EMISSION LIMIT GUIDELINES FOR

FRUIT & VEGETABLE PROCESSING ACTIVITIES

THAT DISCHARGE POLLUTANTS INTO FRESH AND MARINE WATERS

DEPARTMENT OF PRIMARY INDUSTRIES, WATER & ENVIRONMENT

Regulatory authorities should ensure that emission limits set for the point source discharge of pollutants to surface waters from new or existing fruit & vegetable processing activities are set in accordance with these guidelines unless the regulatory authority considers that site-specific circumstances preclude their use. The advice of the Board of Environmental Management and Pollution Control must be sought where the use of the guidelines is not considered appropriate.

This document contains emission limit guidelines applicable to:

(a) all operations with a processing capacity of less than 50 kilograms per hour of product, and

(b) all operations washing fruit and vegetables for the fresh produce market.

1. Introduction

This document provides advice to regulatory and planning authorities on wastewater management requirements for fruit and vegetable processing activities. It also provides some guidance to operators on best practice environmental management in their industry sector.

The Board of Environmental Management and Pollution Control (the Board) is required under the ***State Policy on Water Quality Management 1997*** (the Policy) to publish emission limit guidelines for a number of common activities which are likely to give rise to point source discharges of pollutants to surface waters. Point source pollution is pollution which is emitted at a discrete, identifiable location, usually via a discharge pipe or outfall, which can be readily measured.

Emission limit guidelines are primarily intended for use by local government to assist with planning decisions and with the maintenance of water quality objectives. While the Policy focuses on the receiving environment and prevention of environmental harm, there is recognition, particularly for small to medium scale activities, that 'end of pipe' limits may be the only practical approach to regulation. Setting permit conditions based on the receiving environment would require considerable resources that are often not available, and may only be feasible for larger scale activities.

Produce processing activities are nominated in the Policy as a possible point source of pollutant discharge to surface waters. Consultation with industry regulators and operators indicates that while the larger processors typically undertake land application of wastewater or discharge to sewer, uncontrolled discharges of wastewater to waterways do occur from smaller plants. These discharges can have negative effects on the receiving waters both in terms of their potential for human use and for ecosystem health.

The emission limits specified in these guidelines are derived from a review of accepted modern technology (AMT) within the food processing industry. They represent a treatment standard that is economically viable and achievable using accepted modern technology.

2. Policy Background

Under the ***State Policy on Water Quality Management 1997,*** protection of surface water and groundwater quality is achieved by determining the range of existing values and uses for specific bodies of water, which then provide the basis for setting water quality objectives (WQOs). Any number of the protected environmental values (PEVs) listed below can be assigned to a specific water body:

- Protection of aquatic ecosystems (pristine or modified)
- Recreational water quality and aesthetics
- Raw water for drinking water supplies
- Agricultural water uses (irrigation, stock watering)
- Industrial water supply

The nomination of PEVs is a community-based consultative process involving users, stakeholders and other interest groups. Once PEVs are assigned to a body of water, the Board will determine the water quality guidelines (numerical values for key indicators) to achieve specific PEVs. The most stringent set of guidelines are the WQOs for those waters.

Activities that discharge point source pollutants to surface waters are a potential obstacle to the achievement of WQOs for regional waterways. Local councils are responsible through the Resource Management and Planning System for the prevention or control of pollution in surface water and groundwater by activities within their jurisdiction which are not level 2 or level 3 activities (level 1, 2 and 3 activities are defined under the ***Environmental Management & Pollution Control Act 1994***). This role may be shared with other authorities in some areas (e.g. national parks, other crown land). Larger scale industrial activities - level 2 activities - such as those in the food-processing, mineral and extractive, and waste disposal sectors are regulated by the Board.

Regulatory authorities should set limits (including zero discharge restrictions) on the permissible concentrations and/or loads of pollutants discharging from point sources into waterways to ensure that the achievement of WQOs will not be prejudiced.

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3. Fruit & Vegetable Processing Activities

These guidelines are to be used for activities processing fruit and vegetables. The processing of crops can potentially require one or more activities, from washing of the product for the fresh produce market to value-adding processes such as sterilisation, preserving, juicing, bottling, packaging, freezing, canning or drying.

4. Regulation

Operators of fruit & vegetable processing activities may be required to hold a permit issued by a planning authority under the ***Land Use Planning and Approvals Act 1993***. Conditions of operation detailed in the permit are legally binding.

In addition, the ***Environmental Management and Pollution Control Act 1994*** (EMPCA) contains provisions for the prevention of environmental harm and nuisance. Mechanisms available under this Act such as environment protection notices are applicable to processing activities whether or not a permit is held. Under EMPCA, the production levels of produce processors determine whether the regulatory authority is the Board or local government. Larger operations with a processing capacity of 50 kilograms or more per hour of product are classified as 'level 2' activities and are regulated by the Board. Smaller plants (i.e. less than 50 kilograms per hour) and activities washing fruit and vegetables for the fresh produce market are regulated by local councils.

All food businesses must comply with the food safety and quality provisions of the ***Food Act 1998*** and the ***Food Hygiene Guidelines 1998*** which are enforced by the Department of Health and Human Services and local government environmental health officers. The AFFA document ***Guidelines for On-Farm Food Safety for Fresh Produce*** provides valuable information for fresh produce processors on where food safety hazards may occur and on assessing the risk of contamination from various factors, including the potential for microbial and chemical contamination of process water and wash-water.

5. Wastewater Characteristics

Food processing activities typically produce large volumes of solid wastes, wash water and process wastewater containing organic matter and suspended solids. Liquid effluent containing a variety of contaminants may be generated during different processing stages.

While a general distinction is drawn in these guidelines between wash water (from washing of raw product, plant clean-up etc.) and process water (from value adding steps such as peeling, sorting, canning etc.), such a clear categorisation of wastewater may not always be possible. Analysis of contaminant loads in wastewater may be required to determine treatment requirements.

Wastewater characteristics will vary depending upon:

- quality of influent water;
- rate of water consumption;
- type of fruit or vegetable processed;
- condition (ripeness, damage) of raw product;
- whether the product is conveyed by a wet or dry process;
- processing techniques (washing, blanching, peeling etc.);
- whether brine, caustics and other chemicals are used in processing;
- clean-up methods (dry vs. wet, detergents, disinfectants);
- frequency and duration of shutdowns;
- condition and type of equipment; and
- management and staff training.

Contaminants of particular concern are the decomposable organic compounds (as determined through measurement of 5-day biochemical oxygen demand) and solids, particularly suspended solids (also known as non-filterable residue). Other parameters – pH, temperature, salts, dissolved solids, nutrients, plant pathogens, pesticides or cleaning agents – may be of concern depending upon concentrations and/or circumstances.

Hygiene requirements can require processors to use large volumes of water for cleaning equipment, plant and products, and for wash-down and processing operations. This large hydraulic load must be considered in the design and implementation of a wastewater management strategy.

6. Environmental Impacts

The environmental effects of discharges to waterways will relate to the scale and type of operation, to the wastewater management practices in place, and to the sensitivity of the receiving environment. The key pollutants in wastewater that can cause environmental problems are high levels of biochemical oxygen demand and/or non-filtrable residue.

High demand for oxygen during microbial decomposition of organic waste can result in serious oxygen deficits in waterways and, where there is serious pollution, the receiving environment may be degraded to the extent that it can not support aquatic life. Microbial decomposition in the absence of oxygen can also produce noxious gases such as methane, carbon dioxide and hydrogen sulfide.

Solids in the waste stream can also have undesirable impacts whether in suspension or as settleable solids. High levels of turbidity caused by suspended solids decrease the clarity of the water, physically hindering the functioning of aquatic plants and animals and providing a protective environment for pathogens. Solids that settle on the stream bed can form anaerobic (no oxygen) sludges which smother bottom dwellers and produce a hostile low oxygen environment.

Elevated loadings of nutrients (nitrogen and phosphorus) in effluent can lead to excessive algal growth producing long term problems with odour and toxic algal species.

Disinfectants such as chlorine may also be present in wastewater where it is used during cleaning activities or wastewater treatment and may be harmful if discharged to the aquatic environment. Residual pesticides and fungicides, where present in wastewater, will also adversely impact on the receiving environment.

7. Waste Management Hierarchy

The Policy requires that pollutant discharges to the environment should be reduced to the maximum extent that is reasonable and practical having regard to best practice environmental management, and in accordance with the following hierarchy of waste management, arranged in decreasing order of desirability:

1. waste avoidance;
2. recycling/reclamation;
3. waste re-use;
4. waste treatment to reduce potentially degrading impacts;
5. waste disposal.

It follows, therefore, that before an activity is permitted to discharge effluent to surface waters, the managers of the activity must first demonstrate to the satisfaction of the regulatory authority that all of the above waste management options have been considered; that all reasonable and practical pollutant reduction measures have been implemented; and that alternative methods of disposal such as on-site re-use or irrigation are not practical or would result in a higher net environmental risk considering the effluent quality to be discharged.

8. Minimising the Pollutant Load

It is an essential requirement of the Policy that all activities discharging effluent to surface waters conform to best practice environmental management. Discharge of effluent to surface waters should not be permitted by the regulatory authority unless the operator of the activity demonstrates that all reasonable and practical measures have been taken to avoid, reduce, recycle and reclaim wastes from within the effluent waste stream.

A number of measures for possible improvements in the environmental performance of fruit and vegetable processing plants are outlined below, particularly in relation to the management of waste streams, the enhancement of effluent quality, and the use of alternative re-use/disposal methods. The high standards of hygiene required to ensure the wholesomeness of products should not be compromised in reducing the waste load. Nonetheless, areas to consider for reducing the total volume of water and the pollutant load requiring treatment include the following:

- change the process or equipment;
- change, alter or reduce the inputs (e.g. the isolation of as much solid material as possible from the liquid waste stream by screening or filtering where appropriate);
- improve process controls;
- process alteration (e.g. reduce the number of product changes per day, thus decreasing the amount of wash water produced);
- separation and characterisation (i.e. monitor constituent concentrations) of wash water and process water to allow reuse or recycling, where hygiene requirements permit, of part of the liquid waste stream within the process;
- improve materials handling and cleaning operations;
- roofing or isolation of all process areas including delivery/receiving areas and dry clean spills immediately to minimise the volume of contaminated stormwater;
- use appropriate bulk containers so as to minimise waste through spills and where spills are unavoidable, clean-up spilt material immediately utilising dry clean-up methods as much as possible;
- change general housekeeping (e.g. dry clean up before using water for wash down; use of small diameter, high pressure hoses with auto cut-off valves for wash-down);
- improve maintenance and repair of equipment;
- training for plant employees in quality assurance and continual improvement procedures and in plant operational skills; and
- implementing environmental management systems (such as AS/NZS ISO 14031) or Hazard Analysis and Critical Control Point principles will allow, as one outcome, a systematic approach to dealing with the environmental aspects of an organisation's activities. These approaches enable an organisation of any size or type to control the impact of its activities, with the potential for significant savings in operating costs through reduced energy demand, waste stream generation and chemical usage.

9. Stormwater Run-off

The size of an activity and its associated roof areas and other hard surfaces (e.g. paved roads/receiving areas) will affect the amount of stormwater that is produced. Precautions should be taken to prevent contamination of stormwater by processing waste. Roofing or isolation of all process areas including delivery/receiving areas; the building of diversion drains and bunding; and undertaking ‘dry cleaning’ of spills immediately to minimise opportunities for contamination. Possibilities may exist for clean stormwater to be utilised on site thus decreasing the amount of water taken from council water supply lines or other forms of water supply.

Once stormwater is contaminated it will have to be channelled into the wastewater/effluent stream, thus increasing the volume of effluent requiring treatment.

10. Wastewater Treatment

Regulatory authorities, as a minimum standard, should require operators to use treatment ponds to service all contaminated stormwater, wash water and process water in situations where produce processing activities direct effluent to land or to surface waters, or where effluent discharged to sewer requires pre-treatment. Ponds must have adequate capacity to prevent uncontrolled overflows into waterways and sufficient capacity to enable controlled discharge of wastewater during high flow periods in the receiving waters.

Design advice should be sought from suitably qualified engineers and should address issues such as the proximity to neighbouring land uses, potential for bank erosion, pollutant loading levels, sludge removal, evaporative capacity, pond overflows and achievement of satisfactory levels of organic material breakdown and bacterial disinfection. Microbiological concentrations in outfall water are related to factors such as pond retention time, dilution, water temperature, degree of aeration and the concentration of suspended solids.

11. Options for the Disposal of Treated Wastewater

There are a number of options for dealing with liquid waste (see Figure 1). Generally, regulatory authorities should ensure that liquid waste is applied to land in accordance with wastewater re-use guidelines. Where this is impractical, wastewater should either be directed to sewer (in the case of treated process water) or discharged to waterways (for treated wash water).

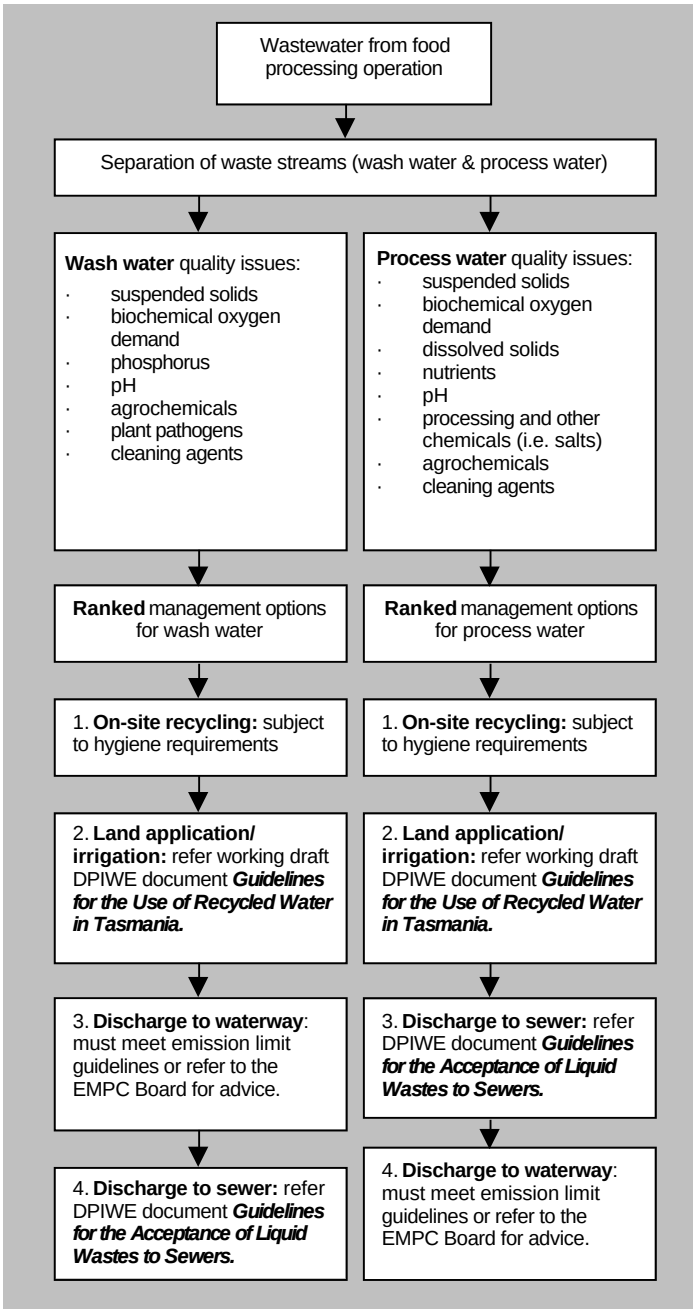

Figure 1: Present options for disposal of treated wastewater.

Land application / Irrigation to land

Land irrigation of treated effluent is the preferred option where site characteristics allow.

The factors governing this "beneficial re-use" approach are described in the draft document ***Environmental Guidelines for the use of Recycled Water in Tasmania***. Presently available as a working draft, this document is to be released in 2002 (to replace the 1994 DELM publication ***Guidelines for Reuse of Wastewater in Tasmania***). It is intended as a reference for determining environmental objectives and management of all major aspects of wastewater re-use systems in Tasmania. These guidelines provide irrigation design, discharge and operating specifications for the use of wastewater in any effluent re-use scheme or activity.

Recycling of wastewater should be managed to achieve the following environmental and health performance objectives:

- control of recycling operations so as not to pollute ground or surface waters;
- use of organic matter, nutrients, salt and wastewater for sustainable operations; and
- management of wastewater so as not to cause any interference with community health or amenity.

The recycling guidelines detail those factors to consider when evaluating the viability of a proposed re-use scheme. These include:

- the volume and constituents of effluent discharged;
- site water balance – i.e. soil type, local drainage, proposed plants/crops, evaporation and annual rainfall;
- capacity for nutrient uptake by soils and plants;
- potential salinity hazards;
- storage requirements during periods where rainfall meets plant needs;
- stormwater management to stop overland nutrient flow;
- buffer distances sufficient to ensure activity separated from residential areas (consider future expansion);
- buffer distances to mitigate impacts on nearby terrestrial and aquatic environments.

Monitoring programs are needed to ensure that long-term irrigation re-use is sustainable and does not adversely affect soil and ground water quality. To ensure that remedial action can be taken early, the following monitoring is recommended – flow (influent and effluent), waste quality (influent and effluent), soil and groundwater.

Suitably treated wastewater may also be of value either on-site or in nearby areas for uses such as irrigation of gardens, golf courses and parks; for dust suppression on roads; or for emergency fire fighting. The draft document ***Environmental Guidelines for the use of Recycled Water in Tasmania*** outlines planning and operational requirements to minimise the risk to public health and the environment when re-using wastewater for these non-farm purposes.

Water-borne plant pathogens may be an issue for some operators in the agricultural sector wishing to re-use wash-water. A study by the Department of Natural Resources & Environment in Victoria - ***Quality washwater for carrots: Insurance for clean food and minimising environmental impact. (1999-2002)*** - is sampling water from carrot and other vegetable washing operations in five states, including Tasmania, to determine what nutrients, chemicals, plant and human pathogens may be present in the water after washing vegetables. The project aims to make the most efficient use of water by enabling extended recycling of water used to wash soil off produce and establish if it is safe to re-use. The project will then test a range of water treatments to find the most effective and economical methods of water treatment that will enable better water re-use. The study should produce important management advice. Where there is perceived to be a risk of cross-contamination, an interim management approach may be to

restrict wastewater application to pasture or to different crop types.

Regulatory authorities should ensure that operators incorporate best practice environmental management into their processing activities and move towards land application of wastewater within five years, where site characteristics allow. Regulatory authorities should seek the advice of the Board where existing plants can't comply with these requirements.

Disposal to sewer

Process water is typically produced in smaller volumes than wash water and contains higher levels of biochemical oxygen demand and non-filtrable residue. The level of environmental risk to receiving waters from these pollutants warrants stringent treatment requirements which can be met within the municipal sewerage system.

Acceptance of waste water to a municipal sewerage system may require a trade waste agreement with the relevant local council detailing conditions for the treatment of waste water. The 1994 document ***Guidelines for the Acceptance of Liquid Wastes to Sewers*** published by DPIWE provides advice on such agreements.

Approved disposal to a watercourse

For new fruit & vegetable processing activities, regulatory authorities should not permit the point source discharge of pollutants to surface waters unless there are exceptional circumstances. These cases are to be referred by the regulatory authority to the Board for advice.

For existing processing activities, the uncontrolled discharge of wastewater to waterways should not be permitted. Regulatory authorities should ensure that premises have adequate settlement ponds both to ensure some pre-treatment prior to discharge and to avoid the need for uncontrolled release into waterways. An approach is to be adopted that couples a summer or dry season land disposal system with controlled intermittent winter or wet weather discharges to surface waters. Restricted discharges of liquid wastes should only be allowed during periods of high runoff and stream-flow (i.e. high rainfall periods) on the assumption that dilution ameliorates some detrimental effects of the effluent. Any such discharges must comply with the emission limit guidelines outlined below.

In circumstances where land application is not an option, discharge of wastewater to sewers may also not be an option either because there is no municipal sewerage system available or because the combination of large wash water volumes and significant loads of suspended solids exceeds the treatment capacity of the local sewerage system.

Discharges to surface waters should not prejudice the achievement of recognised WQOs for local waterways. Generally discharges should not be permitted where:

- the receiving waters at, or downstream of, the discharge point have a Protected Environmental Value of "pristine or nearly pristine ecosystem"; or
- the receiving waters are lakes or natural wetlands; or
- there is likelihood of causing material environmental or serious environmental harm to receiving waters.

Regulatory authorities should refer to the Board for advice in the above circumstances.

12. Emission Limit Guidelines

These guidelines apply to fruit and vegetable processing activities with a processing capacity of less than 50 kg/hour and any activities washing fruit and vegetables for the fresh produce market.

Regulatory authorities should not permit the point source discharge of pollutants to surface waters from new processing activities.

Regulatory authorities should ensure that existing processing activities move towards land application of wastewater within five years where site characteristics allow.

The following emission limit guidelines are to apply in the period before land application is achieved. Where there is no clear distinction between wash water and process water, both discharge requirements apply.

Emission limit guidelines to apply where **wash water** is discharged to surface waters:

I. No visible plume in receiving waters – discharge does not cause greater than 10% increase in turbidity of receiving waters. In practice this is intended to allow only managed intermittent discharges during high flow periods when there are increased volumes of water available for dilution and naturally higher background levels of turbidity.

II. No visual oil, grease, solids or unnatural colour in the receiving waters.

Emission limit guidelines to apply where **process water** discharged to surface waters:

Parameter	**Maximum (mg/L)**	**Dilution requirement in receiving waters**
BOD_5	20	less than 50 times
	40	50 times or greater
NFR	30	less than 50 times
	60	50 times or greater
Oil & grease	10	
pH range in water	Median pH of discharge should lie within the 20 to 80 percentile value of background level in receiving waters.	
Temperature	Median temperature of discharge should lie within the 20 to 80 percentile seasonal value of background level in receiving waters.	

No visual oil, grease, solids or unnatural colour in the receiving waters

Where emission limit guidelines are inappropriate (see Section 13) case-specific emission limits are to be specified by EMPC Board for wash water and/or process water.

The operator / proponent will be required to supply effluent characterisation information - discharge flow data and concentrations of BOD, NFR, pH, nutrients & turbidity. Other parameters may be required.

Information on the quality of receiving waters will also be required.

13. Where the Guidelines are not Applicable

Regulatory authorities should ensure the emission limits detailed in Section 12 are adopted, unless:

- the fruit & vegetable processing activity is a 'level 2' activity which will have emission limits set on a case-specific basis by the Board; or
- there are case-specific circumstances which are identified as inappropriate for the use of the guideline limits – e.g. adoption of waste reduction programs and effluent minimisation practices such as evaporation ponds may, while reducing overall pollutant loading, occasionally result in discharge concentrations above these limits; or
- the limits specified in the guidelines will not be adequate to protect the WQOs for the receiving waters; or
- it can be demonstrated by the operator of the activity that it is neither reasonable nor practical to comply with the specified emission limits and that discharges in accordance with a higher limit will not prejudice the achievement of recognised WQOs.

Advice on emission limits must be sought from the Board where the guidelines are not deemed to be applicable.

14. Monitoring of Discharges

Operators of activities utilising point source discharges to waterways have a responsibility to monitor their effluent(s) for pollutants, and contribute to the ambient monitoring of the receiving waters, including baseline monitoring. Regulatory authorities should ensure that these responsibilities are reflected in the conditions attached to permits and/or environment protection notices as and where appropriate. As an example, during the transition period to land application of effluent, a permit may require the point source operator to monitor turbidity upstream and downstream of the controlled discharge.

Where a processing activity is unable to meet the discharge requirements and is referred by the regulatory authority to the Board for the setting of case specific emission limits, information on 'end-of-pipe' discharge loading (i.e. flow data and concentrations of biochemical oxygen demand, non-filterable residue, pH and nutrients) and water quality in the receiving environment will be required.

At a broader catchment level, the Policy designates a shared responsibility for monitoring involving water resource managers, point source operators, contributors to diffuse source pollution and community-based monitoring organisations. Authorities responsible for resource management and environment protection should ensure that adequate monitoring of receiving waters is carried out to determine whether water quality objectives are being achieved.

15. Departmental Contact

These guidelines are also on the DPIWE website – look under Environment, ***http://www.dpiwe.tas.gov.au.***

Further information may be obtained by contacting:

Environment Division
Department of Primary Industries, Water and Environment.
GPO Box 44, HOBART TAS 7001.

16. Definitions

Accepted modern technology: technology which has consistently demonstrated achievement of the desired effluent pollutant levels in economically viable situations, takes account of engineering and scientific developments in economically viable operations and pursues opportunities for waste minimisation. (National Water Quality Management Strategy '***Policies & Principles: Reference Document***').

Best practice environmental management: management of an activity to achieve an ongoing minimisation of the activity's environmental harm through cost effective measures assessed against current international and national standards applicable to the activity.

Board / EMPC Board: the Board of Environmental Management and Pollution Control established under Section 12 of EMPCA.

Environmental harm: any adverse effect on the environment (of whatever degree or duration) and includes environmental nuisance.

Level 1 activity: an activity which may cause environmental harm and in respect of which a permit is required under the Land Use Planning and Approvals Act 1993, but does not include a Level 2 or a Level 3 Activity.

Level 2 activity: an activity which is specified in EMPCA Schedule 2.

Material environmental harm: specified in Section 5 of EMPCA:

(i) it consists of an environmental nuisance of a high impact or on a wide scale; or

(ii) it involves an actual adverse effect on the health or safety of human beings that is not negligible; or

(iii) it involves an actual adverse effect on the environment that is not negligible; or

(iv) it results in actual loss or property damage of an amount, or amounts in aggregate, exceeding the threshold amount.

Point source pollution: pollution which is emitted at a discrete, identifiable location, usually via a discharge pipe or outfall, and which can be readily measured.

Reasonable and practical: In deciding what is deemed to be reasonable and practical, consideration should be given to:

(i) The severity of the environmental risk in question and the environmental benefits of removing or mitigating that risk;

(ii) The state of knowledge of the environmental risk and options for removing or mitigating that risk;

(iii) The availability, efficiency and suitability of options to remove or mitigate that risk;

(iv) The financial & social costs of removing or mitigating that risk.

Serious environmental harm: specified in Section 5 of EMPCA

(i) it involves an actual adverse effect on the health or safety of human beings that is of a high impact or on a wide scale; or

(ii) it involves an actual adverse effect on the environment that is of a high impact or on a wide scale; or

(iii) it results in actual loss or property damage of an amount, or amounts in aggregate, exceeding ten times the threshold amount.

17. References

AFFA. ***Guidelines For On-Farm Food Safety For Fresh Produce***. Agriculture Fisheries and Forestry Australia. 2001. (www.affa.gov.au)

Dept. of Health & Human Services. ***Food Hygiene Guidelines***. 1998.

DPIWE. ***Guidelines for Acceptance of Liquid Wastes to Sewer.*** 1994.

DPIWE. ***Guidelines for Re-Use of Wastewater in Tasmania***. 1994.

DPIWE. ***State Policy on Water Quality Management.*** 1997.

DPIWE. ***Environmental Guidelines for the use of Recycled Water in Tasmania***. Working Draft in Progress.

Standards Australia. ***AS/NZS ISO 14031: Environmental performance evaluation - Guidelines***. International Organisation for Standardisation. 2000.

United States EPA ***Environmental Compliance Guide for Food Processors***. 1999. http://es.epa.gov/oeca/ccsmd/food/mecgfp.htm