

REPUBLIC OF PALAU

CHAPTER 2401-11  
MARINE AND FRESHWATER QUALITY  
REGULATIONS

IMPLEMENTATION GUIDANCE MANUAL



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## 0.0 INTRODUCTION

In 1981, the Republic of Palau (ROP) enacted the “Environmental Quality Protection Act” (EQPA), Title 24 of the Palau National Code Annotated (Title 24 PNCA) to ensure adequate protection of the unique and aesthetically valuable natural environment of Palau. The EQPA allows for promoting sustainable economic and social development to achieve the desired socio-economic goals of the people of Palau. The EQPA created the Environmental Quality Protection Board (EQPB), a semi-autonomous agency of the Executive Branch of government. The EQPB is tasked and responsible for the protection and proper conservation of quality of the environment and its resources, so that sound and sustainable economic and social development proceeds in a manner that will not jeopardize Palau’s future possibilities or opportunities.

Title 24 PNCA authorizes the EQPB to promulgate and enforce regulations necessary to fulfill its mandate. The Marine and Fresh Water Quality Regulations (WQR) PNCA 2401-11 include protected and prohibited uses, narrative and numeric criteria to protect those uses, and anti-degradation policies to prevent deterioration of high-quality waters.

*Implementation guidance* is utilized to provide clear direction to the EQPB and the regulated community on determinations of compliance with the WQR. Implementation guidance also includes guidance on appropriate duration and frequency components of monitoring programs.

This **ROP WQR Implementation Guidance Manual** is a stand-alone document that supports the applicability of the ROP WQR. Thus, this Manual is not a statutory document, and may be revised at the EQPB discretion on an as-needed basis but at least annually in order to continue to serve the intended purpose.

In general, this Manual describes how scientific data collected for ROP waters shall be evaluated against various parts of the ROP WQR to determine compliance with the WQR. Compliance determinations shall be used for beneficial use support evaluations including: Discharge permit compliance; dredging permit compliance; and enforcement actions against non-permitted discharges, as applicable.

In addition, this Manual describes the procedure for changing the classification of water use for a specific area and the lists the location of Outstanding Natural Resource Waters.

Compliance with any specific criteria of the WQR or the determination of a reference condition is a statistical determination. To make a statistical determination data must be acquired at appropriate temporal and spatial scales to support statistical applications.

For purposes of this Manual, water quality analytical results are assumed to follow a log-normal distribution, and standard methods for determining the geometric mean are applied. Parameters of the WQR are expected to have some degree of variability in the natural systems of streams and marine waters even if no pollution is present. The geometric mean is therefore considered to be the appropriate measure of central tendency to evaluate analytical results, in order to detect elevated levels of constituents of concern as a result of pollution inputs.

The geometric mean can be calculated using Excel®. The Excel® formula for the geometric mean of a column of numbers is “=GEOMEAN(cell:cell)”, where the first “cell” reference is the top cell of the column of numbers, and the second “cell” reference is the bottom cell of the column.

## **1.0 PART 2401-11-13: MICROBIOLOGICAL REQUIREMENTS**

Compliance for microbiological requirements shall be determined by comparing the single sample result and/or the geometric mean of the data set to the appropriate ROP WQR numeric criteria.

### **For routine monitoring:**

Compliance with criteria for specified bacteria for fresh and marine waters for public health protection (e.g., public advisories) shall be based on any single sample exceedence (CFU/100 ml)

Areas will be closed without advanced notice for accidental sewage leaks or spills, and will remain closed until monitoring data indicate that bacteria levels are in compliance with the WQS.

### **For monitoring by Point Source Discharge permittees:**

For Discharge permittees, permit compliance for marine receiving waters shall be determined utilizing the geometric mean of all discrete measurements (all depths, all stations, as required in the permit excluding the station directly over the point of discharge) over a 30-day period.

It is recommended that the permittee consider multiple sampling events in any 30-day period in order to obtain a representative geometric mean.

The use of water quality based effluent limitations for bacteria with end-of-pipe limits which are calculated based on critical initial dilution is permissible for Discharge Permits.

### **For monitoring at localized non-permitted discharges:**

Compliance with criteria for specified bacteria for fresh and marine waters for public health protection shall be based on any single sample exceedence (CFU/100 ml).

## **2.0 PARTS 2401-11-14 - 19: PARAMETERS WITH NUMERIC CRITERIA; PH, NUTRIENTS, DISSOLVED OXYGEN, TURBIDITY**

Compliance for pH, nutrients, dissolved oxygen (DO) and turbidity numeric criteria shall be determined by comparing the geometric mean of the data set to the appropriate WQS numeric criteria.

Compliance for pH and turbidity may also be determined by comparing the geometric mean of the data set to the “ambient condition” for that parameter (see Section 3)

### **For routine monitoring:**

Compliance for routine monitoring shall be determined by the utilizing the geometric mean of not less than 12 measurements taken over a consecutive 12-24 month period to account for seasonality of prevailing trade wind and non-trade wind conditions, localized weather conditions, and various tidal stages. Although the minimum required number of samples is 12, 24 or more samples are recommended to improve the representativeness of analytical results.

For stream waters, samples are to be taken at lower, middle, and upper stream sites where possible, and above the tidal influence. The analytical result for each stream water sample at each sampling station shall be considered as a discrete data point for the purposes of compliance determination for the entire stream reach.

For marine waters, samples are to be taken at mid-depth for waters of depth 30 ft or less, and at two depths (3 ft below surface and near bottom, 60 ft maximum) for waters of depth greater than 30 ft. The analytical result for each water sample from each depth at each sampling station shall be considered as a discrete data point for the purposes of compliance determination.

### **For monitoring by Point Source Discharge permittees:**

Discharge Permit compliance for marine receiving waters shall be determined utilizing the geometric mean of all measurements (all depths, all sampling stations, as required in the permit excluding the station directly over the point of discharge) over a running 12 month period.

For Discharge Permit receiving waters sampled on a regular basis for 3 or more years, numerical criteria shall not be exceeded more than once for any 12 month period within any consecutive 3-year period.

**For monitoring at localized non-permitted discharges:**

Compliance for localized non-permitted discharges that occur as a result of an activity on a specific parcel of land or specific contiguous parcels of land, which result in a discharge to ROP waters shall be determined utilizing the geometric mean of at least 12 measurements taken during periods of discharge. The period of sampling is not required to account for the natural variability of the system (i.e., seasonality, weather, and tidal stage). Water samples are to be taken within the area of discharge influence on ROP waters. Although the minimum required number of samples is 12, 24 or more samples are recommended to improve the representativeness of analytical results.

### **3.0 PARTS 2401-11-14, 18, 19: PARAMETERS WITH AMBIENT CONDITION CRITERIA; PH, TEMPERATURE, TURBIDITY**

Compliance for pH, temperature, and turbidity shall be determined by comparing the geometric mean of the data set to the “ambient condition for that parameter.

Compliance for pH and turbidity may also be determined by comparing the geometric mean of the data set to the appropriate WQS numeric criteria for that parameter (see Section 2)

Ambient conditions for fresh waters shall be determined by sampling at an upper stream site that is representative of the least anthropogenic influence within the water classification utilizing the geometric mean of not less than 12 measurements, although 24 or more measurements are recommended to improve the representativeness of analytical results.

Ambient conditions for marine waters (except for permitted dredging sites, see discussion below) shall be determined by sampling at a “far field” site (site beyond the influence of the discharge) that is representative of the least anthropogenic influence within the water classification utilizing the geometric mean of not less than 12 measurements, although 24 or more measurements are recommended to improve the representativeness of analytical results.

Sampling at “ambient conditions” sites is presumed to be an on-going activity by EQPB, at a frequency determined by personnel and material resources, with the intent of building a long-term data set for “ambient conditions” in ROP waters.

#### **For routine monitoring:**

Compliance for routine monitoring shall be determined by the utilizing the geometric mean of not less than 12 measurements taken over a consecutive 12-24 month period to account for seasonality of prevailing trade wind and non-trade wind conditions, localized weather conditions, and various tidal stages. Although the minimum required number of samples is 12, 24 or more samples are recommended to improve the representativeness of analytical results.

For stream waters, samples are to be taken at lower, middle, and upper stream sites where possible, and above the tidal influence. The analytical result for each stream water sample at each sampling station shall be considered as a discrete data point for the purposes of compliance determination for the entire stream reach.

For marine waters, samples are to be taken at mid-depth for waters of depth 30 ft or less, and at two depths (3 ft below surface and near bottom, 60 ft maximum) for waters of depth greater than 30 ft. The analytical result for each water sample from each depth at each sampling station shall be considered as a discrete data point for the purposes of compliance determination.

**For monitoring by Point Source Discharge permittees:**

Discharge Permit compliance for marine receiving waters shall be determined utilizing the geometric mean of all measurements (all depths, all sampling stations, as required in the permit excluding the station directly over the point of discharge) over a running 12 month period.

For Discharge Permit receiving waters sampled on a regular basis for 3 or more years, numerical criteria shall not be exceeded more than once for any 12 month period within any consecutive 3-year period.

**For monitoring at permitted dredging sites:**

Compliance for permitted dredging shall be determined utilizing the geometric mean of not less than 5 measurements taken during dredging operations over a single day equally spaced along the down-current perimeter of the designated mixing zone. Numerical criteria shall not be exceeded more than once in any consecutive 3 day period

Ambient conditions for permitted dredging projects shall be determined utilizing the geometric mean of not less than 5 measurements on the same day as sampling for compliance determination, at a point outside the zone of mixing and up-current of the activity, as determined by prevailing conditions on the day of sampling. Ambient and compliance samples shall be sampled as closely in time as possible to avoid the interference of a turbidity-enhancing event such as surface waves from a sudden wind event, turn of the tide, or diurnal change in currents.

**For monitoring at localized non-permitted discharges:**

Compliance for localized non-permitted discharges that occur as a result of an activity on a specific parcel of land or specific contiguous parcels of land, which result in a discharge to an ROP water shall be determined utilizing the geometric mean of at least 12 measurements taken during periods of discharge. The period of sampling is not required to account for the natural variability of the system (i.e., seasonality, weather, and tidal stage). Water samples are to be taken within the area of discharge influence on the ROP water. Although the minimum required number of samples is 12, 24 or more samples are recommended to improve the representativeness of analytical results.

## **4.0 PART 2401-11-22: TOXIC POLLUTANTS CRITERIA**

Compliance for toxic substances shall be determined using the value of the analytical result for any single sample. The list of regulated toxic substances and respective action levels are provided in the 2002 or most recent edition of the US EPA National Recommended Water Quality Criteria as referenced in the EQPB Marine and Fresh Water Quality Regulations available at:

<http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm>

## 5.0 PART 2401-11-23: BIOCRITERIA

Compliance for marine biocriteria shall be determined by utilizing EQPB approved measures of coral and seagrass community to show a change over time. Statistical change over time shall be determined using pairwise T-tests making post-hoc corrections for multiple comparison years when/if appropriate.

### **For routine monitoring:**

Compliance with biocriteria for routine monitoring for coral reefs shall be determined by assessing recovery of coral assemblages following natural disturbance events. Recovery for coral reefs will be evaluated based on increases in percent cover and coral diversity over time.

At each site data will be collected from five 50 m transects. A 0.25 x 0.25 m photo quadrant will be taken at each meter along the transect and the CPCe program will be used to place five random points within each photo quadrant. Benthic cover will be identified under each point. Each point will be used to calculate percent cover (250 points per quadrant). Coral diversity will be assessed by placing a 0.25 x 0.25 m quadrant 16 times along the entire swath of the site. Coral species will be identified within each quadrant. The scores from the quadrants will be used to assess diversity.

Coral reef health will be evaluated as follows:

- “Good” – Minimal or significant impacts reported from disturbance events. If natural disturbances impacted coral assemblage metrics then statistically significant recovery is currently underway. If no significant impacts from natural disturbances then metrics were evaluated relative to those expected from the most recent assessment of the water segment and found to be higher than the mean average.
- “Fair” – Minimal or significant impacts reported from disturbance events. If natural disturbances impacted coral assemblage metrics then non-significant recovery trends are currently apparent. If no significant impacts from natural disturbances then metrics were evaluated relative to those expected from the most recent assessment of the water segment and found to be similar to the mean average.
- “Poor” – Minimal or significant impacts reported from disturbance events. If natural disturbances impacted coral assemblage metrics then no recovery trends are currently apparent. If no significant impacts from natural

disturbances then metrics were evaluated relatively to those expected from the most recent assessment of the water segment and found to be lower than the mean average.

Compliance for routine monitoring for seagrass beds shall be determined by assessing annual seasonal growth of seagrass and macroalgae and considering the magnitude and extent of impacts from disturbance events. Annual seasonal growth will be established by percent cover.

At each site data will be collected from five 50 m transects. A 0.25 x 0.25 m quadrat with six systematically placed points will be placed at each meter along the transect. Cover of seagrass and macroalgae will be identified under each point. Each point will be used to calculate percent cover (300 points per transect).

Seagrass health will be determined as follows:

- “Good” – Natural seasonal changes are apparent, existing assemblage has statistically more native seagrass than macroalgae based upon average of estimates from the most recent assessment of the water segment.
- “Fair” – Natural seasonal changes are apparent, existing assemblage has statistically similar abundances of native seagrass and macroalgae based upon average of estimates from the most recent assessment of the water segment.
- “Poor” – Seasonal cycles are masked by persistent macroalgae growth, or, persistent macroalgae growth dominates unless a disturbance event (i.e., large-swell and high surface currents) occurs.

**For monitoring by permittees:**

Permit compliance for applicable permits for marine waters shall be determined by assessing significant differences of coral and seagrass community measures over time compared to the biological integrity of a reference condition (or least impacted condition) within a similar comparative environment. The least impacted condition and similar comparative environment shall be defined by EQPB.

The scope and duration of any required monitoring required by EQPB will be determined by EQPB on a case-by-case basis, based on consideration of the magnitude, extent, and duration of the permitted activity.

## 6.0 OUTSTANDING NATURAL RESOURCE WATERS

Outstanding Natural Resource Waters (ONRW) are defined as the waters of national and state spawning grounds, preserves and water of exceptional recreational or ecological significance including Protected Area Network sites and locations set aside by state or national government as conservation zones.

ONRW locations:

1. Ngerukewid (PNC 24 Chapter 30)
2. Ngerumekaol (PNC 24 Chapter 31)
3. Protected Areas Network
  - a. Ngardok Lake Reserve
  - b. Ebiil Channel
  - c. Olsolkesol
  - d. Mesekelat Watershed
  - e. Helen Reef
  - f. Ongedechuul System of Conservation Areas
  - g. Ngerderar Watershed Reserve
  - h. Kerradel Conservation Network
  - i. Ngeruangel Marine Reserve
  - j. Medal Ngediull Conservation Area
  - k. Teluleu Conservation Area
  - l. Ngermeskang Bird Sanctuary
  - m. Iuiau Marine Conservation Area
  - n. Ngatpang Management Plan (Conservation Zones)
  - o. Merir Protected Area
4. State identified conservation areas
5. Others as identified