List of Analysis Method

June, 2000

Analysis Parameter	Method Number.		Note
	pre-treatment	measurement	
Water Analysis			
Residual Chlorine	4500-Cl G		using portable meter
TOC	5310 B		Shimadzu TOC5000A
TSS	2540 D		
NH_3	4500-NH_3 B	4500-NH_3 F	
TKN	4500-N_{org} B	4500-NH_3 F	except Ammonia removal
Total Phosphorus	4500-P B	4500-P E	
Cyanogen	4500-CN C	4500-CN E	
Magnesium	3111 B		
Phenols	EPA 420.1		
Oil & Grease	EPA 413.2 (Oil contents meter)		Horiba OCMA300
TPH	EPA 418.1 (Oil contents meter)		Horiba OCMA300
BTEX	Head space-GC/FID		
Chlorophyll	10200 H		
Total Coliform	9222 B		Milliflex
Sediment Analysis			
Ignition Loss	2540 B	2540 E	Loss of Ignition @ 550 °C
TOC	Moopam IV.4		
Cr, Cd, Pb, Zn, Cu, Co, Ni, V	EPA 3050 B	Flame AAS	
Hg	EPA 3050 B	Cold vapor AAS	
As	EPA 7471 A	Hydride generation AAS	
TPH	EPA 3550 B	Oil contents meter	Horiba OCMA300
BTEX	EPA 5021	Head space-GC/FID	

Sample Management Plan

Analysis Item	Container	Volume (ml)	Q'ty	Preservation	Holding Time
Water Sample					
Total Suspended Solid	Plastic bottle	1000	1	Cool, 4 °C	48 hours
COD, TOC, Ammonia, Total Kjeidahl Nitrogen, Total Phosphorus	Plastic bottle	2000	1	Cool, 4 °C H_2SO_4, pH<2	28 days
Cyanogen	Plastic bottle	1000	1	Cool, 4 °C NaOH, pH>12	14 days
Metals	Plastic bottle	500	2	HNO_3, pH<2	28 days (Hg) 6 months (others)
Phenols	Glass bottle	500	2	Cool, 4 °C H_2SO_4, pH<2	28 days
Oil & Grease	Glass bottle	1000	1	Cool, 4 °C HCl, pH<2	28 days
TPH	Glass bottle	1000	1	Cool, 4 °C HCl, pH<2	28 days
BTEX (Benzen, Toluene, Etylbenzen, Xylene)	Glass bottle PTFE liner cap	250	1	fill up to the brim Cool, 4 °C HCl, pH<2	14 days
Chlorophyll	Plastic bottle	1000	1	Cool, 4 °C	filtrate - immediately 28 days (frozen filter)
Total Coliform	Whirl-pak Bag (sterile)	125	1	Cool, 4 °C	6 hours
Chlorinated Hydrocarbons	Glass bottle	1000	2	Cool, 4 °C	14 days
Sediment Sample					
Ignition Loss, TOC, Metals	Whirl-pak Bag		1	Cool, 4 °C (freeze)	
BTEX, TPH, *PCBs*	Glass bottle (wide mouth)	500	1	Cool, 4 °C	

Chain-of-Custody Sheet (Water Samples)

No. Page : of

Date Sampled:

Sampler:

Remarks:

Surface Seawater(SS), Bottom Seawater (BS), Waste Water (WW), Glass (G), Plastic (P), Whirl Pack (W), Acid (A), Sodium Hydroxide (S)

No.	Sample ID	Time Sampled	Type of Sample	Bottle Type	Volume (ml)	Q'ty	Residual Chroline	TSS	COD/TOC	NH_3 (Ammonia)	TKN (Kjeldahl Nitrogen)	T-P (Total Phosphorus)	CN (Cyanogen)	Mg (Magnesium)	Hg (Mercury)	As (Asenic)	Cr (Chromium)	Other Metals (Cd,Co,Cu,Ni,Pb,Zn)	Phenol	Oil & Grease	BTEX	TPH	Chlorophyll	Total Coliform	Chlorinated Hydrocarbons	Notes
							Analysis Parameter																			

Supplied to Laboratory by : (Name)

(Signature)

(Date/Time)

Received at Laboratory by : (Name)

(Signature)

(Date/Time)

No. Page : of

Date Sampled:

Sampler:

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
			Sediment (SD), Soil (SL), Biota (B)	Glass (G), Plastic (P), Whirl pack (W)			Analysis Parameter												

Supplied to Laboratory by : (Name)

(Signature)

(Date/Time)

Received at Laboratory by : (Name)

(Signature)

(Date/Time)

MEPA Eastern Province, Environmental Laboratory

LABORATORY ANALYSIS REPORT

Date: **Report No.**

Sample Site :
Type of Sample : **Sediment**
Sample ID# :
Sampled by :

Sampled :
Received :
Completed :
QA/QC ID# :

Analytical Results

Parameter	Method	Unit	Result	DLR	Note
Loss on Ignition	SM 2540 B	%		0.1	
TOC	MOOPAM IV.4	%		0.1	
Cadmium	EPA 3050 B	mg/kg		1	
Cobalt	EPA 3050 B	mg/kg		5	
Copper	EPA 3050 B	mg/kg		5	
Lead	EPA 3050 B	mg/kg		20	
Nickel	EPA 3050 B	mg/kg		10	
Zinc	EPA 3050 B	mg/kg		1	
Chromium	EPA 3050 B	mg/kg		10	
Mercury	EPA 3050 B	mg/kg		0.05	
Arsenic	EPA 7471 A	mg/kg		0.1	
Vanadium	EPA 3050 B	mg/kg		10	
TPH	EPA 3550 B	mg/kg		5	
Benzene	EPA 5021	mg/kg		0.1	
Toluene	EPA 5021	mg/kg		0.1	
Ethylbenzene	EPA 5021	mg/kg		0.1	
Xylene	EPA 5021	mg/kg		0.1	

DLR: Detection Limit for Reporting ND: Not Detected at the DLR
SM: Standard Methods for the Analysis of Water and Wastewater
MOOPAM: Manual of Oceanographic Observations and Pollutant Analysis Methods, ROPME
EPA: U.S. Environmental Protection Agency

MEPA Environmental

Laboratory Director

Meteorology and Environmental Protection Administration
Eastern Province
Tel: 03-857-6260
Fax:03-857-6752

MEPA Eastern Province, Environmental Laboratory

LABORATORY ANALYSIS REPORT

Date: **Report No.**

Sample Site :
Type of Sample : **Seawater**
Sample ID# :
Sampled by :

Sampled :
Received :
Completed :
QA/QC ID# :

Analytical Results

Parameter	Method	Unit	Result	DLR	Note
TSS	SM 2540 D	mg/L		1	
TOC	SM 5310 B	mg/L		1	
TKN	SM 4500-N_{org} B	mg/L		0.1	
NH_3	SM 4500-NH_3 B, F	mg/L		0.1	
Total Phosphorus	SM 4500-P B, E	mg/L		0.01	
Cyanogen	SM 4500-CN C, E	mg/L		0.005	
Magnesium	SM 3111 B	g/L		0.1	
Cadmium	SM 3111 C	mg/L		0.01	
Cobalt	SM 3111 C	mg/L		0.05	
Copper	SM 3111 C	mg/L		0.05	
Lead	SM 3111 C	mg/L		0.1	
Nickel	SM 3111 C	mg/L		0.05	
Zinc	SM 3111 C	mg/L		0.01	
Chromium	SM 3111 C	mg/L		0.1	
Mercury	SM 3111 C	mg/L		0.005	
Arsenic	SM 3111 C	mg/L		0.01	
Phenols	EPA 420.1	mg/L		0.005	
Oil & Grease	EPA 413.2	mg/L		0.2	
TPH	EPA 418.1	mg/L		0.2	
Benzene	Headspace-GC/FID	mg/L		0.01	
Toluene	Headspace-GC/FID	mg/L		0.01	
Ethylbenzene	Headspace-GC/FID	mg/L		0.01	
Xylene	Headspace-GC/FID	mg/L		0.01	
Chlorophyll a	SM 10200 H	ug/L		0.1	
Total Coliform	SM 9222 B	pcs/100ml		10	

DLR: Detection Limit for Reporting ND: Not Detected at the DLR
SM: Standard Methods for the Analysis of Water and Wastewater
EPA: U.S. Environmental Protection Agency

MEPA Environmental

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MEPA Eastern Province, Environmental Laboratory

QUALITY CONTROL REPORT

Date: **QA/QC ID No.** _____

Inorganic QC Report

Parameter	Method	Unit	Blank Test		Duplicate Test			RecoveryTest		
			Result	Note	Conc.	RPD (%)	Note	Conc.	% Recovery	Note

SM: Standard Methods for the Analysis of Water and Wastewater

EPA: U.S. Environmental Protection Agency

RPD: Relative Percent Difference; RPD [%] = $|C_1-C_2|/(C_1+C_2)*100$

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Waste Treatment/Disposal Plan

for Laboratory Works

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

Extremely hazardous wastes should be converted (oxidized, reduced, neutralized, etc) to less dangerous substance before being placed in containers.

Most waste disposal companies require the segregation and identification of all liquid wastes by type.

Laboratory Practices for Waste Disposal

- Always consult your supervisor and the MSDS (Material Safety Data Sheets) before attempting to dispose of waste chemicals..
- Segregate wastes in clearly marked safety containers to avoid any possible chemical reaction. Always consider the possibility of spontaneous reactions, explosions, and fire.
- Protect maintenance, janitorial, shipping, and other personnel. When working with extremely dangerous materials, always monitor your waste disposal step by step to their final disposition.
- Minimize the discharge of waste.

Heavy Metals, general (Cd, Pb, As, Cu, Fe, Zn, Mn, Cr(III), etc.)

- Mineralize the organic compounds
- Store in a container under acid condition

(desirable treatment)

Treat by precipitating as hydroxide (see Note A)

Hexavalent Chromium

- Store under the sulfuric acid condition, < pH3
- After reduction by sodium sulfide, store in the container with heavy metals

Mercury

- Disintegrate the organic mercury with acid
- Store in a container independently

(desirable treatment)

Treat by activated carbon or chelation (see Note B)

Cyanide

- Store in alkaline by NaOH, > pH12
- Decompose CN into N_2 and CO_2 by adding sodium hypochlorite
- Neutralize with sulfuric acid or hydrochloric acid

Organic Solvents, Oil

- Protect from spontaneous reactions, evaporation, and fire
- Propose to recover and reuse
- Treat by incineration

Acid, Alkali

- Neutralize by each other then dilute

Apparatus used with bacillus test

- Sterilized before dispose

Note A: Treatment of heavy metals by precipitating as hydroxide

1) add $FeCl_3$ or $Fe_2(SO_4)_3$, mix thoroughly
2) add $Ca(OH)_2$ slurry, adjust pH to 9 – 11
3) after settling the precipitation, filter the solution
4) discard filtrate after confirmation the absence of heavy metals

Note B: Treatment of mercury by activated carbon or chelation

1) if the solution contains more than 1ppm Hg, add $FeSO_4$ solution and Na_2S, mix thoroughly under pH 6 – 8
2) after settling the precipitation, filter the solution
3) after adding NaCl, let the filtrate pass through activated carbon or chelate resin column to remove the remaining Hg

Daily report of Laboratory work

Date	15 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Meeting Schedule of 4th stage Confirmation of delivery of equipment and chemicals, and trouble shooting

Details	Meeting Schedule of 4th stage Schedule of laboratory work Equipment in laboratory (for Jamal) Analysis items (for Jamal) Confirmation of other items Delivery of purchased items Troubles of equipment (AAS, Milli-Q) Attached document(s) -Itinerary of team

Daily report of Laboratory work

Date	16 May, 2000
Attendance	(initial of attendance) ~~Hashim Al Zawad~~ Qusai Bohlaiqah Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Personnel plan in laboratory Items, person in charge General explanation Method, equipment, apparatus, principal

Details	Personnel plan in laboratory Items, person in charge General explanation of methods Equipment, apparatus Method Principal Chemicals Preparation of GC Health and safety Attached document(s) -Personnel plan in laboratory

Personnel Plan in Laboratory

16-May-00

Analysis Prameter	Pre-treatment	Method	Person in Charge	
			JICA	MEPA
Total Coliform	filtration/cultivation	M-endo	Sato	Jamal
TOC	Purge CO_2	TOC meter		
TOC (sediment)	decomposition	Titrimetric		
Metals				
Mg	dillution	AAS		
Cd,Co,Cu,Ni,Pb,Zn,Cr	extraction	AAS		
As	decomposition	hydride/AAS		
Hg	decomposition	vapor/AAS		
V (sediment)	decomposition	AAS		
Total P	decomposition	SP	Imaeda	Alam
Cyanogen	distillation	SP		
Phenols	distillation	SP		
Oil & Grease	extraction	Oil meter		
TPH	extraction	Oil meter		
TSS	filtration	Gravimetric	Ohi	Qusai
Ignition Loss	ignition in furnace	Gravimetric		
Chlorophyll	filtration/extraction	SP		
TKN	decomposition/distillatic	SP		
NH3	distillation	SP		
BTEX	head space sampler	GC		

Daily report of Laboratory work

Date	20 May, 2000
Attendance	(initial of attendance) ~~Hashim Al Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, Ammonium, Phosphorus and Phenol

Details	Training of analysis procedure Coliform (Jamal) Sterilize method Procedure Ammonium (Qusai) Distillation method Phosphorus (Alam) Preparation of chemicals Phenol (Alam) Preparation of chemicals Health and Safety plan (Jamal) Attached document(s) Procedures (coliform, nitrogen)

Ammonia (NH_3) – SM 4500-NH_3 B,F

Spectrophotometric Method

[Apparatus]

- Steamed-out Distillation apparatus
- Test Tube with stopper (50 ml) or Conical Beaker
- Spectrophotometer

[Chemicals]

① Sulfuric Acid (25 m mol/L)

sulfuric acid 1.4 ml ⟶ 1000 ml

② Borate buffer solution

NaOH(4g/L) 88 ml + sodium tetraborate($Na_2B_4O_7$ 9.5g/L) 500ml → 1000 ml

③ Phenol-Sodium Pentacyanonitrosylferrate (Sodium Nitroprusside) Solution:

Phenol 5 g
Sodium Pentacyanonitrosylferrate 0.025 g ⟶ 500 ml

④ Sodium Hypochlorite solution(0.1 w/v%)

Sodium hypochlorite(5%) 2 ml + NaOH 3 g → 100 ml

⑤ Ammonia Standard solution (100 μg/ml)

Ammonium Chloride 0.3819 g → 1000 ml

[Operation Flow]

Blank Test

Aliquot of Sample put 30 ml of sample into distillation flask

↓ ← Borate buffer solution② 20 ml

in advance put sulfuric acid ① 30 ml into receiver (100ml Cylinder)

pipe-tip of condenser should be kept under 15 mm lower than surface

↓

Distillation heat distilling flask

↓ collect at least 10 ml distillate to receiver

Adjust wash inside pipes, fill up 50 ml by water

↓

Aliquot put into test tube *Standards*

↓ ← phenol-sodium pentacyanonitrosylferrate solution ③ 5 ml

Mix quietly

↓ ← sodium hypochlorite solution④ 5 ml

Stand about 1 hour

↓

Spectrophotometer wavelength: 640 nm

System sterilization

(At beginning of each working day)

1. Sterilization of pump

If the pump has remained unused for 2 days or more, proceed 3. prior to this section.

(1)Remove the cover and wipe the surface of filter support and cover with gauze moistened with ethanol.

(2)Take 400ml MilliQ water to 500ml beaker and place the sanitization tubing in it.

(3)Place the cover onto each filter support.

(4)Press the ON/OFF button to start the pump. Run the pump for 10 seconds. Press the ON/OFF button to stop the pump.

(5)Confirm the VACUUM RELEASE lamp will come off.

(6)Repeat the process (4) 5 times

(7)Remove the sanitization tubing, then repeat (4).

(8)Remove the sanitization tubing from water.

(Before proceed each sample)

2. Sterilization of filter support

Wipe filter support with gauze moistened with 70 – 80% ethanol solution.

(At the end of each working day)

3. Sterilization of pump

At the end of each working day, and at the begging of the week, pump must be sanitized.

(1)Prepare 250ppm sodium hypochlorite solution.

Take 2ml of 5% sodium hypochlorite solution into 500ml beaker and dilute up to 400ml with MilliQ water.

(2)Switch on the pump with ON/OFF switch.

(3)Place the cover onto each filter support.

(4)Connect the tubing to the connection on the back of pump.

(5)Place the other end of the tubing into a 500ml beaker.

(6)Press the ON/OFF button to start the pump. Run the pump for 10 seconds. Press the ON/OFF button to stop the pump.

(7)Repeat the process (6) 5 times.

(8)Leave the pump for next working day.

Daily report of Laboratory work

Date	21 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, Ammonium, Phenol and Phosphorus

Details	Training of analysis procedure Coliform (Jamal) Preparation of chemicals Blank test Handling of pipette (Jamal) TOC (Jamal) Operatoin of equipment Preparation of chemicals NH3 (Qusai) Distillation Blank test Phosphorus (Alam) Calibration Blank test Phenol (Alam) Calibration Blank test Distillation Attached document(s) Coliform

Coliform analysis

(system sterilization)

(1)At the beginning of each working day, proceed system sterilization 1.

(filtration of sample)

(2)proceed system sterilization 2.

(3)Remove protective cover from filter support.

(4)Remove the Milliflex-100 funnel from its packing tray.

A spacer is left in the tray.

(5)Place the spacer on the filter support by sterile forceps.

(6)Firmly press the funnel into the filter support.

(7)Remove the cover from funnel and pour 100ml (diluted) sample into the funnel.

Leave the cover loose over the funnel.

(8)Press ON/OFF button to start a pump for filtering the sample.

(9)After filtration of sample, press ON/OFF button to switch off the pump.

(10)Place the cover onto the funnel firmly.

(preparation of medium cassette)

(11)Remove the yellow cap from cassette.

(12)Open th ampoule of EC medium by pressing the top of ampoule.

(13)Transfer the EC medium into the cassette.

(14)After complete transfer of medium, firmly attach the yellow cap on the cassette.

(15)Remove the paper cover from the liquid medium cassette.

(incubation)

(16)Remove funnel from filter support and place the funnel base down over the exposed liquid medium cassette.

(17)Remove the spacer from filter support and replace the cover onto the filter support.

(18)Press down on the top of the funnel with the palm of hands.

Increase gradually hand pressure until the funnel breaks off.

(19)Remove the cover from the funnel and place over the top of the filter cassette assembly.

(20)Incubate upside down in the incubator at 35.5C for 48 hours.

(counting)

(21)Count the number of colonies by microscope.

Daily report of Laboratory work

Date	22 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi H.O Mamoru Sato
Subjects	Training of analysis procedure Coliform, TOC, Ammonium and Phosphorus Maintenance program

Details	Training of analysis procedure Coliform (Jamal) Blank test TOC (Jamal) Operation of equipment Preparation of standard solution Dilution procedure for solution (Jamal) Weighing procedure (Jamal) Handling of micro-pipette NH3 (Qusai) Distillation Blank test GC Preparation for standard solution Phosphorus (Alam) Calibration Blank test Comparison of EPA and US standard method Maintenance program Mr. Ahmed Al Dalouj will prepare maintenance plan for laboratory equipment Attached document(s) Preparation for laboratory work (maintenance)

Maintenance

(1)Equipment list (Ahmed)

(2)Maintenance program

- Daily maintenance program
- Monthly maintenance program
- Other routinely maintenance program
- Maintenance procedure
- Maintenance record (check sheet)
  - GC [KIAK](Ahmed)
  - AAS [NSC](Ghazi)
  - UV [KIAK](Ahmed)
  - pH meter [KIAK](Ghazi)
  - TOC [KIAK](Ahmed)
  - Oil content meter [Labomatic](Ghazi)
  - Autoclave [KIAK](Ghazi)
  - Centrifuge [Labomatic](Ahmed)
  - Millipore [IDCO](Ghazi)
- Trouble shooting record (Ghazi)

(3)Safety information

- Safety information for electricity and high pressure cylinder (Ghazi)
- Safety information for equipment

Analysis

(1)Operation procedure manuals for routine work

- GC (Oi)
- AAS (Alam)
- TOC (Sato)
- Oil content meter (Qusai)
- pH meter (Najib)
- UV (Sato)
- Autoclave (Qusai)
- Centrifuge (Najib)
- Milli-Q (Alam)

(2)Analysis procedures

- Coliform (Alam)
- Others (Oi and Sato)

Daily report of Laboratory work

Date	23 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, TOC, BTEX and Phenol

Details	Training of analysis procedure Coliform (Jamal) Counting colonies Sample preparation method Calculation TOC (Jamal) Operation of equipment Sample preparation method GC (Qusai) Preparation for standard solution Calibration Phenol (Alam) Calibration Preparation of calibration curve by computer Blank test Solvent extraction Attached document(s) Procedure (BTEX)

BTEX (Benzene, Toluene, Ethylbenzene and Xylene)

Gas-chromatographic Method

[Apparatus]

- GC-FID with headspace auto-sampler
- Vial bottle (20 ml)
- Aluminum cap with PTFE septum
- Microsyringe

[Chemicals]

① Sodium Chloride

② Methanol

③ Mixed reference solution for BTEX (2 mg/ml for each)

④ Fluorobenzene (200 mg/L): store in refrigerator

[Operation Flow]

Blank Test
Standards

Aliquot of Sample — put 10 ml of sample to vial bottle contains 3 g of sodium chloride①
then stopper by cap with PTFE septum

← fluorobenzene (200 mg/L) ④ 5 µl by micro syringe

GC/FID — set in headspace auto-sampler

(Blank Sample)

10 ml of water

(Standard Curve)

Working Solution: dilute 1 ml of reference solution③ to 10 ml with methanol (200 mg/L)
→ store in refrigerator

in advance, add 3 g of sodium chloride① and 10 ml of water to vial bottle
add fluorobenzene (200 mg/L) ④ 5 µl by micro syringe
add 5 and 10 µl of working solution by micro syringe

add volume (µl)	concentration (mg/L)
1	0.02
2	0.04
5	0.10

Daily report of Laboratory work

Date	24 May, 2000
Attendance	(initial of attendance) ~~Hashim Al Zawad~~ Qusai Bohlaiqah Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, TOC, AAS, BTEX, CN and Oil and Grease Meeting with BeeA'h

Details	Training of analysis procedure Coliform (Jamal) Counting TOC (Jamal) Operation of equipment Sample preparation AAS (Jamal) Operation of equipment GC (Qusai) Preparation for standard solution Calibration CN (Alam) Discussion about measurement procedure Oil and Grease (Alam) Discussion about solvent extraction procedure Meeting with BeeA'h Analysis results in last stage Trace analysis of metal in seawater Attached document(s) Meeting memorandum

Daily report of Laboratory work

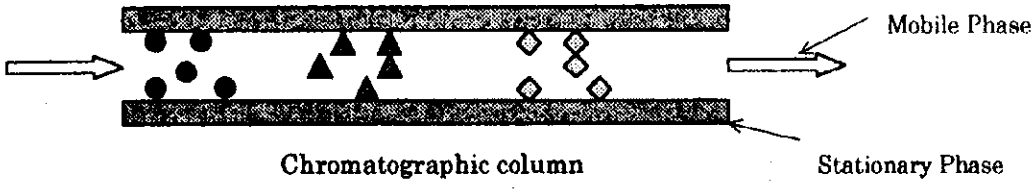
Date	27 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Y. Imaeda Hiroyuki Oi H.O Mamoru Sato
Subjects	Training of analysis procedure Coliform, BTEX, CN and Oil and Grease

Details	Training of analysis procedure Coliform (Jamal) Test analysis GC (Qusai) Discussion of theory CN (Alam) Discussion about measurement procedure Oil and Grease (Alam) Discussion about solvent extraction procedure Attached document(s) Text of theory for GC

Gas Chromatography

Chromatography is a group of analysis methods for separating very small quantities of complex mixtures with high resolution.

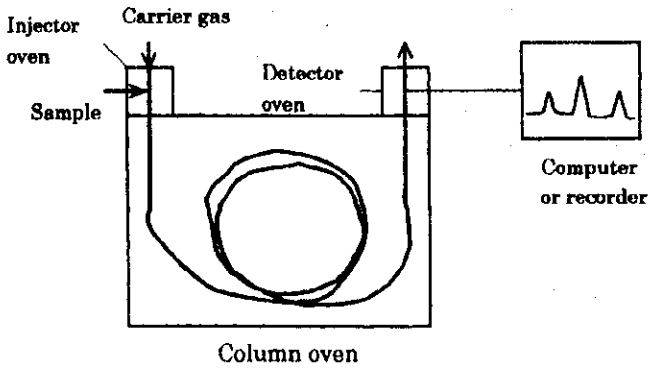
The basis of chromatography is the partition of the sample compounds between a stationary phase and a mobile phase which flows over or through the stationary phase.



A material in the mobile phase which has a stronger affinity for the stationary phase spends more time immobilized in that phase.

Gas chromatography employs an inert gas as the mobile phase and a solid absorbent or a non-volatile liquid coated on solid support as the stationary phase.

Separation depends on the relative partial pressures of the sample components above the stationary phase.



GC detector

After the components of mixture are separated in he chromatography column, they must be detected at the outlet so that they can be identified and measured.

FID (Flame ionization detector) is nearly universally sensitive to organic compounds and shows good sensitivity and linearity. The column effluent is fed into a flame fueled by hydrogen with a forced air flow. A potential of several hundred volts is imposed between the tip of flame burner and the collector. As the sample component burn, they produce a burst of ions. These produce a tiny current and measured by a electrometer.

Head space screening for VOCs

The head space analyzer is useful for VOC (volatile organic compound) measurement in water sample.

The sample is sealed into a septum-topped vial. The concentration of VOC in the head space gas is equilibrated by concentration in the liquid phase under certain temperature. The VOC concentration in he head space can be increased by raising temperature and by adding salt which helps to reduce the solubility of VOC in the water.

Internal Standard Method

An internal standard (IS) is known amount of a compound, different from analyte, that is added to the unknown. Signal from analyte is compared with signal from the IS to find out how much analyte is present.

IS is especially useful for analysis in which the quantity of the instrument response varies slightly from run to run for reasons that are difficult to control.

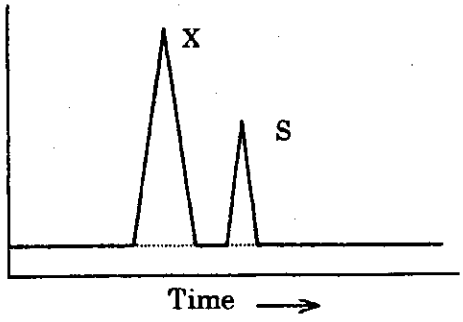
A calibration curve is only accurate for the one set of conditions under which it was obtained. However, the relative response of the detector to the analysis and standard is usually constant over a wide range of conditions.

IS is widely used in chromatography because the small quantity of sample injected into the chromatograph is not very reproducible in some expeiments.

$$\frac{Ax}{X} = F\frac{As}{S}$$

where,

Ax: area of analyte signal
As: area of IS signal
X: concentration of sample
S: concentration of IS
F: response factor



Daily report of Laboratory work

Date	28 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Y.I. Hiroyuki Oi H.O. Mamoru Sato
Subjects	Training of analysis procedure Coliform, BTEX, Metals and Oil and Grease

Details	Training of analysis procedure Coliform (Jamal) Test analysis Explanation of result Metals (Jamal) Decomposition procedure (outline) Measurement procedure GC (Qusai) Operation Oil and Grease (Alam) Analysis of standard solution prepared in the laboratory Attached document(s) Analysis procedure (metals)

Metals in sediment (Cd, Pb, Cu, Zn, Co, Ni, Cr and V)

dry sample — approx. 2g, 250ml beaker (record the weight)
take into fume hood and cover with watch glass
← HNO3 approx.10ml, little by little
← HCl approx.20ml, little by little

stand — until reaction will finish

heat — hot plate, about 180 degrees,
cover with watch glass, for about 30min. (never make dryness)
do not overheat, or splashing will happen

cool — for 5 min.
← HNO3 approx.20ml

heat — hot plate, about 180 degrees,
cover with watch glass, but make some space for escape of vapor
for 30min. (never make content dryness)
do not overheat, or splashing will happen

cool — for 5 min.
← water approx. 50ml

heat — hot plate, about 120 degrees
cover with watch glass, for 15 min.

cool — for 5 min.

filtrate — wash residue with HCl(1+10)

residue (discard)

solution — into 250ml beaker
if color of solution is black or dark brown, stop process
and ask supervisor for extra treatment

heat — hot plate, about 180 degrees, for 30 min.
without watch glass, never make content dryness

cool — to room temperature

transfer — into 100ml volumetric flask

fill up ← water, to marked line

measure AAS

AAS condition

N2O-C2H2 flame: V, (Cr)

Air-C2H2 flame: others

Standard solutions

HCl 2ml / 100ml solution

(ppm)

elements	Cal 0	Cal 1	Cal 2
Cd	0	1	2
Ni	0	5	10
Cr	0	10	20
Co	0	5	10
V	0	50	100
Zn	0	0.5	1
Pb	0	10	20
Cu	0	5	10

Calculation

metal (ppm) = a * 100 / V

where;

a: metal concentration in measured solution (mg/L)

100: volume of measured solution (ml)

V; taken sample amount (g)

Daily report of Laboratory work

Date	29 May, 2000
Attendance	(initial of attendance) ~~Hashim Al Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, BTEX, Metals and Oil and Grease

Details	Training of analysis procedure Coliform (Jamal) Counting Metals (Jamal) Decomposition procedure GC (Qusai) Preparation for standard solution Calibration Oil and Grease (Alam) Purification of used extraction solvent Attached document(s)

Daily report of Laboratory work

Date	30 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ ~~Qusai Bohlaiqah~~ Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, NH3, TSS, Chlorophyll, Metals and Oil and Grease

Details	Training of analysis procedure Coliform (Jamal) Counting Measurement of seawater sample Metals (Jamal) Decomposition procedure Preparation of calibration solution TSS Preparation of analysis Chlorophyll Preparation of analysis Oil and Grease (Alam) Purification of used extraction solvent NH3 (Alam) Study on the measurement procedure Attached document(s)

Daily report of Laboratory work

Date	31 May, 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, Metals, Chlorophyll, TPH and Oil and Grease

Details	Training of analysis procedure Coliform (Janal) Measurement of seawater sample Metals (Jamal) Measurement with AAS Theory of measurement Explanation of "blank test" and contamination Chlorophyll (Qusai) Analysis operation Oil and Grease (Alam) Exercise of measurement using seawater TPH (Alam) Exercise of measurement using seawater Attached document(s) Analysis procedure (Chlorophyll)

Chlorophyll a – SM 10200 H

Spectrophotometric Method

[Apparatus]

- Glass-fiber filter paper, 47 mm diam
- Filtrate system
- Centrifuge Tube with stopper (15 ml)
- Centrifuge
- Spectrophotometer

[Chemicals]

① Magnesium Carbonate solution

Dissolve 1.0 g $MgCO_3$ to 100 ml water

② Acetone solution (90 %) – prepare when it is needed

mix 90 ml acetone with 10 ml water

[Operation Flow]

Aliquot of Sample put V ml of sample (about 1000 ml) into filtration funnel
↓ with magnesium carbonate solution ① 1 ml
Filtrate

sample on filter may be placed in airtight plastic bag and stored frozen for 3 weeks

Filter into centrifuge tube
↓ ← acetone solution ② v ml (10 – 15 ml)
Stand in cool and dark place, 1 hour
↓
Centrifuge 3000 rpm, 10 min.
↓
Pour upper layer into test tube
↓
Spectrophotometer with 10 mm cell at wavelength: 750, 664, 647 and 630 nm
Contrast solution is Acetone solution②

[Calculation]

Chlorophyll a (μg/L) = {11.85*(OD664) – 1.54*(OD647) – 0.08*(OD630)} × v/V

OD664, 647, 630: corrected optical densities (– OD750)
v: volume of acetone solution (ml)
V: volume of sample (L)

Daily report of Laboratory work

Date	3 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ ~~Qusai Bohlaiqah~~ Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, Metals, LOI and TPH

Details	Training of analysis procedure Coliform (Janal) Counting Metals (Jamal) Decomposition procedure Loss of Ignition Preparation TPH (Alam) Exercise of measurement using sediment Attached document(s)

Daily report of Laboratory work

Date	4 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi H.O Mamoru Sato
Subjects	Training of analysis procedure Coliform, Metals, TOC, CN, TSS and LOI

Details	Training of analysis procedure Coliform (Janal) Practice with seawater Metals (Jamal) Preparation TOC (Jamal) Measurement of seawater CN (Alam) Study on analysis TSS (Qusai) Measurement Loss of Ignition (Qusai) Measurement Attached document(s)

Daily report of Laboratory work

Date	10 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ ~~Qusai Bohlaiqah~~ Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Sample analysis Training of analysis procedure Coliform, TOC, Phenol and TKN

Details	Training of analysis procedure Coliform (Jamal) Discussion about sterilization procedure Blank teat TOC in sediment Preparation of chemicals TOC in seawater Fundamentals Phenol (Alam) Calibration TKN Measurement Attached document(s) Materials used for explanation of TOC measurement

TOC total organic carbon

- IC inorganic carbon
- OC organic carbon
- TC total carbon

(TC = IC + OC .....)
(total = inorganic + organic)

measure
IC and TC

OC (=TOC) = TC − IC

if IC = 0

then OC = TC − IC
= TC − zero = TC
OC = TC

(organic compounds contain C)

what is IC?

IC is CO_2 (gas)
(CO_3^{2-} (in liquid))

in seawater
IC is CO_3^{2-}

if we can remove CO_3^{2-} from seawater (sample)

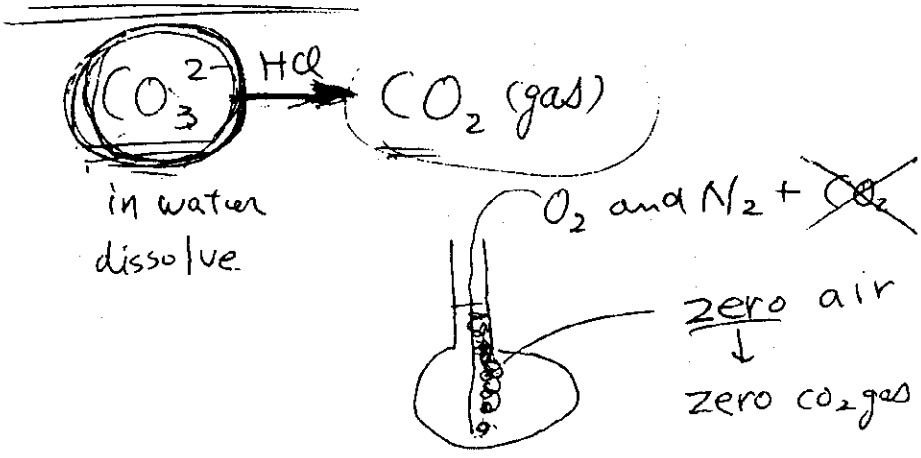
$IC = O$

$IC = (CO_3^{2-})$ ← remove

$\doteq O$

how to remove CO_3^{2-} in water?

add HCl, why?



{add HCl, bubling → CO_2 (gas) ↑ out of sample

$IC = O$

↓

$OC (= (TOC)) = TC$

organic total

Daily report of Laboratory work

Date	7 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ ~~Qusai Bohlaiqah~~ Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, NH3 and TKN

Details	Training of analysis procedure Coliform (Jamal) Counting NH3 (Alam) Distillation TKN Measurement Preparation of sample bottle Attached document(s)

Daily report of Laboratory work

Date	6 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Coliform, Metals, CN and TKN

Details	Training of analysis procedure Coliform (Jamal) Test of sterilization Metals (Jamal) Measurement Explanation of field note Calculation CN (Alam) Distillation and measurement TKN (Qusai) Measurement Explanation of sampling schedule Attached document(s) Schedule of sampling Field note for metal analysis

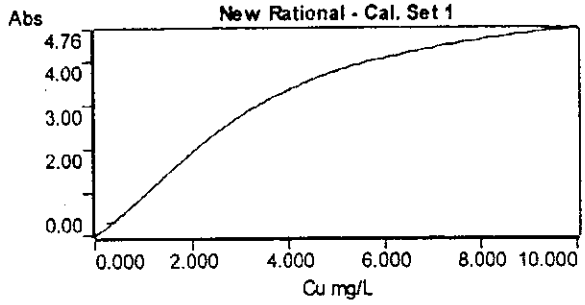
Date	Sample ID	Water Sample																	Sediment Sample								
		Plastic Bottle												Glass Bottle				whirl-pak	whirl-pak							Glass Bottle
		500ml					1 L		2 L					250ml	500ml	1 L		125ml	350ml							500ml (wide mouth)
		HNO_3(1+1) 5 ml 2 bottles					NaOH 6 - 7 pellets		H_2SO_4(1+3) 15 ml					HCl (1+1) 2 ml	H_2SO_4 (1+3) 8 ml	HCl (1+1) 4 ml	HCl (1+1) 4 ml	(sterile)									
		Metals	*As*	*Cr*	*Hg*	Mg	CN	TSS TDS	chloro-phyll	TOC	TKN	T-P	NH_3	BTEX	Phenol	Oil & Grease	TPH	coliform	Ignite Loss	TOC	Metals	As	Cr	Hg	V	TPH	BTEX
10-Jun	H4O							o																			
	H5O	o						o		o						o					o					(o)	(o)
11-Jun	H1							o	o		o	o								o							
	H2								o																		
12-Jun	K7	o				o																					
	K8	o	o	o		o													o	o	o	o	o				
13-Jun	K4							o		o	o	o	o			o		o	o	o	o	o	o				
	K5	o	o	o				o		o	o	o	o			o		o	o	o	o	o	o			o	
	K6					o		o		o	o	o						o		o							
14-Jun	K1							o	o		o	o							o	o	o	o	o				
	K2	o	o	o	o	o		o		o	o	o	o			o		o	o	o	o	o	o	o	o		
	K3							o	o	o	o	o							o	o	o	o					
17-Jun	T11O	o	o	o	o			o		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
18-Jun	T6	o	o	o	o	o		o	o	o	o	o	o					o		o	o	o	o			o	
	T7							o	o	o	o	o	o					o									
	T12O	o	o	o	o	o		o	o	o	o	o	o					o									
19-Jun	T2							o	o	o	o	o	o					o	o	o	o						
	T3							o	o		o	o	o					o									
	T4							o		o	o	o	o					o	o	o	o					o	
20-Jun	R1								o							o	o		o	o	o				o	o	o
	R2																				o		o		o	o	
	R4O	o						o						o	o		o				o	o	o	o	o	o	o
24-Jun	J1	o	o	o	o	o	o	o	o	o	o	o	o						o	o	o	o	o	o	o	o	o
	J2															o					o		o		o	o	
	J4							o	o		o	o															
25-Jun	J5	o	o	o	o	o	o	o		o	o	o	o		o	o			o	o	o	o	o	o	o	o	
	J6	o_1	o	o	o		o	o	o	o	o	o							o	o	o	o	o	o	o	o	
	J7								o	o	o	o									o						
26-Jun	J8O							o								o	o				o		o			o	o
	J9O									o																	
27-Jun	DD2O										o	o							o	o	o	o	o		o	o	

Analyst
Date Started 10:11 AM 6/6/00
Worksheet 6-6test
Comment Sato
Methods Cd,Pb,Zn,Cu,Co,Ni

Nominal Weight = 1.0000 Nominal Volume = 100.00

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.000	26.2	-0.0012	1.0000	100.00	-0.0008	-0.0015	-0.0012
STANDARD 1	5.000	0.6	3.7590	1.0000	100.00	3.7617	3.7808	3.7343
STANDARD 2	10.000	0.2	4.7525	1.0000	100.00	4.7615	4.7434	4.7527



Curve Fit = New Rational
Characteristic Conc = 0.006 mg/L
r = 1.0000
Calculated Conc = -0.002 5.000
Residuals = 0.002 0.000

Sample 001	0.342	1.1	0.2761	1.0000	100.00	0.2754	0.2736	0.2794
Sample 002	0.267	0.6	0.2123	1.0000	100.00	0.2128	0.2133	0.2108
Sample 003	0.237	0.4	0.1872	1.0000	100.00	0.1876	0.1864	0.1876
Sample 004	0.010	9.7	0.0074	1.0000	100.00	0.0081	0.0067	0.0073
Sample 005	4.874	0.3	3.7130	1.0000	100.00	3.7237	3.7157	3.6998

Chemical analysis field note (AAS)

Cu

date dd/mm/yy	Name
3-6-2000	JAMAL KAZIH

#	Sample name	Sample Amount (g)	Concentration in solution (mg/L=ppm)	Final voume (ml)	-B. T.		PPM	Concentration in sample (ppm)
1	R_1	2.0506	0.342	100	0.332		16.19	16
2	$\overline{J1}$	2.2986	0.267	100	0.257		11.18	11
3	$\overline{J1}$	2.0042	0.237	100	0.227		11.32	
4	Blank Test	0	0.010	100	—			
5			4.874					

	Conc. of std. sol'n. (mg/L)	Absorbance (Abs.)	
1	5.0	3.75	
2	10.0	4.75	

$$\text{metal (ppm)} = \frac{\text{Sample} - \text{B.T.} \times a}{\text{Sample weight (g)}}$$

A-100

Chemical analysis field note (AAS)

Zn

date dd/mm/yy 3-6-2000	Name JAMAL KAZIM	

#	Sample name	Sample Amount (g)	Concentration in solution (mg/l = ppm)	Final voume (ml)	– B.T.		ppm	Concentration in sample (ppm)
1	R1	2.0506	over	100				
2	J1	2.2986	0.3132	100	0.2506		10.9 ~~0.109~~	12.45
3	J1	2.0042	0.2818	100	0.2820		14.0	12
4	Blank Test	0	0.0312	100	—			
5	Cal. 1 (STD)		0.5262					

	Conc. of std. sol'n. (mg/l)	Absorbance (Abs.)	
1	0.5	2.01	
2	1.0	2.96	

$$\text{metal (ppm)} = \frac{\text{Sample (mg/l)} - \text{B.T.}}{\text{Sample weight (g)}} \times 100$$

Chemical analysis field note (AAS)

Cd

date dd/mm/yy	Name
3 – 6 – 2000	JAMAL KAZIM

#	Sample name	Sample Amount (g)	Concentration in solution (mg/l = ppm)	Final voume (ml)	– B. T.		PPM	Concentration in sample (ppm)
1	R1	2.0506	0.047	100	0.041		1.99	2
2	J1	2.2986	0.045	100	0.039		1.69	2
3	J1	2.0042	0.040	100	0.034		1.69	
4	BLank Test	0	0.006	100	——			
5			0.941					

	Conc. of std. sol'n. (mg/l)	Absorbance (Abs.)	
1	1	3.52	
2	2	5.10	

$$\text{metal (ppm)} = \frac{\text{Sample} - \text{B. T.}}{\text{Sample weight (g)}} \times 100$$

Daily report of Laboratory work

Date	5 Jun., 2000
Attendance	(initial of attendance) ~~Hashim Al-Zawad~~ Qusai Bohlaiqah Qusai M. Alam Nizami Jamal Kazim Yoshitaka Imaeda Hiroyuki Oi Mamoru Sato
Subjects	Training of analysis procedure Metals, Coliform, CN, BTEX and LOI

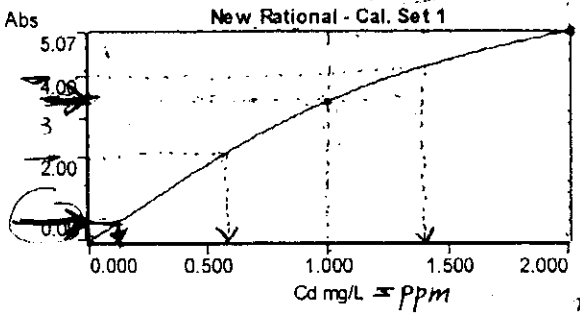
Details	Training of analysis procedure Metals (Jamal) Measurement Explanation of result Coliform (Jamal) Practice CN (Alam) Preparation of reagents BETX in sediment (Qusai) Measurement Loss of Ignition (Qusai) Measurement Attached document(s) materials for explanation of metal measurement

Analyst
Date Started 11:53 AM 5/31/00
Worksheet may 31test
Comment Sato
Methods Cd,Pb,Zn,Cu,Co,Ni

Nominal Weight = 1.0000 Nominal Volume = 100.00

name **Method: Cd (Flame)**

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.000	15.9	-0.0142	1.0000	100.00	-0.0149	-0.0117	-0.0160
STANDARD 1	1.000	0.9	3.3576	1.0000	100.00	3.3881	3.3531	3.3315
STANDARD 2	2.000	0.7	5.0713	1.0000	100.00	5.0361	5.0666	5.1114



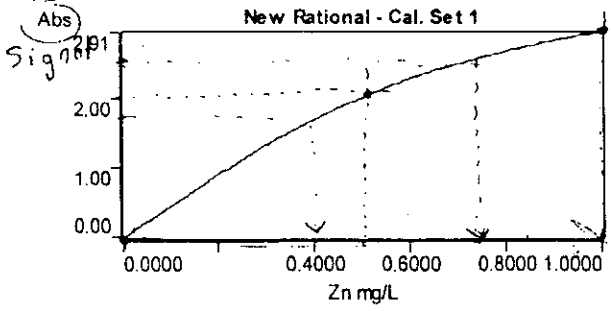
mg/l = ppm

Curve Fit = New Rational
Characteristic Conc = 0.001 mg/L
r = 1.0000
Calculated Conc = -0.004 1.000 2.000
Residuals = 0.004 0.000 0.000

Sample 001	0.024	2.3	0.0820	1.0000	100.00	0.0840	0.0802	0.0819
Sample 002	0.023	4.6	0.0787	1.0000	100.00	0.0745	0.0813	0.0802
Sample 003	0.047	2.2	0.1600	1.0000	100.00	0.1616	0.1623	0.1560
Sample 004	0.012	1.1	0.0394	1.0000	100.00	0.0399	0.0392	0.0390
Sample 005	0.980	0.8	3.3051	1.0000	100.00	3.3344	3.2942	3.2868

Method: Zn (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.0000	>100	-0.0006	1.0000	100.00	0.0007	-0.0009	-0.0016
STANDARD 1	0.5000	0.5	1.9920	1.0000	100.00	1.9939	1.9819	2.0001
ST ARD 2	1.0000	0.2	2.9141	1.0000	100.00	2.9109	2.9204	2.9111



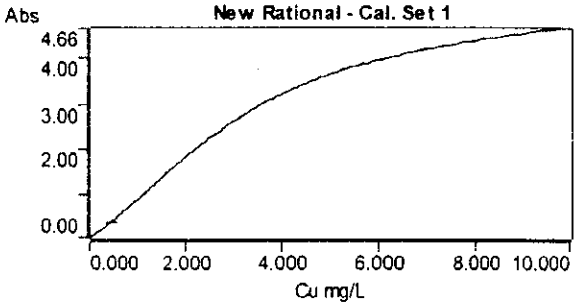
Curve Fit = New Rational
Characteristic Conc = 0.0011 mg/L
r = 1.0000
Calculated Conc = -0.0001 0.5000 1.0000
Residuals = 0.0001 0.0000 0.0000

Sample 001	0.8803	0.4	2.7619	1.0000	100.00	2.7567	2.7551	2.7739
Sample 002	0.4430	0.3	1.8202	1.0000	100.00	1.8185	1.8165	1.8256

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
Sample 003	0.1037	0.8	0.4413	1.0000	100.00	0.4439	0.4374	0.4426
Sample 004	0.4276	1.0	1.7702	1.0000	100.00	1.7681	1.7530	1.7896
Sample 005	0.4849	0.2	1.9483	1.0000	100.00	1.9519	1.9460	1.9468

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.000	33.4	-0.0006	1.0000	100.00	-0.0008	-0.0007	-0.0004
STANDARD 1	5.000	0.2	3.6337	1.0000	100.00	3.6323	3.6433	3.6257
STANDARD 2	10.000	0.2	4.6571	1.0000	100.00	4.6644	4.6492	4.6578



Curve Fit = New Rational
Characteristic Conc = 0.006 mg/L
r = 1.0000
Calculated Conc = -0.001 5.000
Residuals = 0.001 0.000

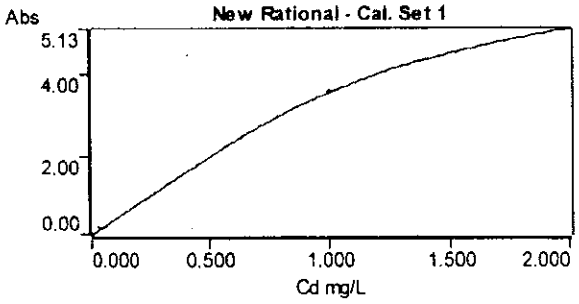
Sample 001	0.431	0.6	0.3394	1.0000	100.00	0.3373	0.3398	0.3411
Sample 002	0.135	0.6	0.1004	1.0000	100.00	0.0998	0.1003	0.1010
Sample 003	0.141	1.2	0.1056	1.0000	100.00	0.1068	0.1043	0.1056
Sample 004	0.457	1.2	0.3620	1.0000	100.00	0.3641	0.3650	0.3569
Sample 005	4.880	0.3	3.5892	1.0000	100.00	3.5849	3.6024	3.5803

Analyst
Date Started 10:26 AM 6/5/00
Worksheet 5-6test
Comment Sato
Methods Cd,Pb,Zn,Cu,Co,Ni

Nominal Weight = 1.0000 Nominal Volume = 100.00

Method: Cd (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.000	8.9	-0.0163	1.0000	100.00	-0.0147	-0.0175	-0.0169
STANDARD 1	1.000	0.4	3.5290	1.0000	100.00	3.5395	3.5367	3.5108
STANDARD 2	2.000	0.8	5.1056	1.0000	100.00	5.1260	5.1300	5.0609

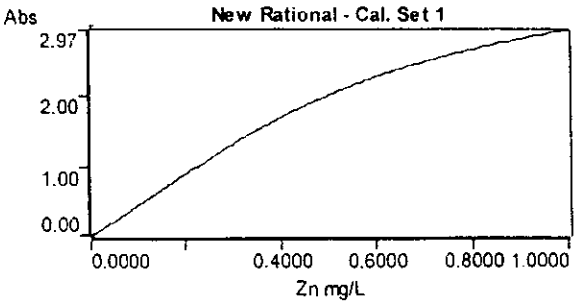


Curve Fit = New Rational
Characteristic Conc = 0.001 mg/L
r = 1.0000
Calculated Conc = -0.005 1.000
Residuals = 0.005 0.000

Sample 001	0.047	1.5	0.1675	1.0000	100.00	0.1704	0.1662	0.1659
Sample 002	0.045	0.5	0.1608	1.0000	100.00	0.1609	0.1599	0.1616
Sample 003	0.040	0.8	0.1439	1.0000	100.00	0.1449	0.1428	0.1441
Sample 004	0.006	14.7	0.0223	1.0000	100.00	0.0249	0.0235	0.0186
Sample 005	0.941	0.7	3.3774	1.0000	100.00	3.3515	3.3811	3.3997

Method: Zn (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
CAL ZERO	0.0000	44.2	0.0020	1.0000	100.00	0.0015	0.0014	0.0030
STANDARD 1	0.5000	0.7	2.0100	1.0000	100.00	2.0043	1.9992	2.0265
STA `\RD 2	1.0000	0.4	2.9626	1.0000	100.00	2.9748	2.9645	2.9484



Curve Fit = New Rational
Characteristic Conc = 0.0011 mg/L
r = 1.0000
Calculated Conc = 0.0005 0.5000
Residuals = -0.0005 0.0000
W0545: Sample result OVER the calibration range

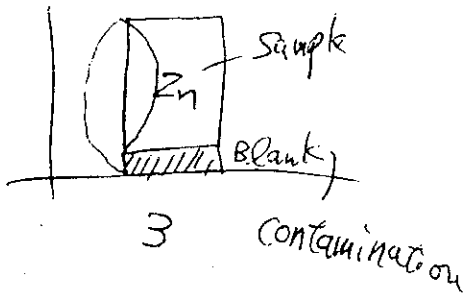
Sample ID	Conc mg/L	%RSD	Mean Abs	Weight	Volume	Readings		
Sample 001	OVER	0.0	3.5305	1.0000	100.00	3.5305		
Sample 002	0.3132	1.4	1.3627	1.0000	100.00	1.3408	1.3734	1.3739
Sample 003	0.2818	0.6	1.2340	1.0000	100.00	1.2341	1.2270	1.2410
Sample 004	0.0312	1.2	0.1283	1.0000	100.00	0.1265	0.1287	0.1297
Sample 005	0.5262	0.6	2.0847	1.0000	100.00	2.0706	2.0946	2.0888

Sample 3

0.2818 mg/l

B.T. 0.0312 mg/l

0.2506 mg/l



3 Contamination

Sample 2

0.3132

B.T. 0.0312

0.2820

Chemical analysis field note (AAS)

Zn

date dd/mm/yy 3-6-2000	Name JAMAL KAZIM	

#	Sample name	Sample Amount (g)	Concentration in solution (mg/l = ppm)	Final voume (ml)	– B.T.		ppm	Concentration in sample (ppm)
1	R1	2.0506	over	100				
2	J1	2.2986	0.3132	100	0.2506			
3	J1	2.0042	0.2818	100	0.2820			
4	Blank Test	0	0.0312	100	—			
5	Cal. 1 (STD)		0.5262					

	Conc. of std. sol'n. (mg/l)	Absorbance (Abs.)	
1	0.5	0.201	
2	1.0	2.96	

$$\text{metal (ppm)} = \frac{\text{Sample (mg/l)} - \text{B.T.}}{\text{Sample weight (g)}}$$

Data Sheet of TSS

No. 1

Corrected

	filter No.	initial weigh b (g)	after weight a (g)	balance (mg (a - b)*1000	revised (mg)	sample ID No.	sample volume(ml)	calculated value (mg/L)	Note
6/10	1	0.3422	0.3470	48	47	H40	980	5 (x8) (48)	
	2	0.3428	0.3475	47	46	H50	1000	5 (x6)	
	3	0.4802	0.4803	*0.1	—	blank	—	—	
						H1			
6/11	4	0.4836	0.4869	3.3	3.3	~~T6~~	1000	3	
	5	0.4816	0.4988	17.2	17.2	T6	~~1000~~ 700	25	Yellow color Drainage
	6	0.3441	0.3503	6.2	6.2	T7	480	13	
	7	0.3442	0.3479	3.7	3.7	T120	990	4	

Date	Name
11 June 2000	Qusai M.

Data Sheet for NH3, TKN

Bk - 0.004
TKN - 0.020
NH_3 - 0.013

No. 2

No.	sample I.D.	TKN or NH_3	Digestion volume (ml)	Distillation volume (ml)	Absorbance	corrected	Nitrogen contents (µg)	Concentration (mg/L)
1	K4	NH_3	/	300	0.076	0.054	43	0.1
2	K5	/		300	0.945	0.923	73.8	2.0
3	water	/		300	0.018	—		
4	K4	TKN	200		0.285	0.261	20.9	0.5
5	K5	/	200		1.076	1.052	84.2	3.4
6	K6	/	200		1.170	0.146	11.7	0.5
			0					

Date	Name
13 June	Qusai M.

Standards (Flour)

	N[redacted] (µg)	ABS
7	0	0.004
8	25	0.327
9	50	0.777
10	100	1.175

Data Sheet of Chlorophyll a

No. 1

Filtration **Measurement**

	No.	sample I.D.	sample volume (L)	Note		wave length of spectrophotometer 750 nm a	664 nm b	647 nm c	630 nm d	calculated value (μg/L) C	Note
					contrast (blank)	0.000	0.605	0.606	0.607		
6/12	1	H1	1.00		absorbance	0.000	0.615	0.609	0.609		
					- blank	0.000	0.010	0.003	0.002	1.14	
	2	T6	0.99	Drain Yellow color	absorbance	0.270	0.943	0.743	0.702		
					- blank	0.270	0.338	0.137	0.002	10.42	
	3	T7	1.00		absorbance	0.005	0.718	0.641	0.634		
					- blank	0.005	0.113	0.035	0.027	12.32	
	4	T120	1.00		absorbance	0.001	0.613	0.608	0.608		
					- blank	0.001	0.008	0.002	0.001	0.81	
6/14	5	K1	1.00		absorbance	0.000	0.605	0.603	0.604		TR < 0.1
					- blank	0.000	0.000	-0.001	0.000	0.02	
	6	K3	0.99		absorbance	-0.001	0.608	0.606	0.607	3	
					- blank	0.000	0.003	0.002	[illegible]	0.02	
	7	H2	1.00			0.000	0.615	0.608	0.608	0.12	
						0.000	0.010	0.004			

$C = \{11.85(b - a) - 1.54(c - a) - 0.08(d - a)\} \times 10/V$

Date	Name
12 June	Oki

Date	Name
19 June	Qusai M.

Appendix D

Documents on Satellite Image Work

Daily Report of Satellite Data Analysis

Daily report of Satellite Data Analysis

Date	20 Jun, 2000	
Attendence	Mohammed A. Bukhari	(initial of attendence)
	Krishna Kumar Mishra	
	Akihiro Sugita	
Subject	Satellite Data Processing Work	

Deatails	Explanation of the Satellite Data brought from Japan Initial discussions about processing the data

Daily report of Satellite Data Analysis

Date	21 Jun, 2000	
Attendence	Mohammed A. Bukhari	(initial of attendence)
	Krishna Kumar Mishra	
	Akihiro Sugita	
Subject	Satellite Data Processing Work	

Deatails	Arrangement & Installation of the Data Processing Units

Daily report of Satellite Data Analysis

Date	24 Jun, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Data Transferring to the UNIX WORKSTATION TM data brought from Japan were installed to the computer hard disk

Daily report of Satellite Data Analysis

Date	25 Jun, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Required TM data were subset from the loaded data Data display procedures and understanding of image viewing properties (image contrast adjustment, histogram manipulation etc.)

Daily report of Satellite Data Analysis

Date	26 Jun, 2000	
Attendence		(initial of attendence)
	Mohammed A. Bukhari	
	Krishna Kumar Mishra	
	Akihiro Sugita	
Subject	Satellite Data Processing Work	

Deatails	Satellite Data Processing Geo-referencing of the original TM data

Daily report of Satellite Data Analysis

Date	27 Jun, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Geo-referencing of the original TM data

Daily report of Satellite Data Analysis

Date	28 Jun, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Processing for temperature distribution Utilization of TM Band 6 Selection of temperture range over water surface Deciding the TM digital numbers (DNs) in accordance to temperature distribution chart

Daily report of Satellite Data Analysis

Date	1 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Processing for temperature distribution Performing the correlation analysis Preparation of the final classcs for the distribution Image mosaic of the analyzed images

Daily report of Satellite Data Analysis

Date	2 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Creation of the map by Map Composer for printing the output map of the distribution Conversion to Tiff file for printing

Daily report of Satellite Data Analysis

Date	3 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Processing for suspended solids distribution Utilization of TM bands 1,2,3,4 for Spectral Enhancement by Principal Component Analysis (PCI) Hard disk adjustment for huge file generation as temporary files before completion of the analysis

Daily report of Satellite Data Analysis

Date	4 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Continuation of the PCI analysis and adjustment of available disk space

Daily report of Satellite Data Analysis

Date	5 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Utilization of TM band 3 for the suspended solids analysis as PCI analysis resulted technical troubles Slicing on TM 3 DNs selection for correlation analysis

Daily report of Satellite Data Analysis

Date	8 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Finalization of the categories for the distribution Preparation of the mosaic images Creation of the map composer Coversion to Tiff file for printing

Daily report of Satellite Data Analysis

Date	9 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Chlorophyll distribution analysis Selection of TM band 4 Slicing the image DNs selection Classes selection for the distribution

Daily report of Satellite Data Analysis

Date	10 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Classes selection for the distribution Correlation analysis Recoding of the prepared image Mosaic images

Daily report of Satellite Data Analysis

Date	11 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Map composer preparation Conversion of the image data to TIFF form Print the color hard copies

Daily report of Satellite Data Analysis

Date	12 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Classification of the data Unsupervised classification Recoding of the data Mosaicing Map composer Hard copy printing

Daily report of Satellite Data Analysis

Date	13 July, 2000
Attendence	(initial of attendence) Mohammed A. Bukhari Krishna Kumar Mishra Akihiro Sugita
Subject	Satellite Data Processing Work

Deatails	Satellite Data Processing Final reviewing of the whole processing

Appendix E

Documents of Workshop I

Workshop Program
List of Participants
Resume of Presentation
Q & A Summary

KINGDOM OF SAUDI ARABIA
Ministry of Defence & Aviation
Meteorology & Environmental
Protection Administration (MEPA)
Eastern Province

المملكة العربية السعودية
وزارة الدفاع والطيران
مصلحة الارصاد وحماية البيئة
المنطقة الشرقية

الرقم: .....

التاريخ : .....

المرفقات : .....

الموضوع : .....

WORKSHOP PROGRAM

Introduction:
Reference to the agreement between JICA (Japan International Cooperation Agency) and MEPA (Meteorology & Environmental Protection Administration) one day workshop program will be held on at Dammam MEPA office dated 07 July 1999. The title of this workshop is "**Environmental Assessment and Water Quality Monitoring Program in the Arabian Gulf**".

Program

1. **Location:** Office of MEPA Eastern Province
   Post Box # 117, Dhahran - 31932
   Phone # 03-857-6260, Fax # 03-857-6752

2. **Date/Time:** July 07, 1999 / 08:30 AM

3. **Chairman:** Dr. Abdul Rahman Al-Arfaj from 8:30AM - 10:30 AM
   Mr. Aziz Al-Omari from 10:50 AM - 12:00 noon

4. **Schedule:**
   08:30 - 08:40 Mr. Hamdan Al -Ghamdi, Welcome speech
   08:40 - 08:50 Mr. Yasuhiro Shimazu, Introduction of the work
   08:50 - 09:20 Mr. Aziz Al-Omari, Mepa rule & the management of the project
   09:20 - 09:30 Question & Answer
   09:30 - 09:50 Dr. Robert Hilliard, Deign of water monitoring
   09:50 - 10:00 Discussion
   10:00 - 10:15 Mr. kazutake Tanaka, Socio- economical frame work of the project
   10:15 - 10:30 Mr. Khaled Al-Rasheed, Cooperation, coordinate with coast guard
   10:30 - 10:50 Coffee Break
   10:50 - 11:40 Discussion
   11:40 - 11:50 Conclusion & summery by the chairman
   11:50 - 12:00 Closing speech by Mr. Hamdan

5. 12:00- 12:30 **Pray time**

6. 12:30 - **Buffet Party.**
   All workshop participants are invited for buffet party.

ص . ب ١١٧ مطار الظهران الدولي ٣١٩٣٢ - تلفون ١٤٢٨ / ٠٨٧٦ / ٦٢٦٠ / ٦٥٢٠ - ٨٥٧ (٠٣) - تلكس : ٨٠٣٤٨٩ مسيبا س ج - فاكس : ٥٣٠٤ / ٦٧٥٢ - ٨٥٧ (٠٣)

"An Environmental Assessment and Water Quality Monitoring of Arabian Gulf in the Kingdom of Saudi Arabia"

WORKSHOP PROGRAM

Date : 07 July 1999
At 08:00 AM
Dammam MEPA office
Eastern Region

The Workshop Participant name and address are under listed below.

1. Name : Dr. Akhtar H. Khan Company/Agency Name : National Environmental Presentation Co. Rank/Position : Laboratory Manager Address : Post Box # 10628, Jubail - 31961 Tel. # 03 - 358-8008, Ext. # 38 Fax # 03 - 358-8584
2. Name : Mr. Joe A. Company/Agency Name : Saudi Gazette Rank/Position : Bureau Chief Address : Post Box # 2230, Dammam Tel. # 859-4003
3. Name : Dr. Ali Al - Dakhil - Allah Company/Agency Name : KFUPM Rank/Position : Assistant Professor Address : Post Box # 646, Dhahran - 31261. Tel # 8603232
4 . Name : Dr. Nabil S. Abuzaid Company/Agency Name : KFUPM Rank/Position : Research Engineer Address : Post Box # 951, Dhahran - 31261 Tel. # 03-860-4944 Fax # 03-860-3220
5. Name : Dr. Ghasham I. Al-ghasham Company/Agency Name : Al-Jubail Municipality Rank/Position : Address : Al-Jubail Municipality Tel./Fax # : 03-3623259
6. Name : Khalifa Abdullah Al-Saad Company/Agency Name : Dammam, Municipality Rank/Position : Address : Dammam, Municipality Tel./Fax # 8270131

7. Name : Mr. Zaki Alawi Alawami Company/Agency Name : Dammam, Municipality Rank/Position : Address : Dammam, Municipality Tel./Fax # 8331686
8. Name : Mr. Tawfiq Abdullah Al-Ghenjafi Company/Agency Name : Water and Sewerage Authority Rank/Position : Operation and Maintenance Address : Qatif Tel./Fax # 8558700
9. Name : Al- Mahel Ali Company/Agency Name : Water and Sewerage Authority Rank/Position : Operation and Maintenance Address : Qatif Tel./Fax # 8558700
10. Name : Mohammed Arif Ali Company/Agency Name : SABCO Rank/Position : Engr. Address : Dammam Tel./Fax # 8575784
11. Name : Mr. Raed F. Al Dulaijan Company/Agency Name : Sceco Qurrayah Power Plant. Rank/Position : Supt., Maint. Operation Address : Sceco East. Post Box # 5190, Dammam-31422. Tel. # 8582178/ 8582171 Fax # 8580401
12. Name : Mr. Ibrahim Al Wayel Company/Agency Name : Water Authority Rank/Position : Sanitary Division Address : Post Box # 4650, Dammam- 31198 Tel. # 827222 Ext. 318
13. Name : Mr. Saleh M. Al Hujala Company/Agency Name : C.G. Rank/Position : Major Address : Rastanourah - C.G. Tel./Fax # 6789910
14. Name : Mr. Hussain A. Al-Hajari Company/Agency Name : SAFCO Rank/Position : Senior Progress Engineer Address : Post Box # 553, Dammam-31421. Tel. # 8575011 Ext. 5075 Fax # 8572601
15. Name : Mr. Farrag Khazim Al-Shahri Company/Agency Name : Civil Defense Rank/Position : IOT, Con. Address : Tel. # 0555900176

16. Name : Al Jaber Abdel Rahman
Company/Agency Name : King Faisal University
Rank/Position : Lecturer
Address : KFU, Post Box # 420, Hofuf-31982
Tel. # 5800000 Ext. 1412.

17. Name : Mohammed Hassan Al-Malekh
Company/Agency Name : KFUPM
Rank/Position : Assistant Professor
Address : Post Box # 1150, Dhahran - 31261
Tel. # 8604735

18. Name : Mohammed Al-Owafeir Al-Ghenjafi
Company/Agency Name : King Faisal University
Rank/Position : Assistant Professor (Staff)
Address : KFU, Post # 420, Hofuf
Tel. # 580000 Ext. 1401/1864

19. Name : Mr. Farid Zaki Farid
Company/Agency Name : SCECO
Rank/Position : Plant Engineer
Address : Post Box # 5190, Dammam-31422.
Tel. # 858-2119
Fax # 858-0401

20. Name : Mohammed Masooduddin
Company/Agency Name : Royal Commission
Rank/Position : Env. Control Specialist
Address : Post Box # 10001, Royal commission Jubail - 31961
Tel. # 3413093

21. Name : Mr. Iyad Shanaa
Company/Agency Name : RGME/RC
Rank/Position : Program Manager
Address : Post Box # 10476, Jubail Ind, City-31981
Tel. # 03-341-1749
Fax # 03-341-0120

22. Name : Mr. Tawfiq S. Al-Issa
Company/Agency Name : SAFCO
Rank/Position : Safety Inspector
Address : Post Box # 355, Dammam-31421.
Tel. # 8575011

23. Name : Mr. Abdul Aziz H.M. Al-Thebiani
Company/Agency Name : Royal Commission
Rank/Position : Env. Control Sp.
Address : Jubail Industrial City
Tel. # 3413092

24. Name : A.H. Al Mahasnah
Company/Agency Name : SCECO East.
Rank/Position : Supt. TSD.
Address : Ghazlan Power Plan
Tel. # 6788308, Fax # 6788420

25. Name : Mr. Fareed A. Al Maghlouth Company/Agency Name : Dammam Municipality Rank/Position : Environmental H. Specialist Address : Dammam Tel. # 8341000 Ext. 688
26. Name : Mr. Hamud Nasser Balkhail Company/Agency Name : Coast Guard Rank/Position : Marine Major Address : Jubail Sector Tel. # 3578037
27. Name : Engr. Mohammed Al - Muaid Company/Agency Name : Ministry of Industry Rank/Position : Ist. Industrial Management Address : Dammam Tel. # 8574369 Fax # 8572509
28. Name : Mr. Mansour H. Al-Ali Company/Agency Name : Civil Defense Rank/Position : Captain Address : Qatif Tel. # No tel. number
29. Name : Mr. Ali H. Al-Shihri Company/Agency Name : Coast Guard Rank/Position : Captain Address : Tel. # 8552533
30. Name : Mr. Abdul Hadi SH. Gahtani Company/Agency Name : Coast Guard Rank/Position : Captain Address : Tel. # 8951010
31. Name : Muaid A. Al-Gahtani Company/Agency Name : Coast Guard Rank/Position : Captain Address : Dammam - Sea port Tel. # 8576611

Environmental Assessment and Water Quality Monitoring Program in the Arabian Gulf

1st Workshop

JICA

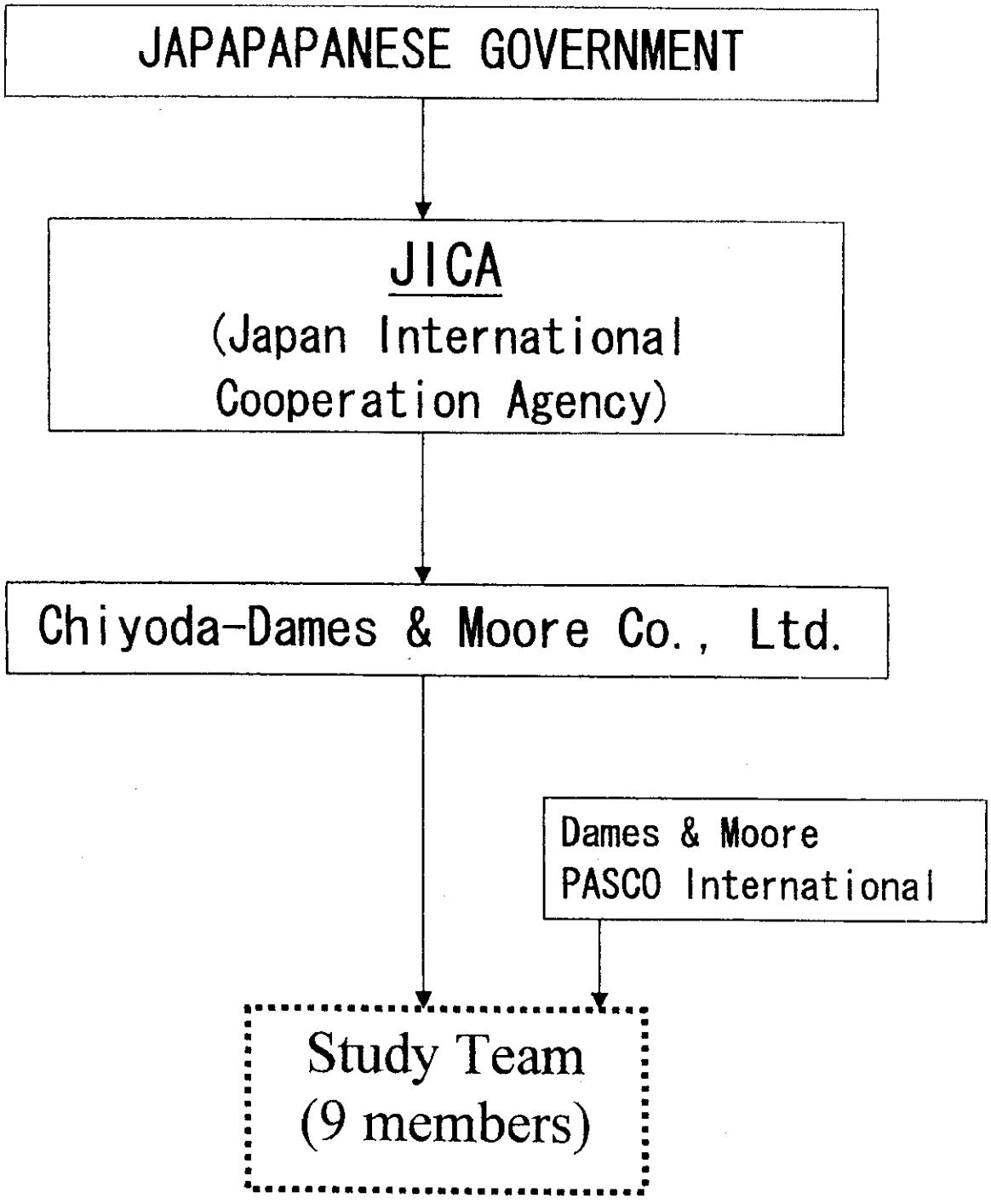
MEPA

7 July 1999

MEPA & JICA

July 7, 1999
Workshop

Introduction of the Work --- Project Summary by Y. SHIMAZU


JAPAPAPANESE GOVERNMENT
JICA
(Japan International
Cooperation Agency)
Chiyoda-Dames & Moore Co., Ltd.
Dames & Moore
PASCO International
Study Team
(9 members)

OBJECTIVES

1) Investigate Water Quality and Cause of Degradation

2) Help Develop a Comprehensive Monitoring Program

3) Strengthen MEPA's Capability

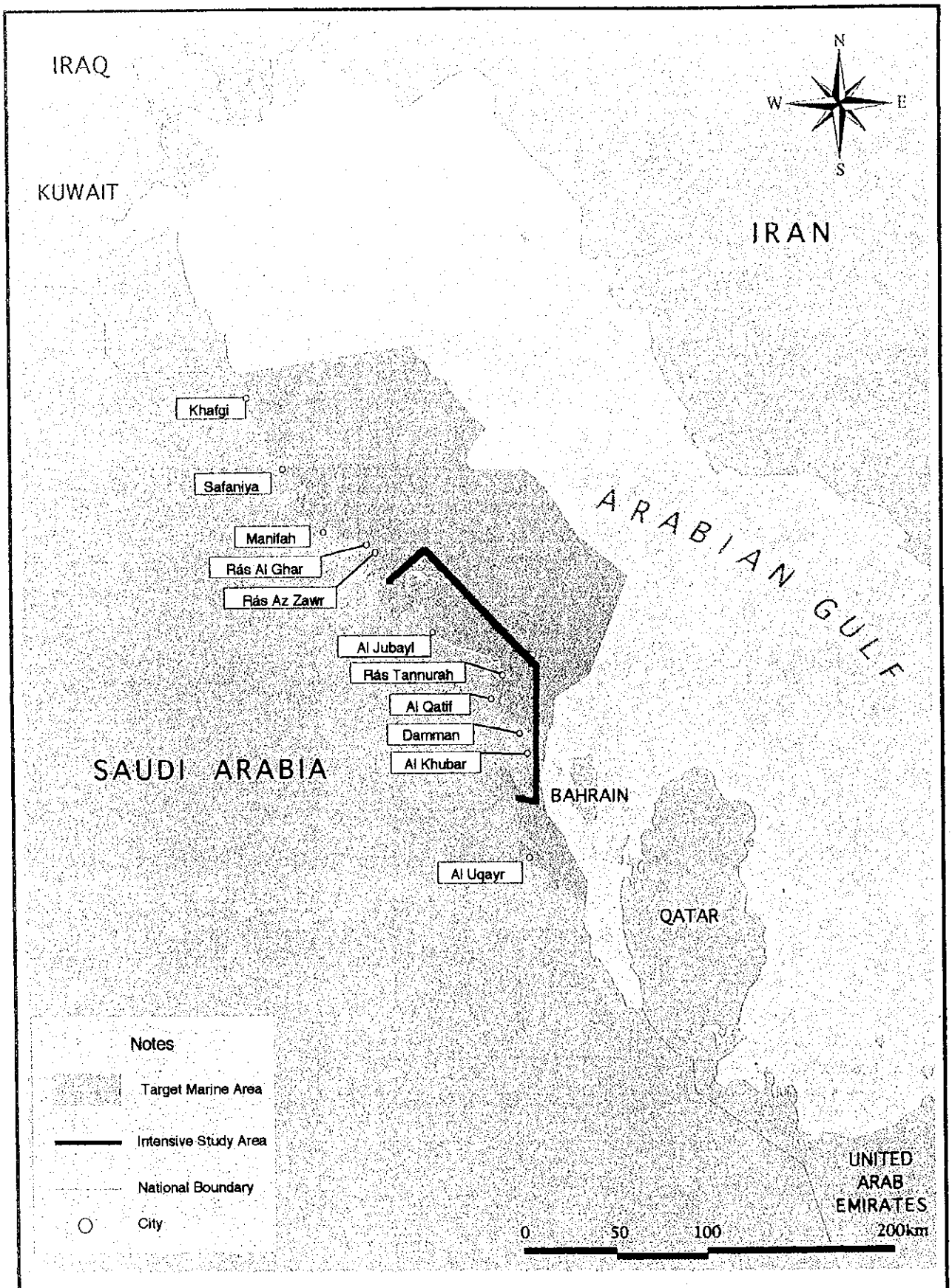


Figure-1 Target Area of the Study

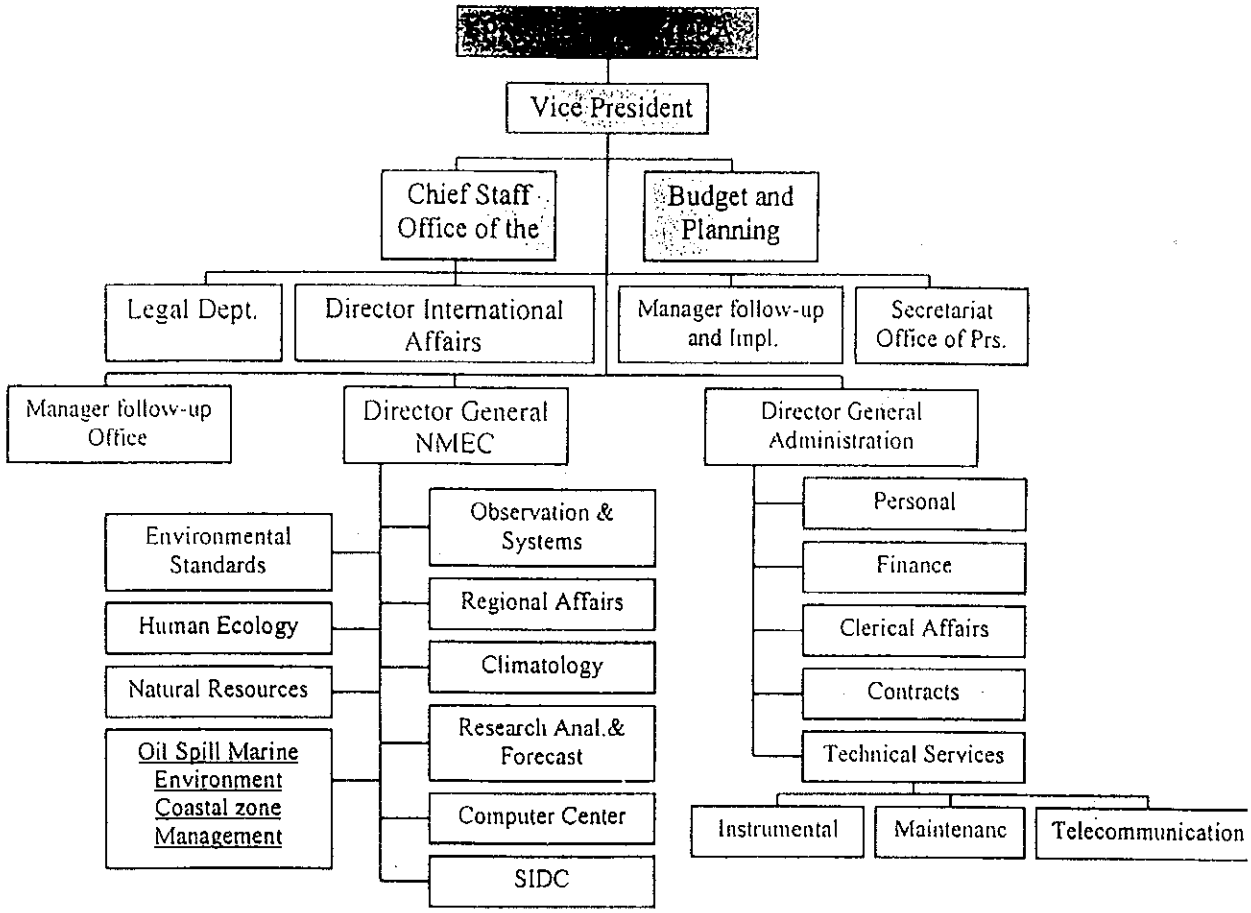
SCHEDULE

(1999)	
March	Planning of the Project
June-July	Field Pre-survey Monitoring Plan Workshop
Sept-Nov	Installation of Equipment 1st Sampling and Analysis Data Analysis Workshop
(2000)	
June-July	2nd Sampling and Analysis Data Analysis
Sept	Evaluation Final Report Seminar

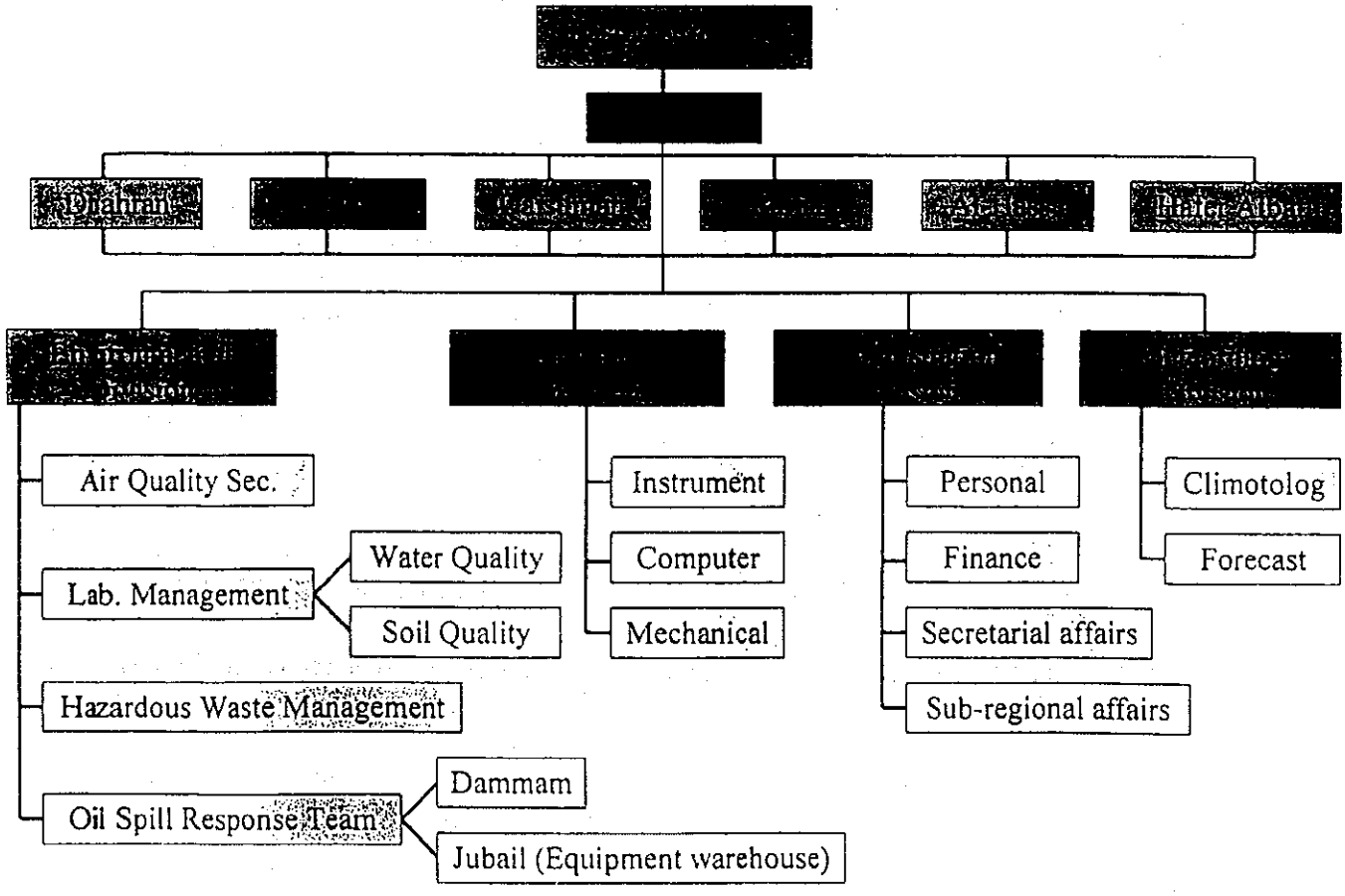
The Role of MEPA and the Management of Monitoring Program

By

Aziz W. Al-Omari



Meteorology & Environmental Protection Administration (MEPA)



Industrial Questionnaire

(Data Base prepared on Microsoft Access
to Control the Discharge of Hazardous Industrial Waste)

•Factory Identification:

Factory name, Owner name & Address.

•General Information:

Permit Number, Raw material used, Product description & etc.

•Waste Water Discharge

Flow rate of effluent, Connection with treatment plant, Present disposal method, Waste transporter company, Waste disposal company, waste analysis report & etc.

•Air Pollution

Average annual emission, Estimated fuel consumption, Air emission analysis report, Pollutants of interest & etc

Project Description

Five Work Stages

Work Stage in Japan

Work Stage in Saudi Arabia

First Stage:

- Data information collection
- Planning of equipment preparation
- Framework of study
- Satellite photography
- Planning of technology transfer

Second Stage:

- Confirmation of study plan
- Field observation
- Intensive study area Characterization, determination & Monitoring planning

Third Stage:

- First round Site work (water quality, sediment quality, tidal flow & plankton)
- Analysis of data collected
- Analysis of Satellite photography

Forth Stage:

- Second round Site work (water quality, sediment quality, tidal flow & plankton)
- Analysis of Data collected & Satellite photography
- Evaluation of Results and Monitoring
- Guideline for Water Quality Monitoring
- Water Quality Monitoring Planing
- Finalization of Technology Transfer

Fifth Stage:

- Valuation of Technology Transfer
- Final report preparation

Table 1

	Coastal and Marine uses	Actual / Potential Environ. Impact
1	Shipping and Transport, Shipping port	Oil Spill, Anchor damage & Habitat loss
2	Residential and commercial development	Coastal reclamation
3	Industrial development, Oil & Petrochemical industry	Oil refinery & other effluent contains heavy metals, drilling mud etc.
4	Desalination Plant, Power plant & Treatment plant	Effluent with elevated temperature, turbidity, heavy metals and other chemical.
5	Fisheries	Population decline at target and non-target species habitat degradation

Human Activities

Since long time in the past people have been attracted to the shores of the Arabian Peninsula. An early civilization of eastern coast of Saudi Arabia prospered four to five thousand years ago even by tenth century AD. The Arabs had established a trade network as China, this was possible through their sophisticated knowledge of astronomy and navigation. Cargoes of textiles and spices were accompanied by the exchange of new ideas, science and new religion. The foundation of life & development in the region remains firmly based on renewable and non-renewable natural sources.