WATER QUALITY PROTECTION CRITERIA FOR THE SOUTH PACIFIC

INCLUDING STANDARDS FOR DISCHARGE OF SEWAGE EFFLUENT.

SPREP - July 1996

Republic of the Marshall Islands	*Republic of the Marshall Islands - National Environment Protection Act, 1994*	Satisfactory coverage of all issues, including monitoring and enforcement.
Cook Islands	*National Water Authority Bill (proposed)* *Environment Bill (proposed)*	Water quality protection criteria should be adopted under the environment bill.
Western Samoa	*Lands Surveys and Environment Act 1989* *Environmental Impact Assessment Regulations (draft)* *Water Authority Act, (proposed)*	Legislation exists to control pollution and monitor compliance with standards. Water quality protection criteria should be adopted under the Lands & Environment Act.
Tuvalu	*Water Supply Ordinance 1967* *Harbors Ordinance* *Marine Pollution Act 1991*	Land based sewage control not adequately addressed, water quality protection criteria should be adopted as regulations under the Marine Pollution Act 1991
Palau	*Environmental Quality Protection Act - Marine and Fresh Water Quality Standard Regulations*	Comprehensive document covering all issues of water quality management.
Tokelau	*Tokelau Marine Pollution Regulations 1990*	Inadequate coverage of land based pollution sources - Water quality protection criteria should be adopted under Marine Pollution Act.
Niue	*Conservation Bill, Part xii* *Marine Pollution Act 1974 (New Zealand)*	Water quality protection criteria should be adopted under the Conservation Bill.
Kiribati	*Public Utilities Amendment Act 1983* *Harbors Ordinance* *Kiribati Ports Authority Act 1990*	No legislation dealing adequately with marine pollution from land based sources. Suggested adoption of a comprehensive policy framework based on other PICs Environment Protection Acts, including water quality protection criteria.

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Recommendations

- That all waters of the Pacific be managed to preserve a level of water quality conducive to:

  Protection of nationally significant pristine or wilderness areas;

  Protection of all ecosystems and fisheries production areas;

  Protection of all recreational and bathing areas;

  Protection of all freshwater supplies, and

  Provision for release of waste after treatment to a specified standard.

- That all PICs adopt regulations and criteria similar to those proposed in this document and administer them either under existing legislation, or under a new Environmental Protection Agency policy framework that addresses all aspects of environmental management.
- That the water resources of the Pacific be classified in to three area types, "A" Pristine, "B" Ecosystem Support and Primary Contact, and "C" Receiving and Assimilative Areas, and that each of these areas have water quality criteria applied to them, that if maintained, will protect the values and uses of these areas.
- That all existing point source sewage and industrial discharge operators be licensed, and also assessed to ensure they are treating effluent to the highest degree possible under existing technical and financial constraints.
- That all present discharge operators be required to monitor their effluent, and where effluent is below standard, prepare an Environmental Management Plan detailing how effluent quality will be improved over an agreed time span.
- That comprehensive monitoring programs be implemented to assess the existing quality of waters in the region, and that these results be used as baseline data to determine change and assess the potential impacts of future projects.
- That the assimilative capacity of water bodies be determined before any new outfalls are constructed, so it can be assessed whether or not discharge conditions have to be more stringent than general standards.
- That general discharge standards be adopted as a minimum requirement for new and existing point source discharges.
- That Integrated Catchment Management plans be prepared for all catchments, particularly those draining urban areas, so that the serious degradation occurring in these waterways is reduced.
- That engineers and construction companies be made aware of, and responsible for, the impact sediment runoff can have on a reef or river eco-system, and that the practice of on-site sediment management be considered under building and road construction codes.
- That a community consultation and education program be developed to complement these water quality regulations, and that it be implemented as soon as possible.

1.0 Introduction.

1.1 Rationale.

It is a well accepted fact that all life on earth depends on water to survive. It is also becoming increasingly obvious that as mankind continues on a path of rapid population growth and natural resource consumption, our supplies of water are simultaneously dwindling and being polluted by the by-products of our existence.

As elsewhere on Earth the relationship between man and his fresh and marine water resources is delicately balanced in the Pacific. On many populated islands, drinking water is scarce, and floats precariously on a layer of sea water just below ground level. These supplies are very vulnerable to over use and contamination from a large range of human activities.

The coastal lagoons and reef ecosystems that are so precious as a food resource for Pacific islanders are also under threat from land based pollution sources, particularly sedimentation and sewage effluent. Excessive algae growth in coastal waters caused by nutrient input is a major threat to biodiversity of reef ecosystems, and as such can be viewed as one of the most critical environmental problems to be addressed in the region.

While the need for action in relation to water quality management and sewage pollution prevention is recognized by PICs, there are few countries possessing the legislation, technical expertise or financial resources necessary to implement a major program.

In producing this document, SPREP seeks to create a generic, yet locally adaptable, water quality and sewage management strategy that can be adopted and implemented by all PICs. In countries that have existing legislation relating to water quality management and sewage disposal, it is envisaged that this document may be used as a guide to strengthen that legislation, and also provide mechanisms for better long term management of fresh and marine water resources.

1.2 Scope of the document.

The purpose of this project document is to:

- Protect and maintain any outstanding waters judged as being a national resource in a pristine state;
- Identify values and uses for which the waters of the region shall be maintained and protected;
- Specify the water quality criteria which will need to be maintained in order to protect the designated values;
- Suggest regulations that can be adopted to ensure that no new or existing sources of pollution will be discharged into waters without first being treated to a degree that will prevent decline in water quality; and
- Promote greater recognition of the harm that can be caused by short term pollution sources, specifically, sediment runoff from construction activities.

2.0 Water Quality Management.

The most important process to be described in this document is the classification of waters according to their values to be protected, and the establishment of water quality objectives that will, if maintained, preserve the value or use of each classified area indefinitely.

The steps needed to classify and set water quality objectives are as follows.

2.1 Identify existing water quality.

Identification of existing water quality will require long term baseline monitoring over a range of water body types, from groundwater to ocean waters. Degraded and pristine examples of similar ecosystems should be sampled so that comparisons can be made between actual and desirable water quality.

Admittedly, this process is both time consuming and costly, but the data is essential in order to make valid decisions on local conditions when setting discharge limits on outfalls, or assessments of the assimilative capacity of a water body.

2.2 Identify existing and potential uses and values.

A survey team consisting of a local fisheries expert, ecologist, water supply engineer and or any other suitable personnel can assess each particular area under consideration. Determine who uses the site, for what purposes, and what intrinsic ecological values it may have that need to be conserved. All uses need to be recorded, even for example, "a good place to dispose of rubbish or wash clothes."

2.3 Classification of water body based on physical attributes.

	Code
• Ground water lens	1
• Surface stream (non tidal)	2
• Estuary (tidal)	3
• Lagoon	4
• Reef	5
• Offshore	6

2.4 Classification of waters based on values to be protected.

- "A" = Pristine and Fresh Water Supply - total protection
- "B" = Ecosystem Support - no point source discharge
- "C" = Receiving and Assimilation Areas - previously degraded systems, controlled outfalls.

Marine Waters

(i) Pristine or wilderness water quality areas. "A"

These are areas where monitoring has revealed that no significant pollution is ever present under current circumstances, in the water body. No wastes may be discharged into these areas, and only ecosystem support class waters may flow into them. These areas will only be found and declared in areas away from intensive human settlement, and should be encompassed within a reserve of some type that will prevent any activities that may damage habitat. This water classification is compatible with sustainable fishing and recreational activities.

(ii) Ecosystem support areas. "B"

In areas classified as "ecosystem support areas" the water quality should be such that the area has;

'..the ability to support and maintain a balanced, integrative, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of the natural habitat of the region.' (Karr and Dudley 1981)

Protection of all fisheries productivity is a significant aim of this area classification, as is maintenance of primary contact recreational and aesthetic water quality.

These areas should be kept clean of any rubbish, and should not be used as receiving waters for any point source sewage discharge. If diffuse pollution sources exist, and they are not causing significant harm to the system, it may still be classified as "B". These areas may receive small amounts of pollution from freshwater streams that flow into them that have been used for bathing or clothes washing. Class "B" will act as a buffer between Pristine "A", and, Receiving "C" water quality areas.

(iii) Receiving and assimilative areas. "C"

This classification will be applied to those areas where it is known that a level of pollution exists, however, they will still be managed with a goal of preserving those uses and values identified for ecosystem support areas. Where areas are recognizably degraded through nutrient input, a discharge management strategy will be developed based on the assimilative capacity of the ecosystem, and nutrient loading managed and reduced to initiate ecosystem rehabilitation.

These waters shall be kept free of rubbish and not act as receiving bodies for any effluent which has not received the highest degree of treatment of control possible under existing technological or economic conditions.

Fresh Waters.

(v) Fresh water catchment - drinking water supply. "A"

No development should be allowed in these areas which would have the potential to contaminate the water supply. This would include development of landfill sites, toilets, cattle feed lots or holding yards or any agriculture or forestry activities. Essentially, vegetation of a water supply catchment should be retained in an entirely natural state.

The uses of this water type to be protected are drinking, food preparation, support of freshwater ecosystems, and where appropriate, recreation.

(vi) Fresh water catchment - bathing and other primary contact uses. "B"

It will be permissible in these areas to undertake agriculture, forestry and other land uses which may contribute pollutants, but not toxic types, or at dangerous levels. Direct discharge of sewage or waste of any kind should not be undertaken in these catchments, nor any other type of freshwater catchment in the South Pacific region, as the supply of fresh water is too precious to afford any contamination.

All fresh water uses, apart from drinking, are to be protected in this classification. This includes every thing from aquatic ecosystem support, to agricultural water supply.

(vii) Fresh water catchment - receiving and assimilative bodies. "C"

Where it is found through water quality monitoring that a creek or river is receiving effluent from point or diffuse sources, and that the water quality of this stream is degraded, the waterway will be classed as "C", a receiving and assimilative water body. The same regulations and conditions applied to class "C" waters in a marine environment apply to these areas.

(viii) Groundwater recharge catchment- drinking water supply and waters of ecological importance. "A"

All areas which contribute to groundwater recharge should be protected from development which would have the potential to either restrict or compromise the quantity or quality of waters entering, or being drawn from aquifers.

In all cases, groundwater must be protected with the aim to keep it as pure as possible so its value as a drinking water resource is maintained indefinitely.

3.0 Setting Water Quality Management Objectives.

The ultimate aim of this water quality management program is to maintain, to as high a degree as is realistically possible, the ecological integrity of the body of water being managed, by ensuring the quality of water in the system will not in anyway compromise the organisms in it.

Pearce et al. (1989) suggests that ecological integrity is maintained when the productivity, stability and resilience of the system are sustained and the system has the capacity to perform all essential ecological processes.

The water quality criteria proposed in this document, termed, "criteria to protect" are defined as, "the level of ambient water quality that will need to be maintained for each classification to fulfill it's objectives." The objectives for each classification being outlined in the previous section.

Initially these values will be adopted from overseas research, specifically USEPA data published in ANZECC (1992). However, all regulations should be drafted with a flexibility clause which would allow this criteria to be supplemented by local research as data becomes available.

3.1 Basic criteria applicable to all waters

All waters should be;

- capable of supporting desirable aquatic life
- suitable for primary contact recreation
- free of floating, human derived slicks or litter
- free of smells or taste
- free of toxic substances or micro-biological hazards.

4.0 Criteria to Protect - Pristine or Wilderness Water Quality Areas, Ecosystem Support and Areas of Fresh Water Supply "A" & "B"

4.1 Biological Factors

(i) Species Richness

In any water body, the species richness of the predominant macrophyte, peryphitic, phytoplanktonic, benthic and planktonic invertebrate or vertebrate assemblages, as measured by an appropriate standardized index, should not be altered.

A decrease in species richness is a sign of ecosystem stress. It is important that all major components of the flora and fauna be assessed as different organisms react differently to ecosystem stress. Obviously it will be necessary to measure species richness at several different impacted and pristine sights to determine statistical anomalies between the two.

(ii) Species Composition

In any water body, impacts that result in significant changes in species composition compared with those in similar, unimpacted systems, should not be permitted.

Assessments should be made after multiple sampling at impacted and control sites. Maintenance of bio-diversity is a key objective of this water quality management program, and a effective indicator of the programs performance.

(iii) Primary Production

In any water body, net primary production should not vary from the levels countered in similar, local unimpacted habitats under similar nutrient loading regimes.

Sensitive to changes in water clarity, nutrient loading and presence of toxic substances.

4.2 Microbiological Criteria

In any pristine or primary contact recreational water quality area, the median bacterial content in samples of fresh or marine watgrs should not exceed:

- *150 faecal coliform organisms/100mL (minimum of five samples taken at regular intervals not exceeding one month, with four out of five samples containing less than 600 organisms/100mL);*
- *35 enterocci organisms/100mL (maximum number in any one sample: 60-100 organisms/100mL); and*
- *Pathogenic free-living protozoans should be absent from bodies of fresh water. It is not necessary to test for these organisms unless the temperature is greater than 24°C.*

4.3 Physico-Chemical Factors

(i) Clarity

The natural euphotic depth should not be permitted to change by more than 10%.

This is most simply monitored with a secchi disk.

(ii) Dissolved Oxygen

DO should not be permitted to fall below 6mg/L, or 80 - 90% saturation.

Where possible, DO should be measured over the full diurnal cycle for a period of a few days to establish the range in concentration.

(iii) Nutrients

It is not really possible to set strict and accurate limits on what concentrations of nutrients will cause problems with algae in different ecosystems. The wide range of variables acting within the system, i.e. grazing, clarity etc. all influence algae growth. The values recommended herein are concentrations at which problems have been known to occur, depending on a range of external influences. These concentrations are guidelines that should be assessed in comparison with site specific monitoring, and re-evaluated where local conditions dictate.

Table 1. Recommended permissible concentrations of nutrients in class "A" waters

Nutrient Type	Waterbody Type	
	Lakes and Reservoirs.	
• Total P:	5-50 ug/L	
• Total N:	100-500 ug/L	
• Chlorophyll -a:	2-10 ug/L	
	Fresh Water - Rivers and Streams.	
• Total P:	10-100 ug/L	
• Total N:	100-750 ug/L	
	Estuaries.	Coastal Waters.
• PO_4-P	5-15 ug/L	1-10 ug/L
• NO_3-N	10-100 ug/L	10-0 ug/L
• NH_4-N	<5 ug/L	<5 ug/L
• Chlorophyll-a	1-10 ug/L	<1 ug/L

The ratio of total nitrogen to total phosphorous should be within:

- 11:1 - 27:1

The concentration of total N and P should not vary by more than 10% from the natural conditions.

(iv) pH

Fresh waters - 6.5 - 9.0, with variations of more than 0.5 pH units outside normal range to be investigated.

Marine waters - should not vary more than 0.2 pH units from the normal, unimpacted maximum and minimum.

(v) Salinity

Fresh water - should not be greater than 1000 mg/L.

Estuarine and coastal waters - should not vary more than 5% from natural norm.

(vi) Turbidity

There should not be a change greater than 5% (marine), and 10% (fresh) in the natural turbidity range as measured and expressed in nephelometric turbidity units..

(vii) Temperature

No increase greater than 2°C from normal should be permitted.

4.4 Inorganic Toxicants.

Table 2. Permissible levels of inorganic toxicants in "A" and "B" class waters

Toxicant	Fresh Waters	Marine Waters
	ug/L	*ug/L*
Aluminium	<5(if pH<=6.5) <100.0(if pH>6.5)	
Ammonia	20.0-30.0	NR
Antimony	30.0	500.0
Arsenic	50.0	50.0
Beryllium	4.0[4]	NR
Cadmium	0.2-2.0[5]	2.0
Chromium	10.0	50.0
Copper	2.0-5.0[5]	5.0
Cyanide	5.0	5.0
Iron	1000.0[6]	NR
Lead	1.0-5.0[5]	5.0
Mercury	0.1	0.1
Nickel	15.0 150.0[5]	15.0
Selenium	5.0	70.0
Silver	0.1	1.0
Sulfide	2.0	2.0
Thallium	4.0	20.0
Tin (tributyltin)	0.008	0.002
Zinc	5.0 -50.0[5]	50.0

4.5 Oil and Petroleum Products

There should be no discharge of oil or other hydrocarbons that are seen as a slick or film on the water surface, and no odour or taste should be detectable. There should be no deposits of oil on any beaches, nor harm to any aquatic biota from floating oil or oil washed ashore.

5.0 Criteria to Protect - Fresh Water Supply.

These criteria are to be used as water quality objectives for class "A" areas, specifically declared as "fresh water supply"

In most countries, drinking water will undergo some level of treatment prior to it being released into the supply system. These criteria are for drinking water that is treated prior to consumption.

These guidelines are based on those from ANZECC 1990.

Table 3. Permissible concentrations of substances in drinking water

Parameter	Permissible Concentrations.
	mg/L except where shown
Inorganic	
Aluminium	0.2
Ammonia as N	0.01
Arsenic	0.05
Barium	1.0
Boron	1.0
Cadmium	0.005
Chloride	1.0
Chromium	0.05
Copper	1.0
Cyanide	0.1
Dissolved Oxygen	> 6.5(> 80% Saturation)
Fluoride	1.5
Hardness ($CaCo_3$)	500.0
Iron	0.3
Lead	0.05
Manganese	0.1
Mercury	0.001
Nitrate	10
Nitrite	1
Nitrate + Nitrite	10
pH	6.5-8.5
Selenium	0.01
Silver	0.05
Sodium	300
Sulphate	400
Sulphide	0.05
TDS	1000
Uranium	0.02
Zinc	5.0

Organics	
Oils	0.01
Total Pesticides	0.1
Benzene ug/L	10.0
Phenols ug/L	2
Detergents	0.2
General	
Odour & Taste	Unobjectionable
Total Coliforms	150/ 100mL
Faecal Coliforms	35/ 100mL

6.0 Criteria to Protect - Ecosystem Support, Fishery, Primary Contact Recreation, and Bathing Waters. "B"

Essentially these waters are to have the same water quality as class "A" areas, but whereas class "A" waters may not be declared adjoining class "C" , class "B" waters can.

It will be acceptable for slightly elevated levels of some pollutants to be found in these areas, as long as they are temporary peaks, and cause no environmental harm in the long term. An example of this would be elevated turbidity, E coli and nutrient levels after periods of heavy rain.

7.0 Criteria to Protect - Ports, Receiving and Assimilatory Areas. "C"

As outlined previously, these areas are those that are known to have been degraded through the input of wastes, and they will be managed with the aim of improving and maintaining their water quality to the point that it will be consistent with that of ecosystem support and primary recreation / bathing areas, "B".

So, in these areas, the same water quality objectives are set, as are for class "B", but they are not expected to be achieved in the short term, until discharge licensing and catchment management plans are implemented. Water quality management plans developed with a combination of discharge standards and assimilative capacity assessments will be used to achieve water quality objectives.

7.1 Interim Regulations

Until that time, the water quality criteria / regulations should read:

- There shall be no new discharges constructed, or existing facilities expanded, which flow into either fresh water, enclosed lagoons, or areas near those waters classified as "A".
- There shall be no further decline permitted in the quality of water found in these areas, and any new effluent source shall be treated before release, so that no adverse impact on water quality will occur.
- All areas should be free of floating debris and scum, or odours, or discoloration of waters caused by, or attributable to human activities.
- No waste should be disposed of to the water way, either from ship, or from land, that has not been treated to the maximum extent possible under available technological and financial constraints.
- Any private or government owned organization, or individual, who presently discharges waste to these waters shall be required to monitor, and keep for inspection, the results of monitoring, of all effluent discharged.
- Any private or government owned organization, or individual, who presently discharges waste to these waters shall, in consultation with a recognized expert, prepare an Environmental Management Plan which will outline how the quality of discharge will be improved within the short and long term so that the pollutant loading does not exceed the assimilative capacity of the water body.

7.2 Setting Discharge Limits.

As a guide, sewage should be treated to at least the following standard, or better, if it is being discharged from a point source. There should be no discharge of raw sewage allowed to any fresh water stream, even if it is classed as a previously degraded water way.

Table 4 Max. permissible concentrations of contaminants in sewage effluent to be discharged to "C" class waters.

Contaminant	Max. Conc. Level (mg/L)
BOD_5	5
COD	40
Suspended Solids	10
Phosphorous	6
Ammonia - N	25
Faecal Coliforms	10^6 / 100mL
pH	6-8 pH units
Dissolved Oxygen	>6
Temperature	< 2°C difference from norm.

7.3 Determining the assimilative capacity of a water body.

In determining the assimilative capacity of a water body it is first necessary to consider:

- Quality and quantity of effluent;
- Dilution rate and flushing in the water body; and
- Ecosystem characteristics.

To determine the assimilative capacity of a water body with regard to sewage, it is critical to determine links between nutrient loading and environmental response. The steps in this process are:

- Define the physical and biological boundaries of the ecosystem that will be impacted by the discharge;
- Quantify the total cumulative load of nutrients that will be discharged to the ecosystem;
- Identify the key pathway of nutrient conversion to biomass;
- Link biomass accumulation with the most sensitive important organism;
- Assess the relationship between biomass accumulation and indicator organism, and determine total ecosystem response; and
- Use ecosystem response information to set nutrient load limits that will maintain the water quality objectives of the area.

Another impqrtant tool which may be used in the assessment of a water bodies assimilative capacity is the effluent discharge dilution model "PLUMES" designed by the USEPA.

7.4 Degradation of urban streams.

There is an acute need within the region to address the contamination of fresh water and estuarine streams flowing through urban areas. These water ways are severely choked with gross pollutants such as food packaging and other house hold garbage, and their water quality is being degraded through the input of sewage and other waste effluent. Faecal coliform levels in these streams may pose a significant risk to human health, not to mention the aesthetic and ecological problems related to their misuse.

An integrated community catchment management program must be implemented in all regional centres to address the problem of creek degradation.

7.5 Management of sediment laden runoff during construction projects.

As a pollutant, sediment derived from terrestrial soils can have a severe and sudden impact on the nearshore and freshwater ecosystems of islands, during suspension, and as it is deposited. Impacts include smothering of sessile organisms, reducing the amount of light available for photosynthesis, and disturbing the hunting patterns of predators. These impacts are more severe in waters that have naturally high clarity, for example reef lagoons.

There are many instances where a potentially short term sediment problem can become chronic if steps are not taken to stabilize earthworks in construction areas during a project, once initial works are complete, and after the project site is abandoned.

A large amount of literature is available providing detailed examples and designs of sediment containment devices suitable for all circumstances and conditions. It is in the interest of water quality management and fisheries production that this topic be addressed by the private sector, i.e. civil and structural contractors, as well as government and overseas aid funded projects.

8.0 Implementation Issues.

8.1 Adoption of water quality protection criteria under existing legislation

The legislation relating to water quality protection in eleven Pacific Island Countries has been reviewed, and in all but three or perhaps four countries, there is a lack of significant provisions in place to protect the quality of fresh and marine ecosystems, in some cases, not enough to protect drinking supplies.

There is however, scope within the legislation of most countries to adopt the regulations outlined in this document. There will be a need for the ministries charged with protection of the environment to supply the personnel required to implement these regulations.

The individual National legislative documents, or Acts, which could be amended to include the provisions of this water quality protection document are listed below in Table 5.

Table 5. Existing PIC legislation dealing with the issue of water quality

Country	Existing legislation	Comments and Recommendations.
Federated States of Micronesia	*FSM Environmental Protection Act 1984* *FSM EPA Subsidiary Regulations, Marine & Fresh Water - 1986*	Sufficient Legislation. Specific water quality standards needed to maintain values. Need to bring states in line with national standards.
Solomon Islands	*Constitution of the Solomon Islands* *Environmental Health Act 1980* *Environmental Bills 1990 & 1991* *Mines & Minerals Act 1990* *Public Health Bill 1990* *River Waters Act 1969* *Fisheries Regulations*	Despite the many individual pieces of legislation in place, there is no adequate policy framework for water management & conservation. There needs to be consolidation and adoption of comprehensive water management legislation, preferably under a national EPA
Tonga	*Sixth Development Plan* *Tonga Water Supply Master Plan* *Marine Pollution Bill (proposed)*	Marine pollution bill should be supplemented with water quality. protection criteria and implemented ASAP.

8.2 Classification and Declaration of Areas

An integral component of these regulations will be the sampling and assessment of water bodies so that classification areas can be declared.

First areas to be declared and mapped will be the receiving and assimilative areas, class "C", as the distinction between these and other areas will be most obvious. A long term water quality monitoring program should be implemented in these areas immediately, both to ascertain present conditions, and to detect future improvement or deterioration in water quality.

Research and sampling will determine the boundaries of the system, both physical and biological, influenced by the pollutants entering the waterway, and this will be the extent of the class "C" area. Where the pollutants entering the system cease to have a discernible effect, under normal conditions, class "B" waters will be declared.

The next group of waters to be declared will be pristine, or "A" quality waters. Research and sampling will indicate those areas where no significant amounts of human generated pollution is found under present conditions, and in the case of fresh water, anywhere that contributes to a drinking water supply. Areas that meet these criteria will be mapped and declared as protected areas.

The remaining waters that have not been classified as either "A" Pristine, or "C" Receiving waters, will be classified as "B" Ecosystem Support and Primary Contact areas.

As each separate area is declared and added to a water quality zoning map, it shall be described by a code, which will include the following information;

- Class letter - A, B or C
- Physical attribute code, (e.g. Estuary "3")
- Name of water body, or closest village
- Boundary coordinates of the water body as taken from a GPS system (if available);

All of this information, including results of water quality monitoring should be entered into a data base and GIS, (if available).

8.3 Monitoring Program

See chapter 7 from ANZECC

8.4 Implementation and Enforcement of Regulations

Take from Palau doco, check library for other EIS info or regulations.

8.5 Education and community facilitation

Protection Board.

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