AMBIENT WATER QUALITY MONITORING

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Outline:

- Water Quality Monitoring
  - Objectives
  - Monitoring Plan
  - Sampling techniques and Methodologies
  - Sample Preservation
  - Sample storage and transport
- Data Storage
- Reporting

What is water quality monitoring?

- A process consisting of integrated tasks – sampling, analysis, data interpretation and reporting.
- Sampling is a collection of truly representative samples which when analyzed will yield results reflecting actual quality of the water samples.

- Teams who initiate the water quality monitoring program interpret and reports the results of the analyses to decision-makers for appropriate actions.
- Water Quality monitoring results are used as a basis for policy or management decisions concerning a water body and its uses.

OBJECTIVES OF WATER QUALITY MONITORING

- Water quality assessment
- Rehabilitation programs
- Database
- Modeling
- Decision-making

USES OF WQM DATA

- Determination of background quality of the water body
- Identification and prioritization for abatement, prevention, control of sources or pathways of water pollutants and their effects on the water body
- Establishment of an information based on water quality changes that could be used for the prediction of future trends, water quality development planning and ecological study
- Evaluation of the achievement of the water quality management

FACTORS TO BE CONSIDERED IN DESIGNING WATER QUALITY MONITORING SYSTEM

- Objective(s) of the water quality monitoring program.
- Types and location of monitoring stations
- Budget, equipment and manpower capability
- Sampling techniques and equipment
- Water quality parameters to be monitored
- Frequency of sampling
- Sample handling and preservation
- Analysis program

MONITORING PLAN

- **Planning of Monitoring System**
  - Information Gathering
    - Review and inventory of all factors which may influence the present and expected quality of the water body
    - Assembly and inventory of information on the quantity and quality of water usage and their relative significance
    - Inventory and description of potential future sources of water pollution
    - Collection of available water quality data
    - Preparation of maps showing the more important water quality issue and future influences and uses

MONITORING PLAN

- **Planning of Monitoring System**
  - Determination of Data Needs
    - Determine relative importance of the different types of water pollution issues and land-use
    - Determine relative importance of factors influencing the quality of water for different uses
    - Decide what information is needed to meet appropriate control, planning and baseline requirements and the monitoring of specified pollutants
    - Locate potential monitoring stations which provide required information

MONITORING PLAN

- **Planning of Monitoring System**

  - Preliminary Surveys
  - Data Review
  - Monitoring Station Records
  - Components of a Monitoring Plan

COMPONENTS OF A MONITORING PLAN

- Background Information
- Objectives of Monitoring
- Monitoring Stations
- Water Quality Parameters for Measurement
- Timing and Frequency of Monitoring
- Water Quality Sampling and Test Methods
- Quality Assurance and Quality Control Procedures

RECOMMENDED LOCATIONS OF SAMPLING STATIONS

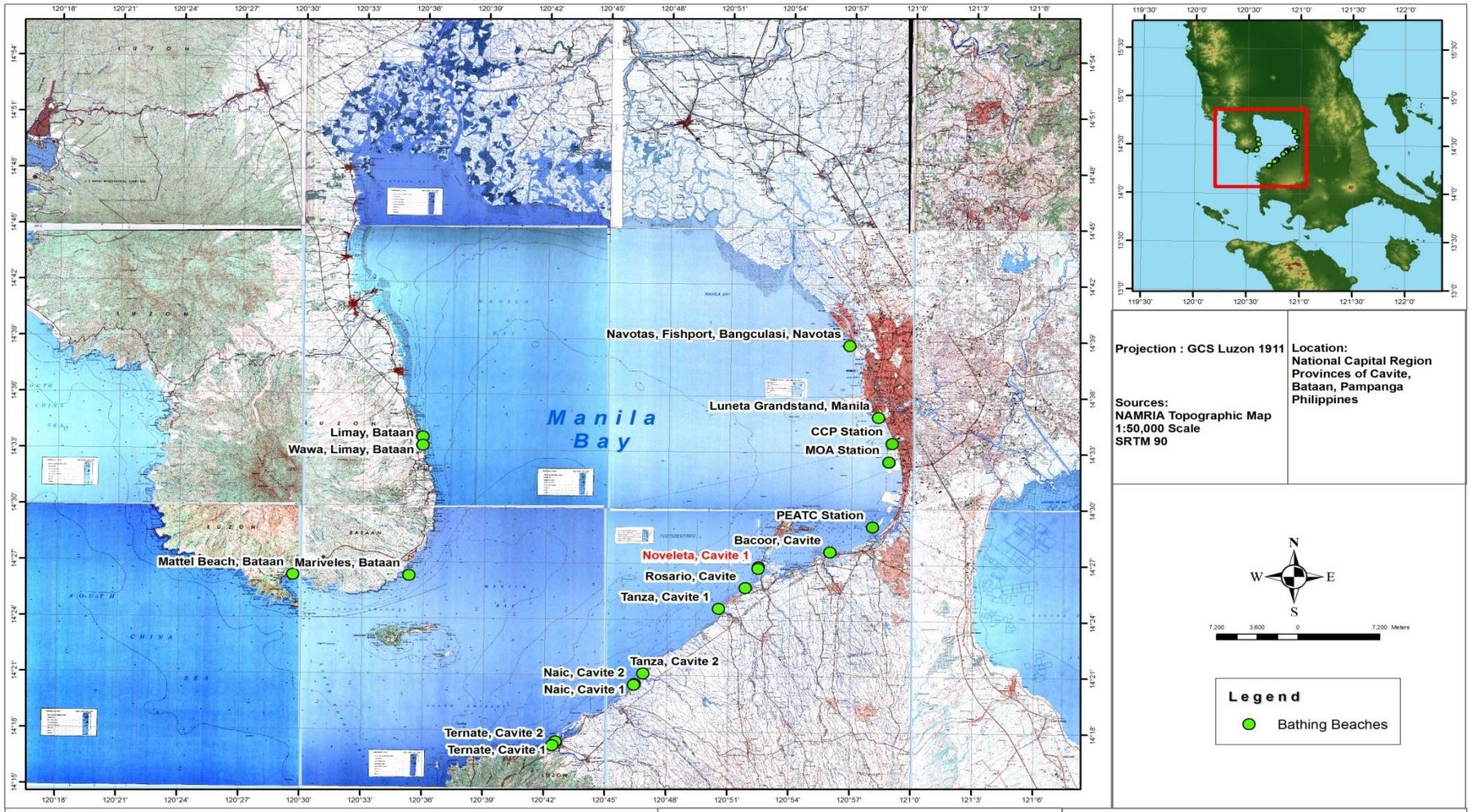
- Upstream and downstream of a significant water withdrawal or discharge
- Intakes for municipal, industrial and agricultural water supply
- Confluence of major tributaries
- Change in beneficial water usage such as recreation and fishing areas
- Sections where water in its natural/unpolluted state
- Inland tidal limits
- Vegetation cover of drainage area

RECOMMENDED LOCATIONS OF SAMPLING STATIONS

- Places where municipal waste and/or industrial wastes are discharged
- Recreation and fishing areas
- Area where wastes leave an impoundment
- Area representing general water quality of the water body

Offshore Monitoring Stations

Manila Bay Bathing Beaches monitoring stations



BATHING BEACHES MONITORING STATIONS

SITE REQUIREMENTS

- Representativeness
- Flow Measurements
- Accessibility
- Distance to Laboratory
- Safety
- Ownership of adjacent land areas
- Disturbances
- Sampling Facilities
  - Bridges
  - Boats
  - Wading (to walk in shallow stream/waterways)
  - Bankside
  - Cable ways

SAMPLING METHODOLOGIES AND FREQUENCIES

- **Sampling Techniques**
  - Types of Samples
    - Grab samples
    - Composite sample
  - Methods of Sampling
    - Manual
    - Automatic

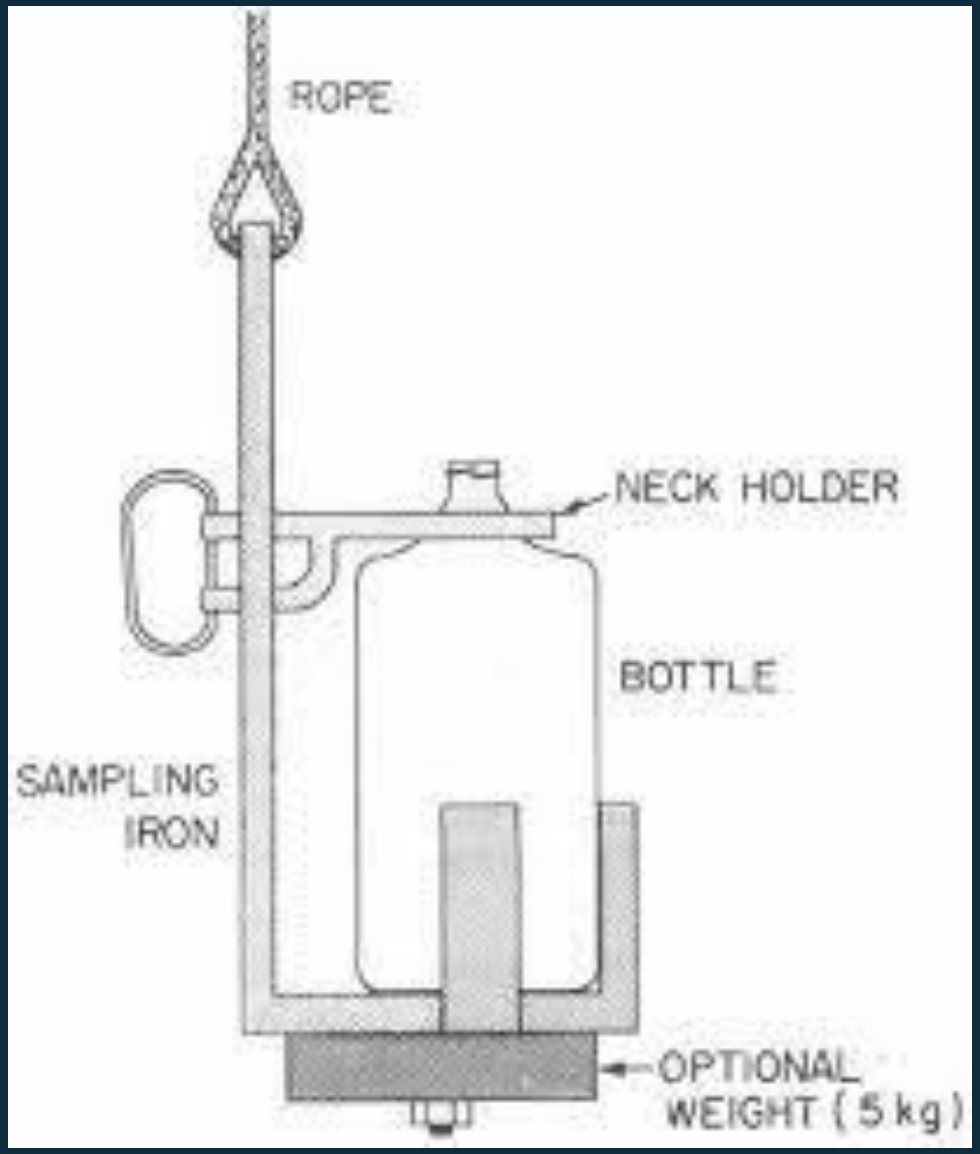
SAMPLING METHODOLOGIES AND FREQUENCIES

- **Sampling Devices**
  - Manual Grab Samplers
    - Van Dorn Bottle
    - Kemmerer Sampler
    - Sampling Iron
  - Dissolved Oxygen Sampler

VAN DORN BOTTLES

KEMMERER SAMPLERS

SAMPLING IRON



DISSOLVED OXYGEN SAMPLERS

Parameter to be Analyzed	Recommended Container[1]
Organochlorine pesticides, PCBs and organo-phosphates	1,000 ml amber glass with Teflon-lined cap
Phenols and Phenolic substances	1,000 ml amber glass with teflon-lined cap
Arsenic, Barium, Cadmium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Zinc	500-1,000 ml Polyethylene (depending upon number of metals to be determined)
Mercury	100 ml glass (Sovirel)
Acidity, Alkalinity, Calcium, Chloride, Color, Fluoride, pH, Potassium, Sodium, Specific conductance, Sulfate, Turbidity	1,000 ml Polyethylene
Ammonia Nitrogen, nitrate, nitrite Total Nitrogen	250 ml Polyethylene
Phosphorus, total	50 ml glass (Sovirel)

- Teflon containers can also be used to replace either the recommended polyethylene or glass containers

SAMPLE CONTAINERS

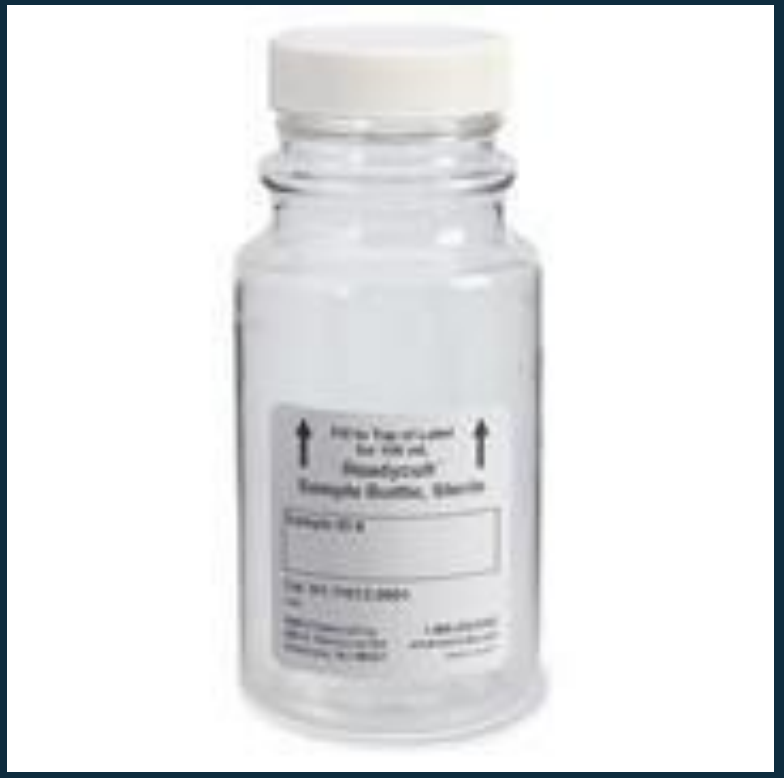
Amber and clear glass

Amber glass jugs

Wide-mouthed jars

BOD BOTTLES
(For D.O. Analysis)

SAMPLE CONTAINERS
(For Fecal Coliform Analysis)



NALGENE BOTTLES

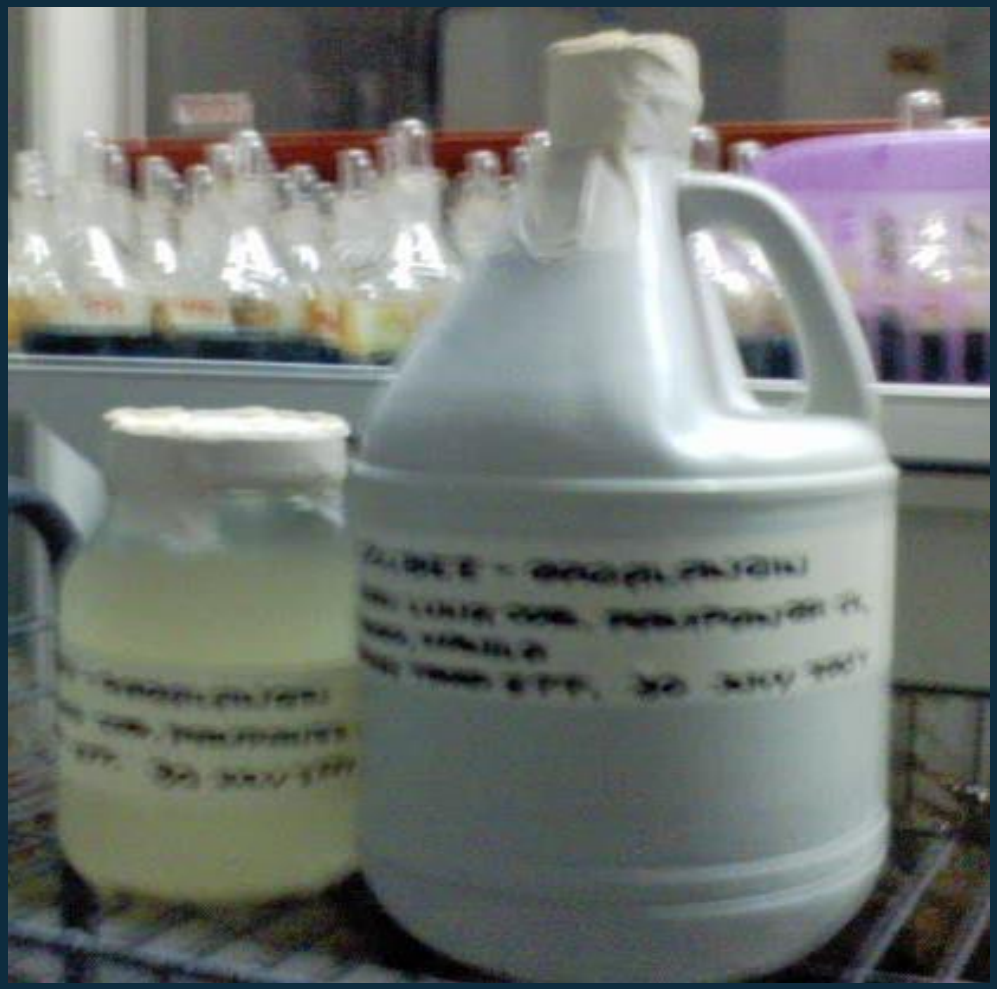
LABELLING AND DOCUMENTATION OF SAMPLES

- Name of water body samples
- Station identification and description
- Date of sampling
- Time of sampling
- Weather conditions
- Discharge rate
- Water condition
- Result of Field determination of DO, pH, Temp, etc.
- Other relevant information
- Name(s) of sample collector

Example of Sample Label

Name of Waterbody: Manila Bay		
Station ID No. MB-Offshore-01	Sampling Site 1- Manila	Description: Seawater
Date Sampled: Sept. 7, 2021 Time: 10:10 AM Sampled by: L.A.C.		
Preservation Done: ☐ None ■ Ice to 4°C ☐ Nitric ☐ Sulfuric ☐ Other		
For Analysis of :	Fecal coliform	

PROPERLY LABELED SAMPLES



SAMPLE PRESERVATION AND HOLDING TIME

- Refrigeration @ 4°C
- Chemical Preservation
  - Acidification
  - Biocides
  - Special Cases

FIELD MEASURED PARAMETERS (in-situ)

- pH Measurement (range)
- Temperature (˚C)
- Conductivity Measurement (µs/cm)
- Salinity (ppt)
- Dissolved Oxygen Measurement (mg/L)
- Depth (m.,ft.)
- Transparency (m.,ft.)
- Total Dissolved Solids (g/L)
- Turbidity (NTU)

FIELD QUALITY CONTROL

- **Field blanks**

  Consist of pure distilled water with known quantity of preservatives added. Analysis of these samples will test effectiveness and purity of preservatives and check on the contamination of containers and sampling equipment

SAMPLING FREQUENCY

- Purpose of monitoring
- Types of water body to be monitored
- Variation of water quality
- Parameters to be monitored
- Accuracy of data required
- Availability of sampling equipment, manpower and budget
- Capacity of laboratory facilities

WATER QUALITY PARAMETERS AND METHODS OF ANALYSES

- Water quality parameters to be monitored

Primary: Color, D.O. Fecal Coliform, Nitrate, pH, Phosphate, Temperature, Total Suspended Solids

Secondary: Inorganics, Metals, Organics

- Methods of analyses (APHA Standards Methods for Water and Wastewater Analysis)

DATA ANALYSIS AND REPORTING

- **Analysis of Data**
  - Basic Statistics
    - Median
    - Arithmetic Mean
    - Range
    - Percentile
  - Basic Statistics
    - Time Series Graph
    - Seasonal Diagrams
    - Spatial –trend Graph

DATA REPORTING

- Reporting
  - Condition of the water body and its drainage basin including the anthropogenic influence factors affecting them
  - General information on the sampling station
  - Sampling methodologies
  - Water quality evaluation based on data analysis of the laboratory results
  - Recommendation(s)

SUMMARY OF AMBIENT WATER QUALITY MONITORING

On-Site Measurement

In-situ water quality parameters of each station were measured using Horiba Water Quality Analyzer/Checker. The parameters measured were Dissolved Oxygen (DO), Temperature, pH, Conductivity, Turbidity, Total Dissolved Solids (TDS), and Salinity.

Field observations based on physical condition of each station were also recorded during the activity.

❖ Water Sample Collection

-Water quality monitoring involved collection of water samples and recording of field observations.
-Water samples collected were then analyzed for physico-chemical, heavy metals and bacteriological parameters in a EMB/DENR-laboratory or its recognized laboratory.

Sampling Protocols

For collecting water samples for laboratory analysis, the following were the references used:

a. Basic considerations - refer to Water Quality Monitoring Manual Vol. 1 – Manual on Ambient Water Quality Monitoring, pages 6-21 to 6-22

b. Sampling from a bridge - refer to Water Quality Monitoring Manual Vol. 1 – Manual on Ambient Water Quality Monitoring, pages 6-23

c. Prevention of sample contamination - refer to Water Quality Monitoring Manual Vol. 1 – Manual on Ambient Water Quality Monitoring, pages 5-7 to 5-8

THANK YOU
FOR YOUR ATTENTION!