

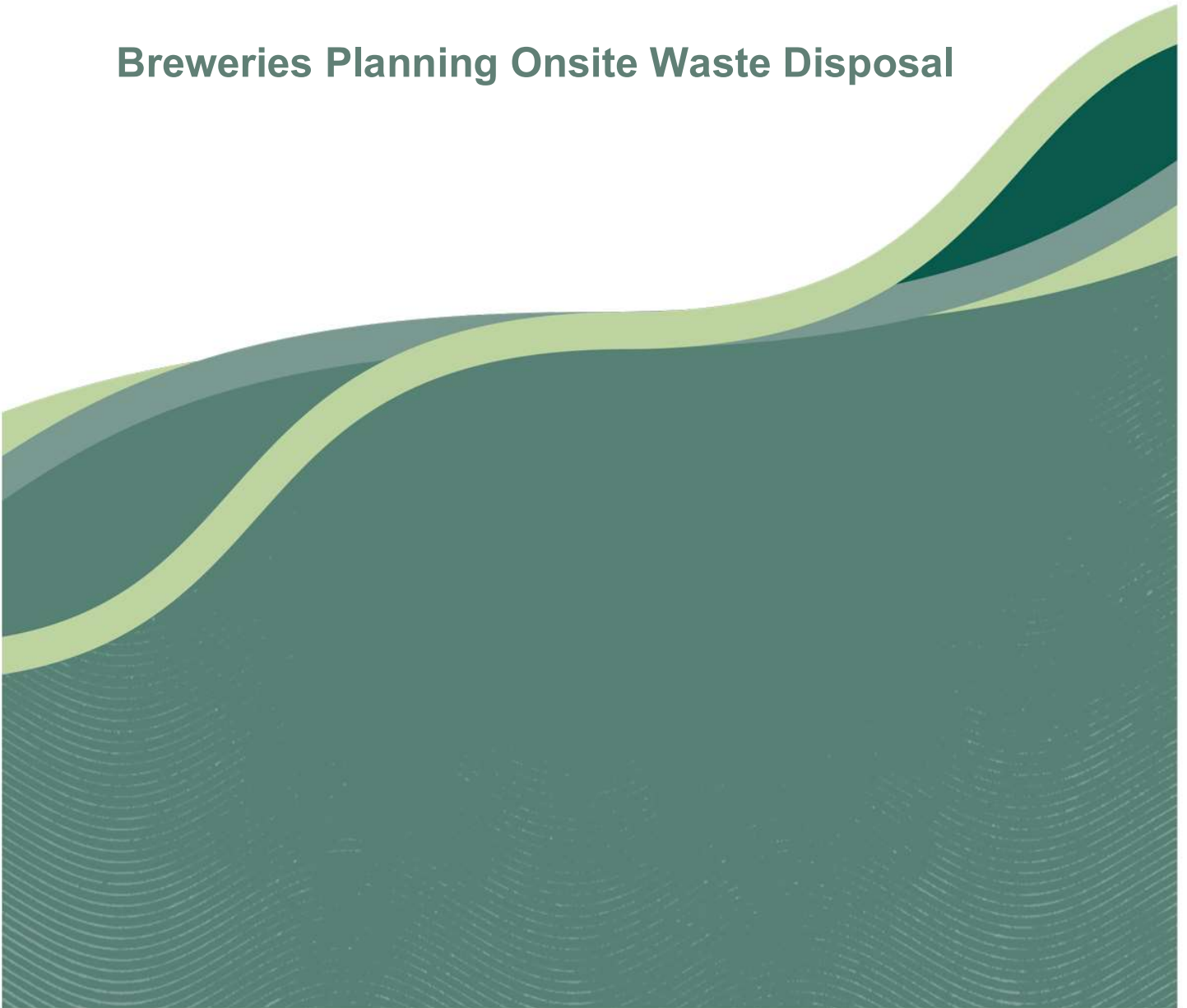


Department of
Primary Industries and
Regional Development

Protect
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Agribusiness Development Guidelines

Breweries Planning Onsite Waste Disposal



Purpose

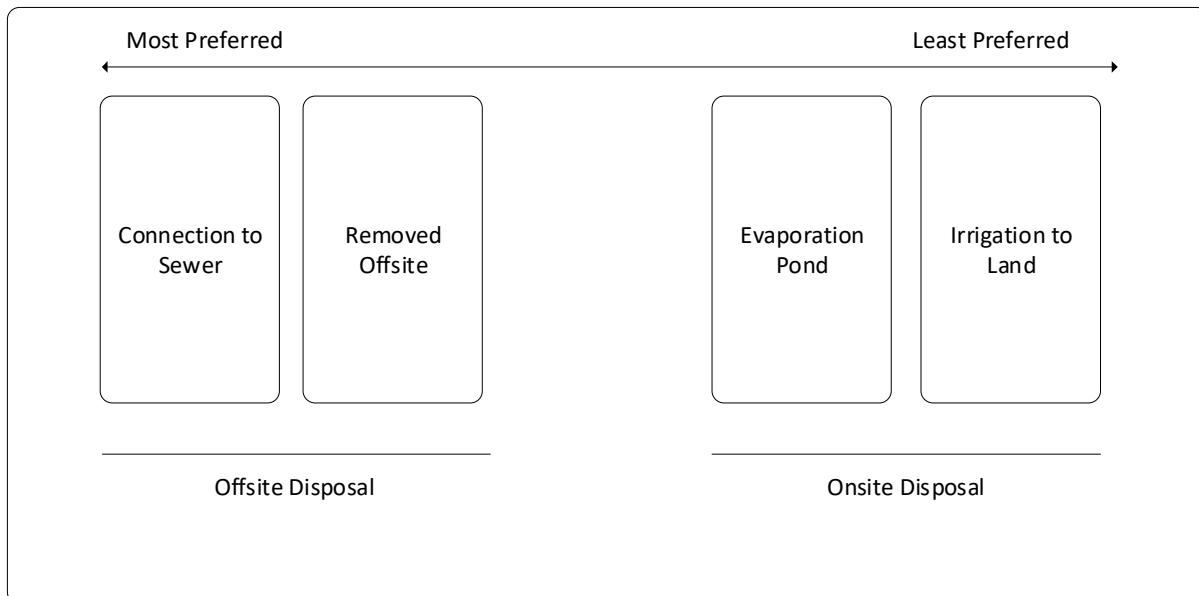
This document gives the general steps that a brewery should take when intending to dispose of trade waste on site.

Principles

- Any facility that produces beer for sale should dispose of their trade waste appropriately.
- Brewery trade waste needs to be treated separately to domestic wastewater (e.g., from toilets, showers, hand basins and other domestic fixtures).
- The use of leach drains is not a recommended disposal method for brewery trade waste.
- Irrigation of trade waste is the least preferred disposal option, with connection to sewer, evaporation or removal off site being the recommended alternatives.
- All waste applied to land should be done without degradation of soil, groundwater or surface water.

Disposal Options

It is important to consider all disposal options, as they will have significant implications to siting a new brewery, capital costs and ongoing management efforts.



Onsite disposal steps 1, 2 & 3 below are not required if using connection to sewer, evaporation ponds or offsite disposal, therefore these should be a key decision in overall business planning.

RULE OF THUMB
Every 1 L of beer produced results in 5.5 L of brewery trade waste.

Offsite Disposal

Connection to Sewer

It is recommended to seek discharge approval from the water utility as early as possible. For locations serviced by the Water Corporation this is done via a Trade Waste Permit, and any trade waste must have approval prior to discharge.

Trade waste acceptance criteria² do apply, and some wastes may be rejected without pre-treatment depending on the capacity of both the sewer network and treatment plant. The key characteristics effecting acceptance is Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and pH. Yeast and grain are not to be discharged unless trade waste is within the acceptance criteria¹.

Generally, the following measures are required for brewery trade waste: water meter, sampling point, bucket trap/strainer, settleable solids arrestor, pH correction, and equalisation tanks to cater for daily discharge limits. Installation of a dedicated trade waste monitoring point including a magnetic flow meter is required for breweries intending to produce more than 250 kL-beer/year.

Removal offsite

Trucking of trade waste offsite needs to be done by a licenced contractor, to a licenced facility able to receive the waste. Costs associated with transport and disposal can be prohibitive.

When trucking waste offsite is the primary method of waste disposal, it is likely that the regulator will require evidence that a licensed facility is able to take the waste. One example of evidence is an agreement between the business and licence waste contractor, including the liquid waste facility intended for disposal.

It is important to confirm whether there are liquid waste facilities available, and that the selected liquid waste facilities have capacity to take the volume and type of liquid waste, this is particularly important to the south-west of WA.

Piping waste across lot boundaries needs to be done via an approved recycled water scheme under a recycled water agreement between a supplier and user, or via sewage connection by a licensed water service provider.

Onsite Disposal

Evaporation Ponds

Evaporation ponds are likely to be a viable option if there is sufficient land area and favourable climatic conditions.

If land area and climate allow for evaporation ponds, another two factors to consider are odour and material compatibility; brewery trade waste may be susceptible to increased odour complications tied to fermentation by-products, and pond lining material² should be selected with consideration to any chemicals used in the brewing process.

¹ Water Corporation [trade waste rates](#) and [acceptance criteria](#) is listed on their website.

² For example, some clays disperse in the presence of sodium, which can be present in high concentrations in brewery trade waste.

As a back-of-the-envelope calculation, an evaporation pond can be sized in 2 easy steps:

$$\text{Evaporation area [m}^2\text{]} = \frac{\text{Annual trade waste volume [kL]}}{\text{Annual Evaporation [m]} - \text{Annual Rainfall [m]}}$$

$$\text{Pond depth [m]} = \frac{\text{Wet season wastewater volume [kL]}}{\text{Evaporation area [m}^2\text{]}} + \text{Wet season rainfall [m]}$$

Evaporation pond depths are generally 0.5-1.5 m, and care should be taken when converting the above numbers to pond dimensions, accounting for wall slope.

Given sufficient land area is available, climatic conditions for evaporation ponds are likely to be favourable anywhere north of the '3' line in Figure 1.

The above equations are early estimates; therefore, it is important to confirm evaporation pond size in the design phase, prior to construction. Specialist advice is recommended.

Irrigation

Step 1 – Is the receiving environment suitable?

Considering whether your site is appropriate for receiving irrigated trade waste is the single biggest factor when considering on-site disposal. The most significant things to consider are:

- Separation to groundwater
- Climate
- Proximity to sensitive receptors (i.e., wetlands, estuaries)

There are other considerations outlined in the '[ABD Guidelines: Site Assessment for Waste Irrigation](#)' including soil type, soil depth, land slope, and proclaimed drinking water catchments. However, for most breweries the main consideration is to ensure that seasonal high³ groundwater separation underneath the proposed irrigation area is greater than 2.0 meters.

Step 2 – Is the waste stream suitable?

An important step in the process is characterising your trade waste to determine if it is suitable to irrigate, or if it requires treatment prior to irrigation.

For raw brewery waste, Biological Oxygen Demand (BOD) reduction and pH correction is likely to be required. Phosphorus or sodium-based cleaning agents should also be treated with caution, as phosphorus is often the nutrient in excess relative to plant requirements, and sodium can cause soil structure problems. Detailed information is provided in '[ABD Guidelines: Suitability of Liquid Waste for Irrigation](#)'.

³ For the southern half of WA the seasonal groundwater high is generally Sept/Oct, and March/April for the north of WA.

Many brewing practices can significantly alter the waste stream by:

- Side streaming and off-site disposal of high BOD waste⁴
- Substitution of phosphorus-based sanitisers or sodium base cleaning agents
- Side streaming and off-site disposal of the high salinity clean-in-place (CIP) waste stream

Any suitable waste stream can be irrigated onto a suitable environment at the appropriate rate. However, a combination of a difficult waste stream and sensitive environment will result in exceptionally low irrigation rates. This increases the required irrigation area, often unavailable at the brewery. Therefore, it is important to understand the required level of treatment prior to making decisions on the trade waste treatment systems.

The level of treatment can be determined by calculating the amount of carbon (BOD), nitrogen and phosphorus that can be applied to the irrigation area. Once waste characteristics (quality and quantity) and site characteristics (crop type, yield and irrigation area) are known, the level of treatment can be determined.

For example, a BOD loading of 1,500 kg/ha/month is often accepted for waste irrigation. This BOD loading at an irrigation rate of 5 mm/day would give an allowable BOD concentration of 1000 mg/L in the waste stream. This is in excess of domestic sewage BOD concentrations and is achievable with side streaming of high BOD brewery waste.

Step 3 – Can a cropping regime assimilate the waste?

A cropping regime needs to be established as a method of assimilating waste from the environment.

This step is to make sure that the water, nitrogen, and phosphorus are utilised by the selected plants, before the crop is harvested and removed off-site. In most cases, phosphorus will be in excess and a fast growing, low maintenance crop such as pasture is recommended. With frequent mowing and basic care, an irrigated pasture can yield 10 t/ha. At a removal rate of 3kg-P/t, this results in a maximum of 30 kg-P/ha/year of phosphorus removal.

Pasture yields of 10 t/ha are rarely achievable in the low rainfall areas without significant freshwater supplementation. Evaporation ponds become an effective option for dealing with liquid waste in low rainfall areas of the south-west, but also including the northern parts of the state (Broome, Kununurra) where evaporation far exceeds rainfall.

For example, a brewery producing 400 kL of beer per year with a phosphorus concentration of 30 mg/L in the waste stream will produce approximately 2.2 ML/year of waste containing 66 kg of phosphorus. Assuming that 10 t/ha of pasture is viable for the climate and soil type, the expected phosphorus offtake will be 30 kg-P/ha/year. Dividing the phosphorus application rate by the crop offtake rate gives a minimum required waste irrigation area of 2.2 ha.

⁴ Weak wort, trub and waste yeast is considered as high BOD waste.

Figure 1 shows the number of months when rainfall exceeds evaporation in the south-west of WA. It is anticipated that with frequent mowing and basic care, pasture yields of 10 t/ha are achievable anywhere south of the '4' line. When using basic irrigation scheduling methods, the number of wet months shown in Figure 1 drives the required winter storage capacity.

For more detailed information, refer to 'ABD Guideline: Sizing a Waste Irrigation Area'.



Figure 1 - Number of months each year when rainfall exceeds pan-evaporation in the southern part of Western Australia (compiled using rainfall data from the Bureau of Meteorology, and pan-evaporation data from the Department of Agriculture and Food of WA.)

RULE OF THUMB
 Evaporation ponds are likely to be better suited than irrigation anywhere north of the '3' line of Figure 1.

Summary

Firstly, determine whether it is viable to dispose the liquid waste offsite, ideally selecting a location that has sewer connection.

If offsite disposal is not an option, and the location is south of the '4' line in figure 1, ensure that the selected site is suitable for liquid waste irrigation.

For locations between '3' and '4' line, take the time to compare both evaporation and irrigation options.

If north of the '4' line, consider evaporation ponds as a disposal option.

Contact

If you require additional information, contact the DPIRD Agribusiness Development team at agribusiness@dpird.wa.gov.au

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