saudi Arabia agreed on November, 1997, the MEPA (Meteorology & Environmental Protection Administration) and JICA (Japan International Cooperation Agency) have conducted a joint project entitled "The Study in an environmental Assessment and Monitoring of Arabian Gulf in the Kingdom of Saudi Arabia (the Study)" from 1999 to 2001.

One of the most important objectives of the Study is to strengthen MEPA 's capability for environment management/monitoring along the Arabian Gulf. In order to attain this objective, JICA team (the Team) has been conducted technology transfer on water quality monitoring along the Arabian Gulf to the MEPA counterparts (C/P) during the Study.

This report summarizes the contents, methods, teaching materials and the results of technology transfer.

2. Outline of Technology Transfer

The items and targets of technology transfer are described as follows.

(1) Items of Technology Transfer

The main items of the technology transfer on the Study are shown in Table 2.1.

Table 2.1 Items of Technology Transfer

Category	Item
Monitoring Plan	- Methods of Marine Monitoring Design - Organization and Network System - Preparation of Monitoring Equipment
Field Work	- Sampling and Field Work Practice - Operation and Maintenance of Field Equipment - Health and Safety Planing - Documentation and Record Keeping
Laboratory Work	- Practice of Laboratory Work/Management - Chemical Analytical Technology - Maintenance of Laboratory Equipment - Data Treatment, Quality Assurance and Quality Control
Satellite Image Analysis	- Arrangements and installation of the data processing units - Data Processing Practice - Interpretation of the analytical results
Water Quality Management Plan	- Data Treatment and Statistical Analysis - Evaluation of Results of Monitoring - Identification of Pollution Sources - Water Quality Conservation Plan

(2) Targets of technology transfer

The targets of technology transfer were not limited in MEPA, or the counterpart organization of this study, but to other organizations relating to the activities of coastal zone management.

Table 2.2 shows the list of conducted technology transfer targeted on the MEPA personnel. The CVs of these counterparts are attached in Appendix A.

Table 2.2 List of Counterparts

Specialty	Name of Person
Water Quality Management Plan	Mr. Hamadan S. Al-Ghamdi (Director of MEPA Eastern Province)
Water Quality Management Plan	Mr. Aziz Al-Omary (Chief of Environmental Division of MEPA E.P.)
Water Quality Management Plan	Mr. Mohammed Ali Al-Ghamdi (MEPA E.P.)
Water Quality Monitoring	Mr. Khaled Al-Rasheed (MEPA E.P.)
Water Quality Monitoring	Mr. Khalid Busbait (MEPA E.P.)
Water Quality Monitoring	Mr. Adel Qusti (MEPA E.P.)
Laboratory Works	Mr. Qusai Bohlaiqah (MEPA E.P.)
Laboratory Works	Mr. Hashim Al-Zawad(MEPA E.P.)
Laboratory Works	Mr. Alam Nizami (MEPA E.P.)
Laboratory Works	Mr. Jamal Kazim (MEPA E.P.)
Laboratory Works	Mr. Najib S Raadan (MEPA E.P.)
Laboratory Works	Mr. Yousef H Al-Hilal (MEPA E.P.)
Laboratory Maintenance	Mr. Ahamed Al-Dalouj (MEPA E.P.)
Laboratory Maintenance	Mr. Ghazi Al-Naimi (MEPA E.P.)
Satellite Image Analysis	Mr. Mohammed A. Bukhari (MEPA HQ)

Following organizations relating to the coastal zone management were to be involved in the technology transfer.

- **Public Organization**
  Coast Guard, Ministry of Industry, Ministry of Agriculture, Al-Jubail Municipality, Dammam Municipality, Civil Defense, Water and Sewerage Authority, Royal Commission etc.

- **Main Industrial Orgainations in the Eastern Province**
  SAFCO, SABCO, SECO, Qurrayah Power Plant, SWCC, etc.

- **Research Institutes**
  King Fahd University of Petroleum & Minerals, King Faisal University, etc.

In order to expand the understanding of necessity of the future environmental management/monitoring system of the Gulf into various organizations of governments of KSA, the Team made presentation about the contents of the Study, including monitoring result at the opportunities of seminars and workshops which were held during the Study.

3. Methods of Technology Transfer

The outline of the technology transfer is shown in Table 3.1.

Table 3.1(1) Technology Transfer Performed by OJT (1)

Period	Category	Item	Method
1st Work Stage (March, 1999)	Field Survey	Planning of Field Survey	Explanation, lecture, OJT
	Laboratory Work	Laboratory Preparatory Plan	Explanation, lecture, OJT
2nd Work Stage (June - July, 1999)	Field Survey	Design of Monitoring Plan	Lecture/discussion
		Sampling Procedures	OJT
	Laboratory Work	Laboratory Preparation	OJT
		Analysis work Plan	OJT
		Basic Analysis Procedure	OJT
		Laboratory Planning	Lecture/ discussion, OJT
3rd Work Stage (Sep. - Nov., 1999)	Field Survey	Monitoring Planning/Preparation	Lecture, OJT
		Monitoring Survey Procedure	Lecture, OJT
		Sample Treatment	Lecture, OJT
		Equipment Maintenance	Lecture, OJT
	Laboratory Work	Analysis Procedures	Lecture, OJT
		Equipment Operation	Lecture, OJT
		Laboratory Management	Lecture, OJT
	Satellite Analysis	Application of Satellite analysis	Lecture
4th Work Stage (May - July, 2000)	Field Survey	Monitoring Planning/Preparation	OJT
		Monitoring Survey	OJT
		Sample Treatment	OJT
		Equipment Calibration	OJT
		Equipment Maintenance	Seminar, OJT
		Data analysis, reporting	Seminar, OJT
	Laboratory Work	Analysis Procedures	Seminar, OJT
		Equipment Operation	OJT
		QA/QC Procedures	Seminar, OJT
		Data Documentation	Seminar, OJT
	Satellite Image Analysis	Satellite Analysis Procedure	Lecture, OJT

For field monitoring and chemical analysis works, the technology transfer works were conducted under the name of 'On-the-Job Training' (OJT). In addition to these OJTs, the lectures/discussions and seminars/workshops were also conducted as 'Off-the-Job Training' aiming to strengthen the theoretical understanding of the monitoring.

4. Details of Technology Transfer

4.1 Field Work

The goal of the technology transfer for field work was to establish the strong technology foundation for water quality management/monitoring in MEPA as well as for MEPA to have enough capability to execute/to improve water quality management/monitoring by itself in the future.
In order to achieve this goal, various kinds of technology transfers including not only basic technologies such as field monitoring technique, sampling technique and sample handling, but also comprehensive items such as analytical method of monitoring data and evaluation of monitoring plan, were conducted. Actual works of technology transfer work were carried out during two rounds of water quality monitoring in the pilot monitoring area (Intensive Study Area) and chemical analysis survey.

In the first round of field survey, basic and important techniques of monitoring and chemical analysis were tried to be transferred from the Team to MEPA. Because of that, in the second round field survey, all practical works such as field monitoring and laboratory works were to be implemented by MEPA itself, whereas the Team provided only necessary supports and/or suggestions. The Team confirmed that each C/P studied very hard to obtain various technologies from the Japanese C/P. In addition, the Team made 'tutorials', throughout the Study in order to strengthen each C/P's theoretical understanding concerning monitoring and sampling activity.

The followings are items of technology transfer for field work.

- Basics of monitoring plan design,
- Preparation works for field monitoring,
- Health and Safety Planning for field work,
- Sampling plan design,
- Recording of field monitoring results,
- Data analysis (calculation and data handling),
- Sample management methods (chain-of-custody procedures).

Some sample documents prepared for technology transfer for field work and tutorials are attached in Appendix B.

4.2 Laboratory Work

Technology transfer for laboratory work was conducted with regard to laboratory preparation and sample analysis work. The items and target of the technology transfer are described as follows.

4.2.1 Preparation of Laboratory

Prior to technology transfer, equipment and facility of the laboratory were improved by means of installation of equipment donated by JICA to the laboratory in the Office of MEPA Eastern Province (MEPA E. P.). The Teaqam supported this activity. Following items are included in the technology transfer along with laboratory preparation.

- Laboratory arrangement for newly installed equipment,
- Preparation of utility supply for laboratory,
- Basics of chemistry and laboratory work,
- Laboratory health and safety plan,
- Management of inventory of chemicals and glassware,
- Handling and treatment of laboratory wastes.

4.2.2 Analysis Work

At both the Second and Third work stages, the Team made technology transfer of sample analysis to MEPA C/P. Basic techniques of chemical analysis for TSS, TOC, TKN, NH3, T-P, Metals (As, Cr, Hg, Mg, Cd, Co, Cu, Ni, Pb, Zn), CN, Oil & Grease, BTEX, Phenol, Re-Cl, coliforms, etc. were transferred to the C/P under the name of OJT.

Items of technology transfer concerning analysis work are listed below.

- Instrument operation and calibration,
- Sample management,
- Principles of analysis methods,
- Sample treatment and quantitative analyses,

- Data handling and record keeping,
- Basic QA/QC methods,
- Data arrangement and reporting,
- Maintenance of equipment.

4.2.3 Documentation

The Team prepared the following documents and forms needed for laboratory management and analysis work, together with MEPA C/P who should know the objective and usage of these documents.

- Laboratory Management Plan (fundamental),
- Chain-of-custody sheet,
- Standard analysis procedures (analysis flow sheet),
- Operation and calibration manuals for main instrument,
- Health and safety plan for laboratory works,
- Waste treatment manual for laboratory works,
- Inventory list of equipment/list of chemicals and glassware/apparatus,
- Data sheet (Field note),
- Final analysis report.

Some of sample documents mentioned above and "daily report of laboratory work" are attached in Appendix B.

4.3 Satellite Image Analysis

The LANDSAT Thematic Mapper (TM) satellite image analysis was conducted at the Geographical and Remote Sensing Unit of the MEPA (Jeddah) from 21 June to 13 July, 2000. The main item of the technology transfer of satellite data analysis is preparation of distribution maps for temperature, suspended solids, chlorophyll and coastal areas. The followings were carried out as part of the technology transfer.

- Arrangements and installation of the TM Data processing units into the Unix Workstation.
- Loading, display, image contrast adjustments and histogram manipulations of TM data
- Processing of the temperature distribution.
- Processing of the suspended solid distribution.

- Processing of the chlorophyll distribution.
- Processing of the coastal areas distribution.

A sample of the 'daily report of satellite data analysis' is attached in Appendix D.

4.4 Workshops

The Team and MEPA C/P organized three times of workshops concerning technology transfer during the Study. Responsible persons from the organizations collaborated with the Study and major enterprises and governmental organizations in Eastern Province were gathered together.
At the Fourth work stage, the Team held the 'Lunch Time Seminars' for MEPA C/P. Table 3.2 shows the records of seminar/workshops held during the Study.

The speakers of these seminars/workshops were selected from the both sides of MEPA and the Team. At each of the question & answer session, many attendants showed much interests in the project, and wanted to exchange views/opinion with both MEPA C/P and the Team.

Table 3.2 Records of Seminar/Workshop

Period	Seminar/Workshop
2nd Work Stage	Workshop I (July 7, 1999) - Introduction of the Study - Design of Water Monitoring - Socio-economical Frame Work of the Project
3rd Work Stage	Workshop II (November 17, 1999) - Environmental Condition Analyzed from Satellite Images - Findings during Actual Monitoring Work - Laboratory Set up and Future Plan
4th Work Stage	Lunch Time Seminars (June – July, 2000) - Laboratory Practice – Important Procedure, QA/QC - Sampling Practice – Planning, Documentation - Interpretation of Results – Graphs and Statistics - Field Equipment – Calibration and Maintenance - Performance Management – Duties and Responsibilities
5th Work Stage	Workshop III (November 13-14, 2000) - Present Seawater Quality Situation in the Study Area - Seawater Quality Evaluated by Satellite Data Analyses - Phased Approach to Future Seawater Monitoring - Laboratory Preparation for Environmental Monitoring - Strengthening MEPA's Capacity - Present Situation and Future Consideration

The contents of seminars/workshops are described as follows.

4.4.1 Workshop I

The first workshop was held at the meeting room of MEPA Eastern Province on July 07, 1999, in the Second work stage. Five panelists were selected from both the Team and MEPA C/P. More than 30 responsible persons jointed from many entities related with environment protection and expressed their opinions at the discussion session.

The program, list of attendants, resumes of speech and summary of Q&A of Workshop I were attached in Appendix E. Table 4.1 shows the information of each panelist.

Table 4.1 Main Subjects on Workshop I

Name of panelist	Organization/ Specialty	Title
Mr. Yasuhiro Shimazu,	JICA Study Team/ Leader	"Introduction of the Work"
Mr. Aziz Al-Omari	MEPA E. P. Chief of Environmental	"The Role of MEPA and the Management of Monitoring Program"
Dr. Robert Hilliard	JICA Study Team /Water Quality Monitoring	"Design of Water Monitoring"
Mr. Kazutaka Tanaka	JICA Study Team/ Socio-Economy	"Socio-Economical Framework for the Project"
Mr. Khaled Al-Rasheed	MEPA E. P.	"Cooperation, coordinate with Coast Guard"

4.2.2 Workshop II

The second workshop was held at the meeting room of MEPA Eastern Province on November 17,1999, in the Third work stage. Many people from relating organizations to this study attended the workshop. The main contents of the workshop were to present the research results conducted. The key topics of this workshop were:

- Environmental Condition Analyzed from Recent LANDSAT Images,
- Preliminary Results of Field Monitoring, and
- Start-up Overcoming of Laboratory.

The program, list of attendants, resumes of speech and summary of Q&A of Workshop

II were attached in Appendix F. A list of each panelist's speech is shown on Table 4.2.

Table 4.2 Main Subjects on Workshop II

Name of speaker	Organization/ Specialty	Title
Mr. Yasuhiro Shimazu	JICA Study Team/ Leader	Present Status of the Study – Outline
Mr. Aziz Al-Omari	MEPA E. P. Chief of Environmental	Requirements for Continuing the JICA/MEPA Project
Dr. Krishna Mishra	JICA Study Team/ Satellite Photography	Environmental Condition Analyzed from Recent LANDSAT Images
Mr. Khaled Busbait	MEPA E. P.	Findings During Actual Monitoring Work
Mr. Mamoru Sato	JICA Study Team/ Equipment for Chemical Analysis	Laboratory Set Up

4.4.3 Lunch Time Seminar

A total of 7 times of seminars entitled "Lunchtime Seminar" was held in MEPA Eastern Province during the Fourth Stage Work. These seminars were held during lunch hour in order to achieve sufficient technology transfer of water quality monitoring to the MEPA's personnel.

Topics of the each seminars were selected based on the discussing between the Team and MEPA C/P. The panelists of these seminars were selected from the both MEPA and the Team. Presentation and opinion exchanges on the topics related to the Study were executed between speakers and attendance.

Resumes of speech and lists of attendance of each seminar are attached in Appendix G. The schedule and contents of these seminars are listed in Table 4.3.

Table 4.3 Lunch Time Seminars

Date	Name of Person	Topic	Suggestions
June 21, 2000	Mr. Yoshitaka Imaeda	Laboratory Practice (1)	Important Procedure
July 2, 2000	Mr. Khaled Al-Rasheed	Sampling Practice (2)	Documentation and Record System
July 8, 2000	Dr. Robert Hilliard	Interpretation of Results	Graphs and Statistics
July 9, 2000	Mr. Khalid Busbait	Sampling Practice (1)	Objectives, Logistics and Planning
July 12, 2000	Mr. Tomohiko Ike	MEPA Field Equipment	Calibration and Maintenance
July 16, 2000	Mr. Mamaru Sato	Laboratory Practice (2)	QA/QC – Preventing Contamination
July 19, 2000	Mr. Kazutake Tanaka	Performance Management	Position Duties and Responsibilities

4.4.4 Workshop III (Seminar of Technology Transfer)

The third workshop was held aiming to summarize the results of the Study. The workshop was opened at Al-Gosaibi Hotel on November 13th and 14th, 2000 with joining of Japan Ambassador and Deputy Governor of Eastern Province and many participants from related organization.

The main topic of this workshop was to report monitoring result and future plan on water quality management/monitoring. The main subjects on presentation of MEPA and the Team are shown in Table 4.4.

The program, list of attendants, resumes of speech and summary of Q&A of Workshop III are attached in Appendix H.

Table 4.4 Main Subjects on Workshop III

Name of Speaker	Organization/ Specialty	Title
Day 1		
Mr. Yasuhiro Shimazu	JICA Study Team/ Leader	"Outline of the Study"
Dr. Robert Hilliard	JICA Study Team /Water Quality Monitoring	"Present Sea Water Quality Situation in the Area"
Mr. Khaled Al-Rasheed	MEPA E. P.	"Sampling Practice
Mr. Mohammed Bukhari	MEPA Headquarter	"MEPA's Ongoing GIS & RS Activities"
Dr. Krishna Mishra	JICA Study Team/ Satellite Photography	"Seawater Quality Evaluated by Satellite Data Analyses"
Day 2		
Mr. Tomohiko Ike	JICA Study Team/ Ecology	"Phased Approach to Future Seawater Monitoring"
Mr. Adel Qusti	MEPA E. P.	"Importance of the Extending Seawater Monitoring along all of the Eastern Coast"
Mr. Hiroyuki Ohi	JICA Study Team/ Water Quality Analysis	"Laboratory Preparation for Environmental Monitoring"
Mr. Kazutaka Tanaka	JICA Study Team/ Socio-Economy	"Strengthening MEPA's Capacity"
Mr. Hamdan Al-Ghamdi	MEPA E. P./ Director	"Present Situation and Future Consideration"

5. Result of Technology Transfer

All kinds of technology transfers had been conducted effectively and harmoniously between the Team and MEPA C/P. A broad range of water quality monitoring techniques including basic operations of the monitoring works, such as field sampling works, sample handling methods, laboratory management works, sample analysis works, data analysis measures and estimation measures for the monitoring results, were transferred during all stages of the Study. As the result of these technology transfers, it was recognized that the technology foundations for water quality monitoring activities were fully established in MEPA E. P.

It is strongly recommended that the further efforts to train and/or educate the personals should be needed by means of continuation of the monitoring activities proposed in the Study, since most of the MEPA C/P still has limited experience in the monitoring works.

In addition to these efforts of MEPA itself, it is also recommended for JICA to keep continuous technical support for example, by dispatching of specialists.

The remaining issues on each items of technology transfer are summarized as follows.

5.1 Field work

As the results of technology transfer, the concerned skills can be evaluated to be enough to conduct actual sampling and measurement works on the routine water quality monitoring.
It is expected to continue further internal technology transfer and/or training in MEPA E. P. under the leadership of these C/P personnel. Also, it is expected to give them the opportunity to learn advanced technology on the field works in the future.

5.2 Laboratory Work

Because of the shortage of technician, the laboratory system is understood sill not to have enough capability to analyze the ideal number of samples for monitoring survey. In order to solve to this problem, MEPA will recruit two chemists on January 2001 in accordance with the strong recommendation of the Study Team.
Technical support for these newly recruited personnel is expected by means of technology transfer both inside of MEPA and by dispatching advisors by JICA and the dispatch of JICA .

5.3 Satellite Image Analysis

The Geographical and Remote Sensing Unit of MEPA already has basic technology, some experiences for image analysis and staff who has basic knowledge of this technique, so that the technology transfer was conducted successfully. More advanced analysis is expected to be made by using existing GIS system and satellite analysis technique for the coastal environment management.

5.4 Workshop and Seminar

It is understood that all workshops held during the Study had attracted attentions of governmental organizations, private sectors, universities and other research institutions. Opinion exchanges between MEPA and the attendants of the workshops were always positive and prospective.

These experience of opinion exchanges with other organizations during the workshops will give the great motivation for MEPA to conduct the coastal environmental management.

Appendix A

CVs of Counterparts

Hamdan Saleh Al-Ghamdi

P. O. Box-117, Dhahran Airport
Dhahran-31932, Saudi Arabia
Tel: (03) 8576260/8575732
Fax: (03) 8576752/8575304

Nationality : Saudi Date of Birth : May 03, 1952

Marital Status : Married

Work Experience

- Working as a Director of Ministry of Defense and Aviation, Meteorology and Environmental Protection Administration (MEPA) Eastern Province since 1998.
- Worked in MEPA Headquarters as a Director for Protection Controls and Services for Marine Environmental Department.

Education

1994 Aberdine University, Scotland U. K.
Environmental Assessment and Management

1981-1984 Western Michigan University, USA
Master Degree of Marine Biology

Aziz W. Al-Omari

P. O. Box-117, Dhahran Airport
Dhahran-31932, Saudi Arabia
Tel: (03) 8576260/8575732
Fax: (03) 8576752/8575304

Nationality : Saudi
Marital Status : Married

Qualification:

- Diploma in Marine Pollution Response from Bahrain in 1987.
- The Saudi Arabian Observer Course from United Kingdom of Great Britain and Northern Island in 1979.
- Two years Met. Observers Course from Civil Aviation Presidency, in 1978.

Experiences:

- Working as a Chief of the Environmental Division, at Meteorological Environmental Protection Administration (MEPA) Eastern Province since 1992.
- Involved in combating the Gulf Oil Spill in January 1991 as a senior airborne observer.
- Worked as the MEPA Air Surveillance Coordinator (Observer) for Gulf Oil Response Team in June 1991.
- Participated in MEMAC workshop on Prevention, Control and Response to Marine Pollution by Oil and the Regional Contingency Plan held at Kuwait on May 4-6, 1986.
- Participated in "Marine Pollution Prevention Control and Response" Seminar at Jeddah in 1987.

Training:

- Advanced training in oil spill observation and trajectory projections.
- Advanced training in equipment development and clean-up method.
- Participated in the training course on the Vaisaia Sounding System in 1981.
- Participated in "Oil Spill Response Training Program" sponsored by NOAA and MEPA at research planning, Inc. USA.

Letter of appreciation:

- Received appreciation letter of the outstanding performance through the Gulf Oil Spill from National Oceanic and Atmospheric Administration (NOAA), US department of commerce in 1991.
- Received appreciation letter as an observer on overflights during Desert Storm Operation from International Maritime Organization (IMO), London.

P.O.Box:20443,
Al-Khobar- 31952

Mobile 055826582 / Pager 19909096
E-mail: ksr@dmm.naseej.com

Khaled S. Al-Rasheed

Work Experience

1990- Present

Ministry of Defence (MEPA) , Dammam

Environmental Observer / Site Supervisor

- Supervision of the day to day activities of the cleanup operation on the Arabian Gulf Oil Spill.
- Air, land and sea surveillance operations .
- Operation and maintenance of oil spill equipment .
- Beach assessment with international organizations (IUCN , IMO).
- Oil Spill Response Team member, and monitoring of environmental pollution in the Eastern Province of Saudi Arabia.
- Involved in the sampling and preservation of solid, sludge and liquid samples for complete range of analyses.

Education / Training

1987	Al-Thgba High School Al-Khobar Graduated, High School Degree.
1987-1989	King Fahad University of Petroleum and Minerals. 13 months, Mechanical Engineering.
1989-1990	Leeds Polytechnic U.K. Diploma in Environmental Monitoring.
16-20 April 1994	MEPA / NOAA Jeddah Workshop on marine pollution prevention, control and response.
14-18 January 1995	Environment Protection Council Kwait Course on response to marine oil spills accidents for supervisors/On-scene commander.
12/11/1995 to 06/12/1995	Ports Authority Dammam Course in Anti Marine Oil Pollution.

K.S. RASHEED 1/2

13-17 January 1996 IMO / GACMAO Bhahrain
Course on response for Oil Spills for supervision/ On-scene commander.

Special Skills

- Computer data logging.
- Very good knowledge of networking and PC's repairs.
- Co-author of a paper on the effects of the 1990-1991 Gulf War on Saudi Arabian prawn stocks.

Honors

- 4 appreciation letters from MEPA in the completion of some environmental projects.
- An appreciation letter from SAUDI ARAMCO for good cooperation in the Medical waste cleanup project.

Personal data

Born in Dammam, Saudi Arabia, April 22nd 1970
Married with two children (4 & 1).
Health – Excellent.

Name : Yousef H. AL-Helal

Birth : 13-11-1966

Nationality : SAUDI

Marital Status : Married

Address : P.O Box 117 DHAHRAN INT Air Port ,
Dhahran, 31932 , Saudi Arabia

Position : member of Air quality team 1990

Qualifications :
High school degree
One year study at Leeds polytechnic and received Diploma in instrumentation
Completed three months certificate of a course of instruction in the operation and maintenance 9800 series Ambient Analyzers from United States
Completed three months in the data entry &word processing at ASSEFR institute in SAUDI ARBIA

Name : Al-Zawad , Hashim H.
Birthday : 01-01-1967
Nationality : SAUDI
Marital Status : Married

Address : P.O Box 117 DHAHRAN INT Air Port ,
Dhahran, 31932 , Saudi Arabia

Position : Member of Oil Spill Response Team, Environmental Protection Section in Eastern Province.

Qualifications :

- High school – Qatif Secondary School
- 2 Years study of Medical science at King Saud University.
- A 12-week English course , Leeds Polytechnic – England
- Diploma in Environmental Monitoring (Noise Pollution Management) at Leeds Polytechnic – England.
- 4 weeks Computer training course at Institute of Public Administration – Dammam.
- 3-days Workshop on Oil Spill Trajectory Modeling by NOAA & MEMAC – Bahrain.

1/2

HASHIM AL SAWAD

EXPERIENCE :

- PARTICIPATED WITH CIVIL DEFENSE IN COMBATING TOXIC GASES DURING THE GULF WAR
- PARTICIPATION IN AIR QUALITY MEASURMENTS AT KHAFJI AS EFFECTED BY THE GULF OIL SPILL .
- CARRIED OUT ADMINISTRATION ISSUES FOR OIL SPILL RESPONSE TEAM DURING GULF OIL SPILL.
- PARTICIPATION OF SOME OF THE COASTAL SURVEILLANCE ALONG EASTERN PROVINCE COASTS.
- PARTICIPATION IN INTIATING OIL SPILL REPORTS.
- PARTICIPATION IN COASTAL SURVEILLANCE OF OIL SPILL RECOVERY CENTRE AT JUBAIL.
- FULL OPERATION OF COMPUTER USING WORD PROCCESSING (WORD PERFECT, ARAB WORD).
- CARRY OUT MEPA ADMINISTRATION ISSUES.

2/2

Khalid Hussain Busbait

P.O.Box - 117, Dhahran Airport
Dhahran - 31932, Saudi Arabia
Tel: (03) 8576260 / 8575732
Fax: (03) 8576752 / 8575304

Nationality	:	Saudi	Date of birth	:	August 12, 1967
Marital Status	:	Single			

Qualification:

- Wroking as an Environmental observer at Meteorology and Environmental Protection Administration (MEPA), since 1990.
- One year English course at King Fahd University of Petroleum and Minerals, Saudi Arabia, and two years in college of Engineering (Applied Mechanical Engineering), 1985 - 1988.
- English course at Leeds Polytechnic, England, 1989.
- Diploma in Environmental Monitoring from Leeds Polytechnic, 1990.
- Diploma in Oil Spill Response from Research Planning, Inc. USA, 1994.
- Certificate in Manufacturer's Operation and Maintenance Course.
- Training in GT 185 Oil Recovery System.
- Hazardous waste management course at KFUPM, 1998.

Experiences:

- Participated with MEPA in environmental studies in Dammam, KSA.
- Participated in the Gulf War Oil Spill recovery and pollution control.
- Participated with air, land and sea oil spill surveillance operations.
- Assisted in issuing oil spill reports.

Khaled. Bustat

- Participated with oil spill planning committee.
- Attendance in Scientific meeting regarding the oil spill held at research institute (RI), KFUPM, Dhahran.
- Supervised the protection made for facilities along Saudi shore (power plant, desalination) during Gulf Oil Spill.
- Participated with the Japanese delegation on mangrove clean-up in Gurmah Island.
- Supervised oil spill warehouse during Gulf oil spill.
- Participated in the scientific experiment for salt marshes clean-up.
- Issuing final reports for Saudi shore facilities.
- Participated with NCWCD in the turtle study in Kuran Island.
- Participated with the international organizations in the environmental assessments.
- Participated in the IMO's 62nd session in London (May 23-28, 1993).
- Participated with the oil spill beach clean-up after the Gulf War.
- Participated in the facilities for protection of tarballs.

RESUME

Name : Bo-Hulaiqah , Qusay M.
Birthday : 6-11-1964
Nationality : Saudi
Marital Status : Married
Address : P.O Box 117 DHAHRAN INT Air Port , Dhahran, 31932 , Saudi Arabia
Psition : Member of Oil Spill Response , Environmental Protection Section , Eastern Province

QUALIFICATIONS :

High school - King Khaled Secondary school , Hofuf

104 credit hours (Systems Engineering) King Fahd University of Petroleum & Minerals (KFUPM) , Dhahran

A 12-week English course , Leeds Polytechnic – England

Diploma in Environmental Monitoring (Waste Disposal Management) – England

A 120-hour (Levels 1,2 & 3) French courses
The French Saudi Center , Dammam

A 5-day Workshop on Marine Pollution Prevention, Control & Response organised by NOAA & MEPA at Jeddah

A 2-week training curse in Anti Oil Pollution by The saudi Ports Authority

A 2-day workshop on Utilization & Conservation of Water & Soil for Desert Greening by The Joint Saudi – Japanese (RI , KFUPM & PEC)

EXPERIENCE

A Certificate of Appreciation for contribution & efforts during Desert Shield & Desert Storm from King Abdulaziz Air Base

A Certificate of Appreciation for contribution & efforts during Arabian Gulf Oil Spill Clean Up from MEPA & BECHTEL

A local membership in Saudi Section of Air & Waste management Association (SAS – A & WMA)

Curriculum Vitae

MOHAMMED ALI M. AL GHAMDI

ADDRESS

P.O. BOX # 30220
AL KHOBAR 31952
SAUDI ARABIA
TEL. # 03 - 8576260
FAX # 03 - 8576752

DATE OF BIRTH : 06 JUNE 1966

EDUCATIONAL BACKGROUND

SECONDARY : AL KHOBAR SECONDARY SCHOOL, SAUDI ARABIA SCIENTIFIC SECTION IN 1985.

CERTIFICATE IN METEOROLOGICAL OBSERVER : THE UNIVERSITY OF WYOMING, WYO, USA. IN JUNE 20, 1989 TO DEC, 20, 1990.

UNDERGRADUATE COURSE IN ELECTRONICS : TECHNICAL TRAINING INSTITUTE, INTERNATIONAL AIRPORT, DHAHRAN, SAUDI ARABIA. FROM 1987 TO 1988.

CERTIFICATE IN ENGLISH :
INTERNATIONAL LANGUAGE CENTERS, SUSSEX, LONDON FROM MAY 05, 1987 TO JUNE 05, 1987.

TRAININGS

AL- KHALEEJ TRAINING & ELECTRONICS INDUSTRIES, AL KHOBAR, SAUDI ARABIA

* BEGINNING FOXPRO 2.5 FOR WINDOWS - APRIL 02, 1996
* BEGINNING DBASE V FOR WINDOWS - MARCH 27, 1996
* INTERMEDIATE MS EXCEL 95 - MARCH 17, 1996
* BEGINNING MS EXCEL 95 - MARCH 12, 1996
* BEGINNING MS EXCEL 5.0 FOR WINDOWS - MARCH 12, 1996
* BEGINNING / INTERMEDIATE MS DOS 6.2 - MARCH 04, 1996
* INTERMEDIATE MS WORD6.0 FOR WINDOWS- JAN. 29, 1996
* BEGINNING MS WORD 6.0 FOR WINDOWS - JAN. 27, 1996
* BEGGING MICROSOFT WINDOWS 3.1 - JAN. 21, 1996

* COMPUTER MADE EASY - JAN. 15, 1996

AMERICAN EXPRESS, BAHRAIN

* GOLD & PERSONAL CARD TRAINING PROGRAM - FEB. 11, 1993

SAUDI BRITISH BANK, TRAINING CENTRE, DAMMAM, SAUDI ARABIA

* UNIT LETTER COURSE - MAR. 19 to 22, 1998

* BASIC BANKING COURSE - MAR. 05 to 10, 1988

CITY OF GUILDS OF LONDON INSTITUTE, LONDON

* TELECOMMUNICATIONS TECHNICIANS - PART 1 - DEC. 18, 1986

US EPA - SAUDI ARABIA ARSAD PROJECT

* PRINCIPLES OF ENVIRONMENTAL ENFORCEMENT AND COMPLIANCE

EMPLOYMENT RECORD

* MINISTRY OF DEFENSE & AVIATION - METEOROLOGY & ENVIRONMENTAL PROTECTION ADMINISTRATION (MEPA)

NATURE OF POSITION - METEOROLOGICAL OBSERVER, FROM 08 NOV. 1997 TO 01 OCT. 1999. AND FROM OCT. 02, 1999 TO UNTIL PRESENT AS ENVIRONMENTAL OBSERVER

*	COMPANY	: AL-FALAK ELECTRONICS COMPUTERS AND SUPPLIES CO.
	NATURE OF BUSINESS	: COMPUTER SUPPLIES AND ACCESSORIES
	ADDRESS	: AL-KOHBAR, KSA
	INCLUSIVE DATES	: FEB. 01, 1996 to NOV. 1997
	POSITION	: ACCOUNTS RECEIVABLE CONTROLLER
	INCLUSIVE DATES	: NOVEMBER 1995 TO JANUARY 31, 1996
	POSITION	: ACCOUNTING
*	COMPANY	: AHMED HAMAD AL GOSAIBI & BROS.
	NATURE OF BUSINESS	: MONEY EXCHANGE
	ADDRESS	: AL-KHOBAR, SAUDI ARABIA
	INCLUSIVE DATES	: 1992 TO 1993
	POSITION	: MARKETING REPRESENTATIVE
*	COMPANY	: SAUDI BRITISH BANK
	NATURE OF BUSINESS	: BANK
	ADDRESS	: TRAINING CENTRE, HEAD OFFICE IN DAMMAM, SAUDI ARABIA.
	INCLUSIVE DATES	: MRCH 05, 1988 TO SEPTEMBER 05,1988
	POSITION	: GOLD & PERSONAL CARD REPRSNTATVE

PERSONAL DATA

MARITAL STATUS	:	MARRIED
NATIONALITY	:	SAUDI
LANGUAGE	:	ARABIC, ENGLISH.
HOBBIES	:	TRAVELLING, READING, SWIMMING AND CAMPING.

Curriculum Vitae

ADEL M. KUSTI

ADDRESS

P.O. BOX # 1358 (MEPA Eastern Province)
21431 (MEPA Headquarters)
Tel : # 02-6512-321, ex 2625, 2616 (MEPA Headquarters)
055-542-156 (Mobile)
Date of Birth : 1958 (Makkah)

EDUCATION

Graduated from King Abdoul Aziz University of Jeddah in 1982 with B.sc. in Biology and M.sc. in Ecology (range land management) from Bangor University of U.K.,1990.

EXPERIENCE

1- From 1982 until now working in EPGD (Environmental Protection General Department), MEPA
2- 1983 working for Nerows Oil Spill clean-up
3- Charge in Vol 6, 7, 8, 9, 10 and 11 in fauna of Saudi Arabia
4- From 1993-1996 working of research programs into wild life
5- From 1996-1999 working in the ESON Programe (Environmental Support of the Nomads) with expert from Arizona University, USA

ALAM NIZAMI

MEPA, P.O. BOX - 117
Dhahran Airport, Dhahran - 31932, Saudi Arabia
Tel: (03) 857-5732/6260 (Off), (03) 8653665 (Res.)
Fax: (03) 857-6752

PERSONAL DATA

Address in India

Ekhlaque Manzil
Surat ganj, Madhubani - 847211
Bihar, India
Tel: 91 6276 22377

Date of birth	:	December 21, 1964
Nationality	:	Indian
Marital status	:	Married
Religion	:	Islam

PROFESSIONAL EXPERIENCE:

April 1994 to-date: **Meteorology & Environmental Protection Administration (MEPA), Dammam, Saudi Arabia.**

Working as a Chemist in MEPA project of Dyna Arabia Co. Ltd., since April 1997.

Worked as a Chemist in MEPA project of Saudi Amoudi Group Co. from April 1994 to April 1997.

Responsibilities include the following:

Management of the MEPA Environmental Laboratory equipped with State-of-Art instrumentation such as Gas Chromatograph, Atomic Absorption Spectrophotometer, Total Organic Carbon Analyzer, UV-VIS spectrophotometer, Oil Content Analyzer & various others to operate the laboratory according to MEPA Environmental Protection Standard for the analysis of industrial effluent/wastewater, ground water, municipal wastewater and etc.

Treatment and disposal evaluation of the various types of waste generated from industries and making waste disposal decisions for implementation.

Participated in the sampling program of seawater, sediment and clams with the representatives of UN laboratory at Monaco to carry out the ROPME Contamination Screening Project.

Evaluation and recommendation of analytical results of industrial effluent/waste on the basis of MEPA Environmental Protection Standard submitted to MEPA by various companies located in eastern region of Saudi Arabia.

Extensively involve in the project *"The Study on an Environmental Assessment and Monitoring of Arabian Gulf in the Kingdom of Saudi Arabia"* with Japan International Co-operation Agency (JICA).

Provided training to employees on wet chemistry analysis and the analytical instruments.

Nov. 23, 1996 - Dec. 06, 1996: Royal Commission, Yanbu, Saudi Arabia

Worked as a **Chief Chemist** in Royal Commission (RC) laboratory at Yanbu. In this period submitted a proposal to RC Quality Control Manager on the management of laboratory, implementation of QA/QC procedures, a complete range of analytical procedure for the analysis of industrial wastewater, ballast water, drinking water etc., and the distribution of work load according to the qualification of technicians.

Jan. 1990 - July 1993: KFUPM Dhahran, Saudi Arabia.

Worked as a Research Assistant in Chemistry department at KFUPM, Dhahran. Responsibilities include: graded course assignment, taught freshmen chemistry 101 & 102 labs., proctoring exams., assisted professors in research activities and participated in seminars and other meetings scheduled by department.

April 1991 to May 1992: Research Institute, KFUPM, Dhahran, KSA.

Samples of sediment, soil, fish, oyster and seawater were prepared as well as analyzed for metal analysis. Analysis were performed through the extensive use of Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Argon Plasma (ICAP), on part time basis, in Water Resources and Environmental Division, Research Institute, KFUPM, Dhahran.

Worked on the following King Abdulaziz City for Science and Technology (KACST) Projects at KFUPM, Dhahran, KSA.

"Investigation of the size of industrial waste in the industrial city of Jubail" at Research Institute, KFUPM, Dhahran.

"Studies on used lubricating oil recovery and re-refining" in oil testing center, chemistry department KFUPM, Dhahran

"Stability characteristics of liquid fuels" in oil testing center, chemistry department.

Dec. 1988 - Dec 1989: Aligarh Muslim University (AMU), Aligarh, India

Worked as a Research Scholar in chemistry department at AMU, Aligarh. During research program, involved in the extraction and synthesis of naturally occurring alkaloids as well as flavonoids from plants by using column chromatography. The crystalline extracts were identified by chromatographic and spectroscopic methods.

ACADEMIC QUALIFICATIONS:

King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, KSA.

Master of Science (MS) in chemistry, GPA = 3.50/4.00, July 1993.

Thesis Title: "Chemical Aspects of Thermal Instability in Jet Fuel from Saudi Arabian Crude Oils".

MS Thesis works include the following:

PONA (Paraffin, Olefin, Naphthene and aromatic) determination by Gas Chromatograph (GC) in aviation turbine fuels (Jet fuel).

Carbon, Hydrogen, Nitrogen and Oxygen analysis by elemental analyzer in jet fuel.

ASTM and IP methods were applied for the examination of sulphur, mercaptan sulphur, peroxide number, gum existent, copper strip test, silver corrosion test, flash point, smoke point and various other test in Jet fuel.

Investigation of the composition, structure and mechanism of gum/sediment formation in jet fuel during long term storage, by using elemental analyzer, Fourier Transform Infra Red (FTIR) and mass spectrometry (MS).

Application of nuclear magnetic resonance (NMR) spectroscopy to chemical characterization of jet fuels and various fuel blends containing varying amounts of paraffinic and aromatic constituent with the help of computer programming.

Aligarh Muslim University (AMU), Aligarh, India.

M.Sc. in Chemistry with first class, 73.2 % marks, August 1988.

B.Sc. (Chemistry, Botany & Zoology) with first class, June 1986.

Intermediate (physics, chemistry, biology, mathematics and English) with first class from L.N. Mithla University, Darbhanga, Bihar, India, 1982.

High School with first class from Bihar Education Board, Patna, Bihar, India, 1980.

Supervised students in Senior project CHEM. - 411 at KFUPM, Dhahran.

Fuel degradation study by doping of standard fuels with nitrogen and oxygen containing compound.

Nitrogen compounds in petroleum fraction.

PUBLICATIONS:

M.F. Ali, A. J. Hamdan and A. Nizami, "Chemical Aspects of Thermal Instability in Jet Fuel From Saudi Arabian Crude Oils", Preprints, Am. Chem. Soc., Div. Pet. Chem., 76-94, 1994.

M.F. Ali, A. Nizami and A J. Hamdan, "The role of heteroatoms on the instability of jet fuels", Fuel Science and Technology Int.'L. 13 (5), 655 - 679, 1995.

COMPUTER SKILL:

Worked on FORTSYS & WSCRIPT software available on IBM compatible AMDAHL 5850 mainframe at KFUPM, Dhahran.

Used extensively the Microsoft word, Microsoft Excel, Microsoft Access, Word Perfect, Lotus 123 and many other PC packages.

Well experienced in use of Microsoft packages on Macintosh Computer.

PROFESSIONAL AFFILIATION:

Member, American Chemical Society (ACS)

HONORS AND AWARDS:

Research Assistantship	:	Ministry of Higher Education, Saudi Arabia.
Merit Scholarship in M.Sc.	:	University Grants Commission, 1986 - 1988, India.
Stood 3rd in order of merit	:	M.Sc. examination, Dept. of chemistry, AMU, Aligarh, India.

Jamal Kazim

Objective JICA REQUERED

Experience

1995–2000 Working

Oil Spill Response center / MEPA , Jeddah

- Response for Oil Spill Incident.
- Combating Oil Spill .
- Writing Report .

1986–1995 Working

Lab Analyst at K . F . U . P . M , Dhahran

- Sampling Fish and Plankton from Arabian Gulf .
- Sorting for Fish larvae and Fish egg .
- Writing Report .

Education

1981–1985 k.A.A. University, Jeddah

- B.Sc. in Marine Science Collage.

Interests For computers, running, swimming, collecting shells .

Curriculum Vitae

AHMED IBRAHIM AL DALOUJ

Mailing Address

Post Box # 239
Al Khobar - 31952
Saudi Arabia
Tel. # 03-8900720

Date of Birth : 22 January 1958

Present Occupation : Meteorological Instruments Technician

Present Employee : Meteorology And Environmental Protection Administration

Date of Commencing : 10 September 1981

EDUCATIONS :

* High School in 1976
* High Diploma in Electronics - 10 August 1981
* Eight weeks Course in Introduction to Computers an Basic Language - 1983
* Eight weeks Course in Introduction to Cover Language
* Five weeks Course in Cobol Language - 1990
* Three weeks Course in Met. Communication System - 21 June 1990
* Two Months Course in Met. Computer System - 20 October 1993
* Two weeks Course in Enhance Training Capability - 1994

Scope of Work :

Nineteen Years working with Meteorological Instruments and Systems such as :

1. Wind Speed and Direction Transmitters
2. Wind Speed and Direction Indicators
3. Anemograph

4. Thermohydrograph
5. Barograph
6. Psychrometer
7. Rain Gauge
8. Rain Recorder
9. Ceilometer
10. Sun Shine Recorder
11. Sun Radiation Recorder
12. Manned Data Collection System
13. Automatic Weather Stations
14. Seimens - 100 Teleprinters
15. Trends -800 Teleprinters
16. Receive only Teleprinters
17. Time Plexer (Communication)
18. Commaster
19. Pesely Weather Radar 43S
20. RVR System Impulsphysik (Runway Visual Reading
21. IBM PC and Compatibiles Hardware and Software
22. Upper Air Cora Systems
23. Upper Air Micro Cora Systems
24. Upper Air Digi Cora Systems
25. ASOS (Automatic Surface Observation Systems)
26. IMS (Integrated Meteorological Systems)

Appendix B

Documents on Field Work

Health & Safety Plan
Chain-of-Custody Sheet
Field Record Sheet
Field Team Tutorials

HEALTH AND SAFETY PLAN FOR VESSEL AND SHORELINE WORK

Field Team:	**MEPA**	**JICA**
	Khaled Al Rasheed	Robert Hilliard
	Khalid Busbait	Ike Tomohiko
	Adel Qutsi	Sakaguchi Kozo

Equipment:

Mobile Phone (K. Busbait)
VHF radio (vessel)
First Aid Kit
Two torches
Water-resistant sun screen lotion (+15)
Cooler box with ice, bottle water and cool drinks (1-2 L /person/day)
Lunch boxes

Protective Clothing:

Hat with brim
Sunglasses (polaroids with 100% UV protection are preferable)
Loose long sleeve shirt
Shorts and trousers
Boat shoes
Note: cotton clothes are much better than nylon or other artificial fibres

Vessel Work Safety Meeting:

A "Vessel Work Safety Meeting" will be held prior to departure, including:

- Familiarise main features of vessel.
- Confirm location and type of Vessel Emergency Equipment for crew and workers (location/use of life jackets, fire extinguishers, radio, flares, etc).
- Confirm emergency communication & transport for serious injury or illness.
- Confirm Vessel Emergency Plan for 'Man Overboard', Fire and Collision/Sinking.
- Team to explain to vessel crew the project work procedures and requirements.
- Anchoring and Engine/propeller 'switch off' routine if workers go in water.
- Confirm preferred Entry and Exit points on vessel
- Confirm no fishing by crew when workers are in the water.

Assessment of Potential Injuries and Precautionary Actions:

Injury/Accident	Risk	Precautionary Action
Sun burn	High	Maximise shade use; use sunscreen cream regularly.
Heat exhaustion	High	Drink water regularly; take more salt than usual amount at mealtimes.
Heat stroke	Medium	Work slowly; do not ignore early symptoms (dazzling light, dizziness, headache, hot dry itchy skin)
Sea sickness	Medium	Take 1-2 motion tablets at least 1 hour before start. Avoid engine exhaust and small internal spaces; Move to rear (less motion); lie down; sip water and eat some plain food (biscuits, bread, apple) between bouts of sickness.
Slips and falls/	High	Move carefully; wear boat shoes.
Cuts and abrasions.	High	Use First Aid Kit promptly to clean skin cuts.

Potential Injuries and Precautionary Actions:
(continued from Page 1)

Injury/Accident	Risk	Precautionary Action
Rough weather	Medium	Stop work and wear life jacket if sea gets very rough.
Man overboard	Low	Maintain continuous visual contact with person in water. Shout 'Man Overboard' and point clearly with arm.
Boat fire or sinking	Low	Follow Vessel Emergency Drill and commands of skipper.

Brief Snorkelling Inspection of Shallow Seafloor (< 3m):

Minimum dress: T-shirt, shorts, socks, mask, snorkel, fins for rapid inspections (<10 minutes). For longer or frequent inspections, use long trousers or overalls to prevent sunburn.

Preferred dress: Bootees, diving knife, gloves, and lycra diving suit.

Winter dress: Neoprene wet suit, hood and gloves, with 2-4 kg wet belt.

Procedure:

* Confirm anchor is holding the boat.
* Engine switched off (skipper to remove ignition key, if present).
* Check site safety (vessel traffic, current, wave, visibility, water temp, etc)
* Deploy the international Diving Flag (Code "A"; white/blue).
* If there is a strong water current, also deploy a 10 m safety line and float from the stern of boat.
* Emergency visual, audible and/or rope signals to be confirmed before snorkeller/s enter the water (eg. 'Recall to boat' and 'Help Me' signals).
* At least two persons, including skipper or deputy skipper, to remain on boat. Always one observer on deck with no other job to distract.
* The observer must be ready to enter the water for rescue (ie. wearing suitable clothes for immediate water entry, with his mask and fins placed in a convenient position for immediate use).
* No fishing from boat before or during snorkelling operation.
* Snorkellers must use the 'buddy' system - always remain in visual contact with each other and the boat.
* Snorkeller/s to be tethered by a rope line if there is a low water clarity (>1 m) or a strong current.
* Snorkellers not to touch corals or fish.
* Remain alert for jelly fish.

SCUBA DIVING IS NOT PERMITTED FOR MEPA/JICA PROJECT

Use of Vehicles for Shoreline Sites:

Only MEPA approved vehicles and Saudi national drivers will be used by field team members.

Emergency Plan for Serious Injury:

Offshore: Field team leader/deputy leader will coordinate with skipper for contacting nearest local hospital and MEPA (Dammam Office) for arranging appropriate transport.

Onshore: Field team leader/deputy leader will contact nearest local hospital and MEPA (Dammam Office), for arranging appropriate transport.

MEPA (Dammam) Office to immediately locate and inform JICA project team leader (or deputy leader if absent from Dammam).

CONFIRMATION OF H&S PLAN:

We have the read the above and agree to the requirements of the Health & Safety Plan:

NAME:	SIGNATURE:	DATE:
 KHALED S. AL RASHEED (Field Team Leader)		10/6/2000
Bushart (Deputy Field Team Leader)		10.6.00
ROB HILLIARD		10-6-00
Adel M. Kusti		10-6-00
Kozo Sakaguchi		10/6/00
Tomohiko Ike	T. Ike	10/6/00

Chain-of-Custody Sheet (Sediment/Soil and Biota Samples)

No. Page : of

Date Sampled: 24-25/6/2000

Sampler: M-RASHEED, Bushail, Kusti

Remarks:

No.	Sample ID	Time Sampled	Type of Sample	Bottle Type	Volume (mL)	Q'ty	Particle Size	Ignition Loss	COD/TOC	Hg (Mercury)	As (Asenic)	Cr (Chromium)	V (Vanadium)	Other Metals (Cd,Co,Cu,Ni,Pb,Zn)	BTEX	TPH	PCBs	Plankton, Biota	Notes
	J1	12:00	SD	W	350	1	✓	✓	✓	✓	✓	✓	✓						
	J1	12:00	SD	W	125	1	✓												
	J1	12:00	SD	G	350	1								✓	✓				
	J1	12:00	B	W	125	1											✓		
	J2	14:30	SD	W	350	1					✓	✓	✓						
	J2	14:30	SD	W	125	1	✓												
	J2	14:30	SD	G	350	2									✓				1 for Beeah
	J4	15:20	B	W	125	1											✓		
	J80	8:00	SD	W	350	1					✓		✓						
	J80	8:00	SD	W	125	1	✓												
	J80	8:00	SD	G	350	2								✓	✓				1 for Beeah
	DD20	17:30	SD	G	350	1									✓				
	DD20	17:30	SD	W	350	1				✓	✓	✓	✓						
	DD20	17:30	SD	W	125	1	✓												

Supplied to Laboratory by : (Name) M-RASHEED

(Signature)

(Date/Time) 26/6/2000 / 10:30

Received at Laboratory by (Name) Alam Nizami

(Signature)

(Date/Time) 26/6/2000 11:10

FIELD RECORD SHEET

MEPA/JICA PROJECT

Samplers name : Adi M Kusti

Site No.: H 2 **Location:**

GPS, DOP:	Latitude (N) : 26° 04.05	Longitude (E) : 50° 04' 95
Date 16/6/2000	Time 9.40	

Weather Condition

Weather	Fine	Temperature (°C)	37.5	Cloudiness	0
Wind Direction	N/o	Wind Speed (m/s)	Calm	Wave height	< 0.1 m

Water Condition

Tide	middle-Low	Depth (m)	5.7
Current Direction	60	Current Speed (m/s)	

70 :9

Water Quality Surface

Temperature (°C)	30.7	Water Color	green
Salinity	59.09	Odor	N/o
pH	7.86	Sheen	N/o
DO (mg/l) 99-31.	3.08	Rubbish	
Turbidity (NTU)	6.6	Res. Cl (as Total)	0.15
Water Clarity (m)	5-7	Free	3.13

Bottom

30.16
60.65
7.91
64.51. 3.36
0.0

Sediment Quality

Sediment Color	—	Temperature (oC)	
Odor	—	ORP (mv)	
Texture	—		

Observations and Comments

FIELD TEAM TUTORIAL

Date: 2. July, 00
Title: Planning Sampling

(Planning with Navigation Charts and Satellite Position Fixing)

1) Sampling Site Selection

<Key Issues>

- Sensitivity/Detectability for Target contaminants
- Environmental conditions/Geographical features
- Accessibility/Convenience
- Unchangeability etc.

---→Navigation Charts, Aerial photography/Satellite Image, Site inspection

2) Sampling time, frequency and period

<Key Issues>

- Fluctuation of the Target contaminants
- Tides etc.

3) Number of Samples

<Key Issuess>

- Reliability
- Statistical analysis

4) Sample handling methods.

<Key Factors>

- Sample number check
- Storage
- Transport
- Delivery

Factors for selecting analysis method

1) Matrix of sample
2) Analysis parameter
3) Concentration of analyte, required detection limit
4) Number of sample
5) Equipment, apparatus
6) availability of chemicals
7) Budget/fund
8) experience of the method, skillful

ex. NH_3 in water sample

Method	equip	MDL (mg/l)	turnaround	cost
Titration	burette	5	medium	low
Phenate colorimetry	spectrometer	0.1	long	medium
Selective electrode	electrode	0.03	short	low
Flow injection analysis	FIA apparatus	0.002	short	high

Note: Reporting Detection Limit is not Method Detection Limit (MDL)

Factors for selecting outside laboratory

1) Reliability
2) Specialty
3) Cost
4) Location
5) Client focus, satisfactory response

Information needed to discuss with outside lab

1) Analysis parameter with matrix, sampling location
2) Number of sample/amount
3) Container with preservative
4) Minimum level for reporting
5) Analysis method
6) Time limit for reporting
7) Analysis request sheet (chain of custody sheet)

1) Matrix of sample:

wastewater, seawater, sediment, waste, air

2) Parameter, Analyte:

Physical: TSS, Salinity, Conductivity

Inorganic: N, P, Cyanide

Metals

Organic

Microbiological

3) Concentration of analyte:

minimum level for reporting comes from some standard or target value for research programs

4) Number of sample

5) Equipment, apparatus:

GC, AAS, SP

6)availability of chemicals

7) Budget: should be related sample amount

8) experience of the method, skillful

Ammonia analysis: distillation is needed to separate from interference; some metals

titration[1]: simple procedure but need skillful to find out the end point on titration, slow start sharp change

NH3 is collected into boric acid and then is titrated with HCl

colorimetry[2]: certain and easy to detect, need several chemicals and SP

indophenol-blue

electrode[3]: more easy than others, need sufficient care for the electrode; delicate

FIA equipment: principal is same as colorimetry, automatically, most sensitive

Turnaround: the time needed for analysis operation

Cost: initial and running, chemicals and labor cost

---

[1] A process by which a substance to be measured is combined with a reagent and quantitatively measurement. Ordinarily, this is accomplished by the controlled addition of a reagent of known concentration to a solution of the substance until reaction between the two is judged to be complete; the volume of reagent is then measured.

[2] The solutions of many compounds have characteristic colors. The intensity of such a color is proportional to the concentration of the compound. The spectrophotometer measures the intensity of visible light after passing through a sample.

[3] Use the gas-sensitive electrode, a type of ion-selective electrode, to measure the NH3 gas.

Detection limit for reporting

Precision of measurement; signal/noise ratio

Contamination on the method, blank measurement

Sensitivity of the equipment

Size/amount of the sample

Selecting for outside lab

1) Reliability: meet with lab manager, refer to their service specification, responsibility of work

2) Specialty: each lab has their strong/weak point

3) Cost: cost performance, cooperative to negotiate

4) Location: close to the sampling site or our office

5) Client focus, satisfactory response: do as what we want to do

Information needed to discuss with outside lab

1) Analyte with matrix, sampling location

2) Number of sample/amount

3) Container with preservative → sample management

Volume: suitable amount for each analysis method

Container: adequate container for each compound

Preservation:

to prevent the compound from changing caused by chemical, biological affection

changes caused by growth of microorganisms are greatly retarded by keeping the sample at low temperature (4°C ± 2°C) and dark

for Cyanide, to avoid forming HCN gas from the sample, alkalize the sample to a pH above 12

metal ions are subject to loss by adsorption or ion exchange with glass wall

to minimize precipitation and adsorption, acidified with nitric acid to a pH below 2

to fill the container, except for VOCs and DO, leave an air space approximately 1% of container volume to allow for thermal expansion during shipment

Holding time means maximum storage time recommended

4) Minimum level for reporting

5) Analysis method

6) Time limit for reporting

7) Analysis request sheet (chain of custody sheet)

Appendix C

Documents on Laboratory Work

Laboratory Management Plan
Health & Safety Plan
Inventory Sheet
List of Chemicals
List of Glassware/Apparatus
Instrument Operation Manuals
List of Analysis Methods
Sample Management Plan
COC Sheet
Reporting Forms
Waste Treatment/Disposal Plan
Daily Report of Laboratory Work
Data Sheets (example)

Laboratory Management Plan
(Fundamental Plan)

To establish a reliable laboratory for environmental monitoring of Arabian Gulf, it is recommended to implement the following measures.

(1) Organization

To carry out the sample analysis for continuous monitoring program, following staffs should be arranged by MEPA (these numbers depend on the monitoring plan). Specification and documentation of authority, responsibility and interrelation of all laboratory personnel are very important to assure the quality of chemical analysis. Existing laboratory staff shall be trainers for new laboratory person therefore they should be kept hired for more several years.

Sections	Number of personnel		Roles
	Experts	Assistants	
Laboratory Manager	1		Overall Management of the Laboratory, Analysis Planning, Data Management and Quality Control of Analytical Works
Wet Chemistry	1	(1)	TSS, NH3, TKN, T-P, CN, Phenol
Trace Metals	1	(1)	Metals
Organic Analysis	1	(1)	TOC, Oil & Grease, BTEX
Biochemical	1	(1)	Coliform, Chlorophyll

It is recommended to assign a pair of person for equipment maintenance.

(2) Education and Training System

To learn and maintain the up-to-date technologies for chemical analysis, laboratory management, and 'health & safety', MEPA should provide opportunities to attend the education and training programs to be held by proper organization (e.g. ROPME, RCJY, SWCC and JICA) to lab personnel. Lab manager should prepare the schedule of education and training of lab staff. Close relationships with other reliable laboratories and university are also important.

(3) Restrictions

An access of unauthorized persons to laboratory should be prohibited more strictly. The use of measurement instruments by not trained persons should also be prohibited. (refer to Laboratory Health & Safety Plan)

(4) Cleaning of Laboratory

Good system to keep the laboratory clean should be made to prevent or minimize the contamination. The use of detergent and cleaner that contain chemicals with adverse affects on the results of chemical analysis should be prevented. (refer to Laboratory Health & Safety Plan)

(5) Register of Equipment

The laboratory should provide the list of measurement instruments to perform the laboratory works correctively. The following information should be recorded in the list. (refer to Inventory Sheet)

(a) Name and ID number
(b) Date of purchase/installation
(c) Name of manufacturer
(d) Name of vendor
(e) Results of calibration
(f) Detail maintenance record
(g) History of any damage, malfunction, modification or repair

(6) Maintenance of Equipment

All equipment shall be properly maintained. Periodical maintenance shall be executed based on the maintenance manual supplied by manufacture. In case that instrument is broken or suspect result is obtained, the reason of the trouble (e.g. overloading or miss-operation) shall be clearly identified. At present, the following equipment needs periodical maintenance. (refer to Inventory Sheet)

Gas Chromatograph	Shimadzu GC 17A
Atomic Absorption Spectrometer	Varian spectra 220
TOC analyzer	Shimadzu TOC5000A
Spectrophotometer	Shimadzu UV1240
pH meter	Metrohm 744
Oil Contents meter	Horiba OCMA300
Autoclave	ALP Japan KI30S
Centrifuge	LIG
Water Purification	Milli-Q "Academic"
Balance	Sartorius

(7) Inventory system of chemicals and glassware/apparatus

Lists of chemicals, gases and other consumable goods should be provided. Since it takes long time to purchase some of them in Saudi Arabia, it is important to have an appropriate volume of inventory. Remaining volumes of them must be checked periodically, and required goods should be purchased prior to run out. The proper inventory control of glassware/apparatus is also essential to maintain continuous analysis work. (refer to List of Chemicals and Glassware/apparatus)

(8) Instrument operation manual

It is recommended to provide the instruction sheet on the use and operation of all instruments based on the operation manual of manufacture to perform the analysis works correctively. According to the operation manual or instruction sheet, every instrument must be calibrated periodically. (refer to Operational Manuals)

(9) Analysis Methods and Procedures

The laboratory should provide standard procedure for each analysis, and analysis must be made based on the standard procedure. The procedure of report making should be included in this standard procedure. The standard procedure should be prepared based on the authorized procedures including the following manuals.

"Methods for Chemical Analysis in Waters and Waste", US.EPA-600/4-79-020
"Standards Methods for the Analysis of Water and Wastewater", 20th edition
"Manual of Oceanographic Observations and Pollutant Analyses Methods" (MOOPAM), 3rd edition, ROPME

All standards, manuals and reference data relevant to the laboratory works shall be maintained up-to-date and readily available to the staff. (refer to List of Analysis Methods)

(10) Sample management

The laboratory shall establish appropriate manuals for sample management including sample handling, storage and identification system.

Proper sample containers, sample volumes, preservatives, and holding times are essential to provide reliable data. The laboratory shall provide the sample management plans by referring the manuals mentioned in above (9). (refer to Sample Management Plan)

(11) Sample custody

It is essential to ensure sample integrity from the time of sampling through analysis and final disposition. Chain-of-custody procedure is useful for routine control of sample flow. Prior to shipping samples, all documentation must be ready for proper chain of custody. Chain-of-custody record includes the information below: (refer to Chain-of-Custody Sheets)

- Sample description
- Sample type
- Sampling date and time
- Name of sampler
- Sample containers, preservatives

After receiving the samples, laboratory manager should put ID number on each sample to conduct analytical works smoothly.

(12) Reporting system

Test results carried out by the laboratory shall be reported accurately, clearly and objectively, in accordance with the standard procedure mentioned in the above (9). The results should include all information necessary for the interpretation of test results and all information required by the method used. The report shall include the following information: (refer to Analysis Report Forms)

- Title
- Name and address of laboratory
- Identification of the report
- Description of the test item (parameter)
- Date of sample received
- Date of performance of test
- Test method used
- Measurements, examinations and derived results
- Signature and title of the responsible person

The process of transforming raw analytical data into a finished report shall involve mathematical modeling of the standard calibration curves, statistical analysis of acquired data, calculations procedure by taking into account of dilution (or condensation) factor.

(13) Waste management procedure

The laboratory shall provide a waste management procedure for the prevention of environmental pollution to be caused by chemicals or organic solvents in the wastes. The laboratory shall stores the wastewater containing organic solvent, oil and heavy metals are stored in separate containers and entrust the waste treatment contractor. (refer to Waste Treatment/Disposal Procedure)

(14) Health and Safety procedure

The laboratory staff should make effort to protect their health and be safe from accident. The use of goggles and gloves are recommendable for the protection of eyes and hands, especially in case that strong acid or alkali is used. In case that organic solvent is used, operation should be done in the hood with draft. For the protection of body, work wear or laboratory coat should be used. (refer to Laboratory Health & Safety Plan)

(15) QA/QC procedure

Maintenance and evaluation of instrument efficiency

- Standard solution to be used for preparation of calibration curve
  - Standard solutions made by reliable laboratory or company must be purchased or they must be prepared in the laboratory based on the standard procedure.
  - Standard chemicals with high purity (analytical grade) must be used for the preparation of standard solution.
  - Standard solution should be stored properly.
  - The maximum holding time for each standard solution should be defined.
- Pretreatment/condensation
  - These procedures must be made based on the standard operation procedure.
- Adjustment of analytical equipment
  - Periodical calibration of measurement instruments is very important.

Evaluation of credibility for measurement result

- Detection limit
  - The laboratory must define detection limit of each parameter.
  - In case that result of analysis is smaller than detection limit, it must be reported as "less than detection limit (e.g. less than 0.1 ppm or '< 0.1 ppm')".

- Blank test
  - Blank test should be made as much as possible in parallel with sample analysis.
  - Whenever new reagent is used, blank test must be made.
  - When unexpected high concentration of some parameter is measured, blank test must be made.

- Repeat measurement
  - Analysis of duplicated samples or repeat analysis of same sample is useful for assessing precision of analysis.
  - When unexpected result of analysis is obtained, analysis of same sample should be done again. In this sense, enough amounts of sample for repeat measurement is recommendable.

- Check on sensitivity of measuring instruments
  - Calibration of measurement instruments should be made periodically.
  - If sensitivity of some instrument fluctuates widely, daily check of sensitivity is required.

- Spike and recovery test
  - In environmental analysis, process such as solvent extraction and distillation are widely used. Spike recovery test by adding known amount of substances (target of measurement) is useful for assessing an accuracy of the analysis.
  - This test is useful to assess the matrix effect.

- Cross-checking
  - Cross-checking with other expert analyst or reliable laboratories should be made periodically to check the precision of analysis.

Data control and evaluation

- Reliability of samples
  - Representative sample must be taken at sampling point.
  - In case that suspect result of analysis is obtained, re-sampling and analysis of it shall be made.

- Treatment of abnormal data and lack of data
  - In case that abnormal data is obtained, the reason of such result must be checked. If enough amount of same sample is available, it must be analyzed again.
  - If result of the second analysis is also abnormal (abnormally high), re-sampling should be made.
  - If analysis result of newly collected sample is abnormally high, the result must be reported to the general manager of MEPA. The general manager must inform the result to relevant organizations, and take appropriate measures to find the polluter.

- It is anticipated that no data is obtained due to accidents. MEPA should provide the standard procedure for such case.

- Recording of measurement operation
  - Results of analysis including raw data must be kept for an appropriate period (e.g. 5 years)
  - The result should be recorded on table and chart by sampling points and by parameters.

(16) Internal inspection

To secure the proper operation and management of the laboratory, a system to inspect the operation and management of laboratory should be provided. MEPA should nominate three persons in charge of inspection, and the nominated persons shall visit the laboratory periodically for observation and discussions with laboratory personnel. One or more of them should be a person with technical background of laboratory works. If such person is not available in MEPA, specialist in this field shall be hired from outside as a technical adviser. In case that some troubles are observed or informed, discussions between general manager of MEPA, inspectors and laboratory manager shall be held to solve the problems.

HEALTH & SAFETY PLAN

For Laboratory Works

In order to carry out the laboratory works in health and safety, lab staff should keep the following rules:

Tidiness

- Keep the laboratory clean and tidy. Before starting lab work, wipe your bench and equipment that will be used.
- Cleaning must be done by lab technician or qualified person. Janitors under the supervision of lab manager or lab technician, however, can do regular cleaning of floor and table.
- Do not leave obstructions in the passages.
- Do not leave dirty apparatus around the sink.
- When a job is finished, wash used glassware and dispose chemicals properly or arrange to store all chemicals – other than those in standard reagent bottles – and leave your bench empty.
- When a job is finished, do not leave dirty apparatus in the laboratory.

Self-protections

- Wear laboratory coat or work wear in laboratory to avoid staining or eroding your skin or clothes. For the same reason, shoes are needed in laboratory to protect your toe.
- Wear eye protection devices, such as goggles or safety glasses, when there is the slightest risk of splashes or flying particles reaching the eyes.
- Safety gloves and fume cupboard should be used at the time of handling toxic/dangerous substances.
- In anticipation of chemical splashes on your body or in your eyes, you must know where to find and how to operate the emergency shower and eyewash.

Sulfuric Acid and other corrosive liquids

- During the period of diluting concentrated acid, remember always to pour the acid slowly into cold water well stirred in an open basin beaker. **Never pour water into concentrated sulfuric acid.**
- Do not store acids and similar materials on high shelves or in a hot place.
- Wear eye protection and the appropriate protective clothes.

Forethought

- Before you start a new experiment, ask yourself or lab manager whether it is exactly the same as one that you have done. If there is anything new, there must be possibilities to happen unexpected issue.
- Do not alter the details of an installation without very carefully thinking out what the possible consequences may be caused.
- Manager should give enough information and precautions prior to order of new experiment or work.

Spillage

- Mop up at once when water or chemicals are spilled on the bench or floor.
- If the spillage contains any chemicals, ask lab manager how to treat it.
- If mercury is spilt it must be removed immediately, since mercury escape as vapor easily.
- In case of the spillage of large quantities of sulfuric acid or organic solvent, special adsorbent or absorbent can be used. Ask manager for treatment.

Waste materials

- Do not pour into the sinks large volume of solvent, heavy metals and inflammable liquids.
- Refer the procedure of waste treatment.

Labels

- See that bottles containing reagents are clearly labeled.
- Keep the adequate labels on sample containers.

Glassware

- Examine all glassware for defects before carrying out any experiments and washing.
- Do not carry a glassware (bottles, flask, etc.) by the cap or neck, since it may slip or break off.
- Make sure that any vessel you are going to carry is clean on the outside and your hands are dry and not oily.
- Do not rapidly heat or cool thick-walled or normal glass apparatus. They will crack under such treatment.

Electrical Circuit

- Ensure that all resistance, cables and terminal arrangements are capable of carrying the desired current without overheating.
- All switches, sockets and terminal connections must be made correctly and firmly.

- All high voltage electrical equipment should have good earth connections. The handling of such equipment should be avoided in wet conditions.
- When pull out the electrical plugs, do not pull the electrical cord, but plug itself.

Fume Chamber

- Do not carry out on the open bench experiments likely to result in the generation of poisonous or unpleasant vapor/fumes, but work in a fume chamber.
- Make sure that the ventilation system is in order before use.

Fire

- Each room should be provided with fire extinguishers.
- Know the locations of the fire extinguishers and how to operate them.
- Do not use water unless you know it is safe to do so, electricity turned off, no organic liquids involved, and no chemicals that react dangerously with water.

Notice

- All warning and danger notices should be posted appropriate locations.

Eating and Smoking

- Eating and smoking are strictly forbidden in laboratory.

First-aid

- When chemicals adhere to skin or reach eyes, wash with running water for at least 15 minutes. During washing, call the lab manager and get instructions.
- In any case of poisoning, summon first-aid and a doctor. Speedy action is essential in poisoning cases.
- In case of burn, cool the burned area with running water or ice chilled water for at least 15 minutes.

Inventory of Equipment

No. _____

Name of Equipment	Maker	Model/Type	Reference Number

Date of Purchase		Purchace Price	
Vendor (contact point)			

Specifications

Accessories

Instruction Guidebook	Keeping place

Inspection/Repair record

Details	Date	Signature

List of Chemicals (1/2)

Chemicals	Unit	Q'ty	note	stock	Date
Acetic Acid	1 L	1	glacial		
Acetone	2.5 L	1			
Amidosulfuric Acid	100 g	1			
Ammonium Amidosulphonate	100 g	1	sulfumic acid		
Ammonium Chloride	1 kg	1			
Ammonium Hydroxide	2.5 L	1	30%		
Ammonium Iron(III) Sulfate-6H_2O	500 g	1			
Ammonium Molybdate-4H_2O	250 g	1			
Ammonium Sulfate	1 kg	1			
4-Aminoantipyrine	25 g	1			
APDC	25 g	1			
Ascorbic Acid	100 g	1			
Chloramine T	1 kg	1			
Chloroform (for spectrometry)	1 L	1			
Copper Sulfate-5H_2O	1 kg	1			
2,6-Dimethyl-4-Heptanone	1 L	1			
Dipotassium Hydrogen Phosphate	1 kg	1			
EDTA-2Na	1 kg	1			
Ethanol	2.5 L	1			
Fluorobenzene	100 g	1			
Hydrochloric Acid	2.5 L	1	37%		
Hydroxylamine Hydrochloride	100 g	1			
Iron(III) Sulfate-7H_2O	1 kg	1			
Magnesium Carbonate	500 g	1			
Magnesium Oxide	250 g	1			
Mercury(II) Sulfate	100 g	1			
Metacresol Purple	5 g	1			
Methanol	2.5 L	1			
Methanol (GC grade)	1 L	8		2	
Methyl Orange	100 g	1			
3-methyl-1-phenyl-5-pyrazolone	25 g	1			
MIBK	500 g	1			
N,N-Dimethyleformamide	500 ml	1			
Nitric Acid	2.5 L	4			
o-Phenanthroline-H_2O	25 g	1			
Perchloric Acid	2.5 L	1			
Phenol	1 kg	1			
Phenolphthalein	100 g	1			
Phosphoric acid	2.5 L	1			
Potassium Dichromate	1 kg	1			
Potassium Dihydrogen Phosphate	500 g	1			
Potassium Hexacyanoferrate(III)	500 g	1			

List of Chemicals (2/2)

Chemicals	Unit	Q'ty	note	stock	Date
Potassium Hydrogen Phthalate	500 g	1			
Potassium Iodate	500 g	1			
Potassium Iodide	1 kg	1			
Potassium Permanganate	1 kg	1			
Potassium Peroxodisulfate	500 g	1			
Potassium Sulfate	1 kg	1			
4-Pyridinecarboxylic Acid	100 g	1	Isonicotinic acid		
S Silica Gel 60-200 mesh	500 g	2			
Sodium borohydride (SBH)	100 g	1			
Sodium Chloride	1 kg	1			
Sodium Cyanide	5 g	1			
Sodium Hydroxide	1 kg	3	97%		
Sodium Hypochlorite	1 L	1			
Sodium Pentacyanonitrosylferrate(III)-2H_2O	25 g	1			
Sodium Peroxide	500 g	1			
Sodium Sulfate	1 kg	1	anhydrous		
Sodium Thiosulfate	500 g	1			
Starch, soluble	500 g	1			
Sulfamic Acid (for general use)	100 g	1			
Sulfamic Acid (standard material)	500 g	8			
Sulfuric Acid	2.5 L	4	95 - 98%		
T Tartar Emetic (Antimony Potassium Tartrate)	5 g	1			
Tin(II) chloride-2H_2O	100 g	1			
Tri-n-octylamin	25 ml	1			
U Urea	1 kg	1			
Standard Chemicals					
Buffer solution (pH = 4)	1 L	1			
Buffer solution (pH = 7)	1 L	1			
Buffer solution (pH = 9)	1 L	1			
As standard solution	100 ml	2			
Cd standard solution	100 ml	2			
Co standard solution	100 ml	2			
Cr standard solution	100 ml	2			
Cu standard solution	100 ml	2			
Hg standard solution	100 ml	2			
Mg standard solution	500 ml	1			
Ni standard solution	100 ml	2			
Pb standard solution	100 ml	2			
V standard solution	100 ml	2			
Zn standard solution	500 ml	1			
BTEX standard solution	1 ml	3	from Japan	2	

Glassware/Apparatus (1/2)

Date: _____

Material	Specification	Q'ty	Note
Glassware			
beaker, low form	250ml	10	
beaker, conical	150ml	20	
beaker, conical	250ml	30	
beaker, conical	500ml	10	
tall beaker	250ml	10	
Erlenmeyer flask	100ml	10	
Erlenmeyer flask	500ml, with stopper	10	
Erlenmeyer flask	100ml, with stopper	10	
volumetric flask	100ml	15	
volumetric flask	200ml	6	
volumetric flask	250ml	10	
volumetric flask	50ml	10	
evaporating dish	45ml	20	
measuring cylinder	100ml	10	
measuring cylinder	500ml, with stopper	6	
Kjeldahl flask	300ml	6	
centrifuge tube	15ml test tube with stopper	10	
separating funnel	spherical, 1000ml	6	
separating funnel	conical, 250ml	10	
separating funnel	conical, 500ml	10	
test tube	pyrex, 25ml with stopper	6	
test tube	pyrex, 50ml with stopper	15	
test tube	195ml, with stopper	10	
test tube	54ml, with stopper	30	
watch glass	80mm, dia.	20	
watch glass	200mm dia.	5	
digesting bottle	Duran, 100 ml	10	
reagent bottle	glass, 500ml	10	
Apparatus			
Bunsen burner	LPG	1	
LPG gas cylinder	25 lbs.	1	
tubing for burner	8mm bore, 10 m	1	
nickel crucible	25ml	40	
ignition crucible	12 ml	60	
crucible tongs	bow type	1	
filter paper	GF/B, 47 mm	100	
filter paper	GF/A, 125mm	100	
filter paper	Whatman No.40, 125mm	200	
funnel, glass	60 mm dia.	20	
glass cell for spectrophotometer	10 mm	4	
quarts cell	10 mm	4	
glass cell for spectrophotometer	50 mm	4	
quarts cell	50 mm	4	

Glassware/Apparatus (2/2)

material	specification	Q'ty	Note
micro syringe	1 μ l	2	
pippte filler	three valve	3	
pippte vulve	PVC, 15 ml	10	
agate mortar, with pestle	7cm dia.	1	
porcelain mortar, with pestle	100ml	5	
porcelain desiccator plate	190 mm	5	
vacuum filtration funnel (holder)	for 47mm membrane	1	
wash bottle	500 ml	12	
dropping bottle	60 ml	10	
burette clamp	for 11-14 dia rods	1	
stand clamp	holding 1-75 dia item	10	
retort stand base	200 x 125 mm	5	
steel rod	12.5 mm dia, 600 mm	5	
tweezzers	102mm	3	
weighing paper	4 x 14"	5	
PTFE stopcock burette	10 ml	1	
stainless funel	200mm dia.	2	
tray	ABS	5	
brush		10	
brush		10	
sieves, mesh size 10,20,40,60,80 &	100 mm dia, with brush	2	
Sampling Container			
glass bottle	1000 ml	60	
glass bottle	500 ml	60	
glass bottle	500 ml, wide mouth	60	
glass bottle	250ml, with PTFE liner cap	50	
polyethylene bottle	2000 ml	50	
polyethylene bottle	1000 ml	100	
polyethylene bottle	500 ml	100	
cooler box	Igleo, 50 liters	5	

Operational manual (Atomic Absorption Spectrometer)
Varian AA220

[Start up]
(1)check drain tank.
if it is almost full, dump solution into "metal waste tank".
(2)switch on AAS.
The switch locates on the left of the machine.
(3)switch on the exhaust system and air compressor.
The switch locates on the left sidewall.
(4)turn on the computer.
The switch locates on the center of computer.
(5)start up the control system.
Double click the icon "SpectrAA 220" in the display.
(6)click "work sheet".
"Load Worksheet" will be shown.
(7)click "New from".
"New Worksheet from Worksheet" will be shown.
(8)select proper worksheet, and click it and click "ok"
"Name Worksheet" will be shown.
(9)type name and click "ok"
in general date should be put in "Name"
(10)click "Select"
select elements and number of sample
black frame is selected (measured)
(11)click "Select"

[Optimization of measurement condition]
(1)click "Optimize"
"Optimize" will be shown.
(2)select element and click "ok"
"Flame Optimization" will be shown.
"Analysis checklist" will be shown.
Click "ok"
Wait until green bar will be shown.
(3)arrange the lamp position
set 2 knobs on the back of lamp holder in order to get highest intensity.
(green bar shows the intensity)
if intensity becomes over the range, click "Rescale".

(4)arrange the burner position

remove burner front cover

use name card, move burner to be set the burner slit will be just above the light pass.

put front cover back

(5)open gas cylinder

(6)turn on flame

push the flame switch, which is located just above the main switch.

(7)adjust the burner height

click "Optimize Signal"

for optimization, use proper solution that contains the measured element

move knob to get the highest intensity

white bar shows the signal.

(8)click "ok"

(9)click "Cancel"

(10)start measurement

click "start"

follow the direction of PC

(use MilliQ water for equipment zero)

(11)if there is more element(s)

confirm "prepare instrument zero" is shown

and click "Cancel"

(12)if different lamp is used for next element, turn off burner and go to (1), or go to (7)

[Print out the result]

(1)click "exit"

(2)click "Return to Main Index"

(3)click "Reports"

"Reports" will be shown.

(4)select worksheet

(5)click "Next"

(6)select element(s)

selected element(s) is shown in blue

(7)click "Next"

(8)click "Next"

(9)click "Print Report..."

"Print" will be shown.

(10)click "ok"

(11)click "Close"

main index will be shown.

[Shut down]

(1)at main index, click "Exit"

"confirm" will be shown.

(2)click "Yes"

(3)turn off main switch of AA

(4)turn off exhaust

(5)close gas cylinder valve

(6)shut down computer

Operational manual (Gas Chromatography)

Shimadzu GC 17A

[Start Up]

1. Air Compressor ON
2. after air pressure comes up (> 50 kPa), turn on GC-17A
3. CBM-101 ON, Computer ON
4. GC System ON
   1) [Main Menu] open
   2) [Real time analysis]
   3) [Method file] - load: BTEX.MET
   4) Helium gas open
   5) Click System ON
   6) Wait until setting temperature comes up (see GC monitor)
5. FID Ignition ON
   1) Hydrogen gas open
   2) Click Flame ignition
   3) Wait until the baseline settled

[Start an Analysis]

{using Sample Login}···for few samples or optimize the analytical conditions

{using Sample Schedule}···for many samples or using an auto sampler

1. select 'Sample Schedule' on 'Real Time Analysis'
2. input parameters directly or using 'Edit Parameters'

   Vial #
   Sample Name
   Sample ID
   IS (internal standard) Amount ┐
   Sample Amount ├ controlled by Headspace sampler
   Dilution Factor ┘
   Injection Volume
   # of Injection
   Data File
   Type → input 'U' for unknown sample, 'S' for standard sample
   Method File → select by click the file from 'File' menu
3. Set the samples (vial bottles) in the headspace auto sampler – outside first
4. Start the Analysis – click 'RUN'

[Shut Down]

1) [Method file] - load: Shut.MET
2) Hydrogen gas shut
3) Wait until the temperature comes down (at least column temp. < 50°C)
4) Click System OFF
5) Helium and Air shut
6) Turn off Computer, CBM off, GC off

[Quantification]

{make a Calibration Curve}

1.Set the Method File

'Setup' – Data Processing Ch# – Quantitation

Calculated by	→ Area
Method	→ Internal Standard
Curve Fit Type	→ Least Square Method
Calibration Level	→ 3
Window/Band	→ Widow

2.Create ID Table

1) 'Load' existing Data File (chromatograph) for the same parameters
2) enter the component name, retention time and concentration of each peak
   - set Conc. in order of concentrations
   - fill in the internal standard in the row of ID No.1, Conc.→ 1

3.Set 'Sample Schedule' using the method file

- the Type of sample should be 'S' for standard sample
- samples which are set to Type 'U' are quantitated based on the calibration

4. Click 'RUN'

{using Post-Run Analysis}

1. Select "BATCH"
2. File – Load Data Files:

   select the data files for Calibration Curve and Sample Analysis Data

3. Batch Schedule – click Method Name
4. Data Processing – confirm or change the method
5. Click 'RUN' → print out

Daily operational manual

TOC-5000 (sea water measurement)

(start up)

1. open gas (zero-air) cylinder.
   confirm gas pressure (500 – 600KPa).
2. turn on main power switch (on the left side of machine).
   confirm carrier gas flow (150 ml/min.).
3. push "F1" (next).
   display will go to "MAIN MENU".
4. push "3" and "ENTER".
   display will go to "GENERAL CONDITIONS".
5. confirm next items.
   "TC CATALYST" is "1" (1=NORMAL).
   "SYRINGE SIZE" is "1" (1=250).
   "CELL LENGTH" is "1" (1=STD).
   "TOC OR SSM" is "1" (1=TOC).
   if some of these items are different, enter proper number and "ENTER".
6. change furnace condition.
   at "FURNACE ON/OFF", enter "1" (1=TOC) and "ENTER" to turn on furnace.
7. push "F2" (MAIN MENU).
   display will go to "MAIN MENU".
8. push "2" and "ENTER".
   display will go to "SAMPLE MEASUREMENT/CONDITIONS".
9. confirm "1st CAL CURVE #" and "NPOC" is "6", if not enter "6" and "ENTER".
10. confirm next items.
    "RANGE" of "NPOC" is "30".
    "INJ VOL" of "NPOC" is "50".
    "SPARGE TIME" of "NPOC" is "15".
    "NO OF INJECTS" is "2".
    "MAX NO OF INJ" is "3".
    if not, enter proper number and "ENTER".

leave equipment approx.30min., until the ready lamp will come on.

(sample measurement)

11. push "F1".

display will go to "MEASUREMENT START".

12. set sample.

13. push "START/STOP".

measurement will be implemented automatically.

14. confirm "COMPLETE" is blinking on the display.

15. if there is no more sample to be measured, go to 19.

16. change sample.

17. push "F1" (NEXT).

display will go to "SAMPLE MEASUREMENT/CONDITIONS".

18. repeat 11 To 15.

19. push "F2" (END).

display will go to "MAIN MENU".

(shut down)

1. enter "7" and "ENTER".

display will go to "STANDBY OPTIONS".

2. push "1".

3. push "F1".

confirm "WAIT 29 MIN TO TURN MAIN SWITCH OFF".

wait for 30 min.

4. confirm "TURN MAIN SWITCH OFF" is displayed.

5. turn off main power switch.

6. close gas (zero-air) cylinder.

TOC-5000 + **SSM-5000 (for Solid Sample)**

(start up)

1. open gas (zero-air) cylinder.
   confirm gas pressure (500 – 600KPa), **water level of drain vessel (outlet pipe)**
2. turn on main power switch of TOC-5000 (on the left side of machine)
   confirm carrier gas flow (150 ml/min.).
   turn on main power switch of SSM-5000 (on the right side of machine)
   confirm carrier gas pressure (2 kg/cm^2), flow (500 ml/min.)
3. push "F1" (next).
   display will go to "MAIN MENU".
4. push "3" and "ENTER".
   display will go to "GENERAL CONDITIONS".
5. confirm next items.
   "TC CATALYST" is "1" (1=NORMAL).
   "SYRINGE SIZE" is "1" (1=250).
   "UNIT OF CONC" is "1" (ppm), **is "5" (%)**
   "CELL LENGTH" is "1" (1=STD), **is "3" (w-short)**
   "TOC OR SSM" is "1" (1=TOC), **is "2" (SSM)**
   if some of these items are different, enter proper number and "ENTER".
6. change furnace condition.
   at "FURNACE ON/OFF", enter "1" (1=TOC) and "ENTER" to turn on furnace.
   enter "3" (TOC & SSM) *or "4" (SSM)*
7. push "F2" (MAIN MENU).
   display will go to "MAIN MENU".
8. push "2" and "ENTER".
   display will go to "SAMPLE MEASUREMENT/CONDITIONS".
9. confirm "1st CAL CURVE #" and "NPOC" is "6", if not enter "6" and "ENTER".
   "1st CAL CURVE #", "TC" is "9" and "IC" is "10"
10. confirm next items.
    "RANGE" of "NPOC" is "30".
    "INJ VOL" of "NPOC" is "50".
    "SPARGE TIME" of "NPOC" is "15".
    "NO OF INJECTS" is "2".
    "MAX NO OF INJ" is "3".
    Enter "Sample Amount" in 'mg'
    if not, enter proper number and "ENTER".

leave equipment approx.30min., until the ready lamp will come on.

(sample measurement)

11. push "F1".
    display will go to "MEASUREMENT START".

12. set sample. **at first in TC port then IC port (add phosphoric acid)**
    open the sample port cover and place the sample boat in sample boat holder

13. push "START/STOP".
    Gently push the sample boat push rod from "Sample change" to "Measuring"

measurement will be implemented automatically.

14. confirm "COMPLETE" is blinking on the display.
    TC: pull sample port to "Cooling" wait 30 sec. then move to "Sample change"
    IC: pull sample port to "Sample change"

15. if there is no more sample to be measured, go to 19.

16. change sample.

17. push "F1" (NEXT).
    display will go to "SAMPLE MEASUREMENT/CONDITIONS".

18. repeat 11 To 15.

19. push "F2" (END).
    display will go to "MAIN MENU".

(shut down)

1. enter "7" and "ENTER".
    display will go to "STANDBY OPTIONS".

2. push "1".

3. push "F1".
    confirm "WAIT 29 MIN TO TURN MAIN SWITCH OFF".

    wait for 30 min.

4. confirm "TURN MAIN SWITCH OFF" is displayed.

5. turn off main power switch.

6. close gas (zero-air) cylinder.