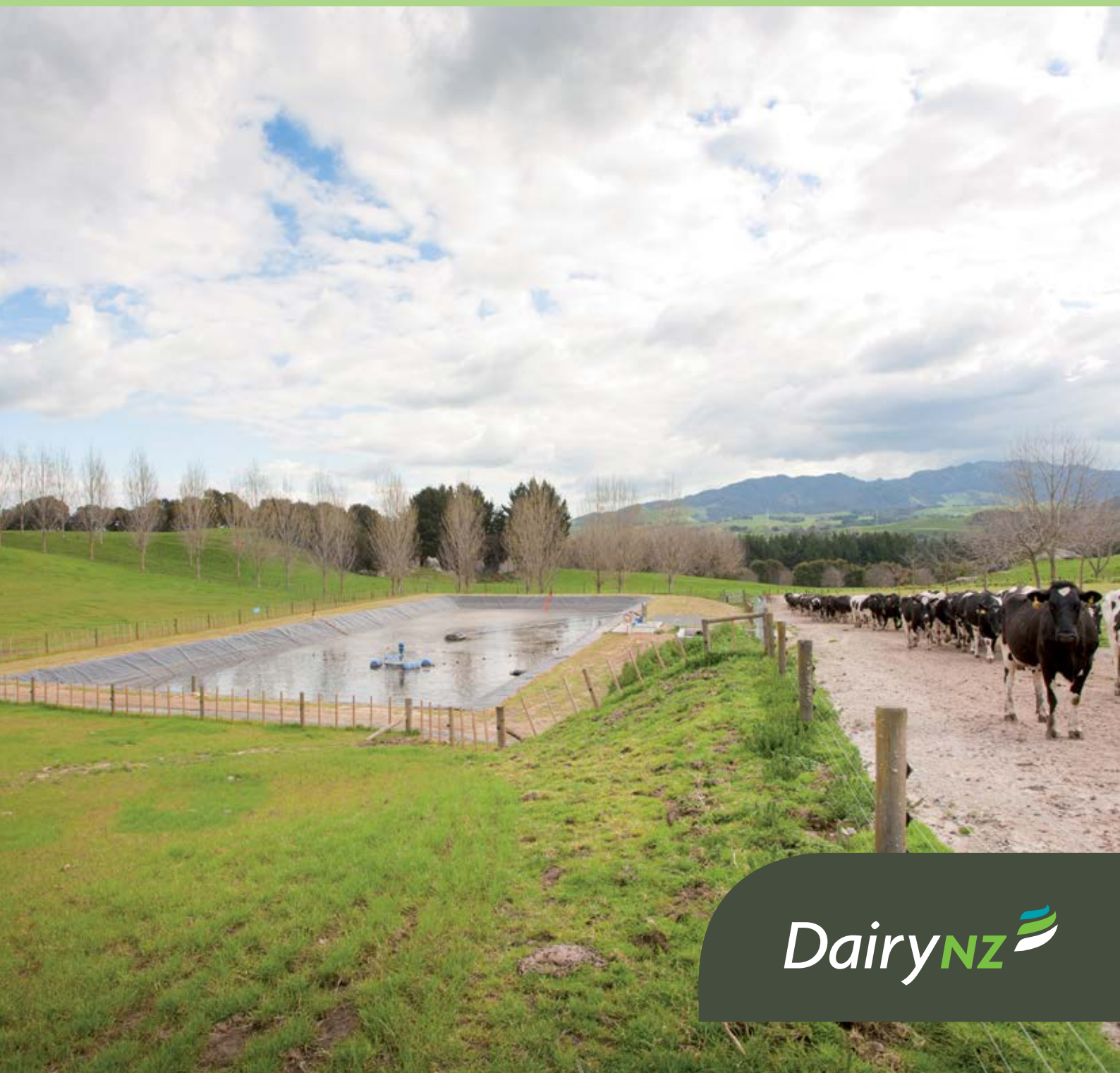
A farmer's guide to building a new effluent storage pond

How to plan, design and work with consultants and contractors



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Disclaimer

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Introduction

This guide will help farmers through the process of building a new effluent pond including planning, design and working with consultants and contractors.

This document does not provide the detailed technical information required to design and construct a pond. Throughout the document however, you will see references to the *'Institution of Professional Engineers New Zealand (IPENZ) Practice Note 21: Farm Dairy Effluent Pond Design and Construction'*. When you see this reference, you can refer to the full 'Practice Note' document for further technical detail. Visit dairynz.co.nz/environment.

The value of a good storage pond

Farm Dairy Effluent (FDE) ponds provide temporary storage of effluent, when soil conditions are not suitable for irrigation. Having a well designed and constructed pond will save you time and money.

A well designed and managed pond will provide:

- Peace of mind
- Increased flexibility – you can determine when to irrigate at a time that suits
- More effective utilisation of nutrients and water
- Reduced risk of effluent non-compliance
- Environmental protection.

When designing a pond there are three key things you want:

1. A sealed pond to avoid leakage to groundwater
2. A well designed structure that also allows for ongoing operation and maintenance, and is appropriately sized for the volume of effluent produced now and in the foreseeable future
3. A pond that meets regional and district council and Building Act requirements.

The practice note for pond design and construction

The *IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction* has been developed to provide industry standards and guidance for the construction of new effluent storage ponds.

We recommend that those involved with the technical design and construction of dairy effluent storage ponds have a thorough understanding of the full practice note for effluent pond construction.

To see a copy of the full practice note for effluent pond design and construction visit dairynz.co.nz or order a copy through the DairyNZ Farmer Information Line on 0800 4 DairyNZ (0800 4 324 7969).

The process of building a new effluent pond

Planning

This is a critical stage – poor information now will compromise the whole project and your effluent pond may never meet your needs. To ensure your designer and contractor have the right information to design your effluent pond you will need to provide them with information on your future intentions and your design preferences.

Consider future intentions

When designing effluent ponds it is best to future-proof your system by making sure your future intentions with your farm are taken into account. You do not want your new pond to be inappropriate or unable to cope in five years' time. Note down your plans below.

	Example	Your plans
Cow numbers	Aiming to increase to 1000 cows	
Feed	Increasing amount of supplement feed in general	
Feed pad	Will build a feed pad	
Feed storage/pit	Silage bunker being built	
Wintering pads/barn	No	
Farm expansion	No	
Effluent block size	Would like to increase	

Design preferences

While the design of the effluent pond is best carried out by a specialist, and the final design may differ from your original thoughts, it's a good idea to have some idea of your preferences before talking to the designer.

I am interested in the following: Circle the options that apply for each aspect below.

	Options				
Pond type	In ground	Above ground			Not sure
Liner type	Synthetic liner	Concrete	Clay	Other	Not sure
Increase current storage capacity	Yes	No			Not sure
Storage capacity that provides flexibility around irrigation timing	High flexibility	Some flexibility	Low flexibility		Not sure
Solid separator system	No	Mechanical	Weeping wall	Other	Not sure
Automated checks and fail-safe controls	Very interested	Some interest	Not interested		Not sure
Green water recycling	Yes	No			Not sure
Pond stirrers	Yes	No			Not sure

Other requirements or ideas:

Using the right person(s) for the job

Using the right person/people for the job is critical to getting a good pond. Designing and constructing FDE ponds is a technical job and requires specialist knowledge.

Design

It is recommended that you get a suitably qualified person to design your pond. This will provide assurance that:

- The investment in your pond will be appropriate for your farm and your farming system
- The pond will comply with regional council requirements
- The pond is designed with an understanding of the current research and best technology options available at the time
- The pond will meet the design requirements set out in the Practice Note.

Construction

Earthworks contractors and equipment/service suppliers may both be involved at different parts of the construction process e.g. excavation, liner installation.

When choosing who to use, consider the following:

- Are they experienced in building effluent ponds?
- Do they have experience in the type of pond and liner you want?
- Do they offer a warranty and/or certification of work?
- Do they have experience working with your specific regional council rules?
- Do they have farmer or industry professional references or testimonials?
- Are they acceptable to the person signing off on the work?

To help keep track of information and compare options, use the table below.

	Option 1	Option 2	Option 3
Designer/contractor name			
Experience with pond type/liner type?			
Do they offer warranty/ certification of work?			
Do they understand the local regulations/rules?			
When are they available?			
Any ongoing service offered? *e.g. leak tests*			
Terms and conditions *Any concerns or queries*			
Cost?			

Contracts

Before any design or construction begins make sure you have a suitable written and signed contract with each of the parties involved in the process.

Having a suitable contract in place, before design or construction begins, is critical to ensure that both parties are clear about their expectations. A written contract will protect your interests and sets out your rights and obligations. It also gives your engineer/contractor an incentive to get things right first time.

When discussing contracts with different parties make sure the following areas are covered:

1. Make sure the roles and responsibilities of the farmer, the contractor and the engineer are clearly defined before construction work starts.
2. Clearly define who the subcontractors are directly working for, the contractor, the engineer or yourself.

Contract between farmers and engineers/consultants

The scope of the services to be provided should be clearly recorded and agreed to, so that there is full understanding by all parties from the outset.

The following elements should be included in the scope of work:

- Evaluation of the existing system (if applicable)
- Identify improvement options/advise good practice systems
- Survey and geotechnical investigations
- Design
- Tendering and tender evaluation/recommendation
- Construction supervision
- Certification and reporting
- Operations and maintenance
- Payment schedule.

The most appropriate contract between farmers and engineers/consultants is the IPENZ 'Short Form Agreement for Consultant Engagement' (included at the back of this guidebook).

Contract between farmers and contractors

Given the cost of FDE ponds, and the risks involved with poor construction, you should ensure you have a written contract with your contractor.

Form of contract

Contractors may have their own contracts or alternatively the following options can be used:

1. Standards New Zealand NZS 3910: Conditions of contract for building and civil engineering construction.

This comprehensive contract is best used when using an engineer's services as well as a contractor. The engineer in this situation administers the contract between all parties. This contract defines the contractual relationship between a farmer, the contractor and the engineer, and defines their rights, obligations and communications. It also sets out procedures for issues such as payments, insurance, defects liability, and dispute resolution.

2. New Zealand Contractors Federation: Standard form for small contracts.

This contract template is appropriate for projects up to the value of approximately $100,000 and covers all the critical components of a contract listed below. It can be purchased at nzcontractors.co.nz/publications.

As a minimum any contract should include the following:

- The name and address of both you and your contractor
- A full description of the work, including materials and products to be used
- The contract price
- A clear payment schedule that lays out when and how much you will be charged
- How any variations may be considered
- Who pays for the consents and other council fees
- A statement that the contractor is responsible for ensuring work meets council and Building Code requirements
- Dates when the work will start and be completed
- Warranties detailing what is covered and for how long
- Information about how any disputes will be resolved.

Take time to read the contract – don't sign it straight away. You may want to negotiate changes.

Remember: A contract must be initialled on every page, signed and dated and ensure both parties keep a copy. If you have any doubts seek legal advice.

Also check that the contractor has the following insurances in place:

- Public liability
- Contract works (for larger projects)
- Materials
- Plant and construction machinery
- Motor vehicle third party liability.

Legislative and regulatory requirements

When designing and constructing ponds there are a number of legislative and regulatory factors that must be considered. The requirement for building consent and resource consent depends on which regional council, district council or unitary authority has authority over the region where the effluent pond is to be located.

It is important to consult your local regional and territorial authority directly to get the most up-to-date requirements for your effluent pond.

Regional council requirements

When checking with your regional council about the specific rules for effluent ponds – ask the following questions:

Questions	Notes
Is effluent discharge to land a permitted activity or a controlled activity for my area i.e. do I need a resource consent?	
What requirements does the council have around pond size?	
Are there any requirements in terms of pond seepage or permeability?	
Are there any requirements in terms of freeboard?	
Are there any requirements in terms of proximity to other features?	
Are there any other requirements relating to pond design and construction that I need to be aware of?	

District council requirements

When checking with your local district council about the rules for effluent ponds – ask the following questions:

Questions	Notes
Are they a permitted activity or a controlled activity?	
What are the specified separation distances from roads, houses, or property boundaries?	
Are there any earthworks limitations?	
Are there any other requirements relating to pond design and construction that I need to be aware of?	

Building consent requirements for effluent ponds

Building consent for dams: A dam for the purpose of effluent ponds can fall into one of three categories:

Not a dam	If a pond is constructed by excavating a pit in the ground and does not have an embankment constructed to allow the fluid to rise to a greater height than that of the surrounding land, then the pond is not confined. It is therefore not a dam	Building consent for dam not needed.
Dam	If the fluid in the pond is confined by an earthen embankment or any other structure in such a way that the fluid in it may rise to a maximum height of 4 m **or** the holding capacity of the pond is less than 20,000 m^3, then the pond is confined and may be described as a dam	Building consent for dam not needed, but must comply with the building code. Resource consent may be required for the earthworks associated with construction.
Large dam	If the fluid in the pond is confined by an earthen embankment or any other structure in such a way that the fluid in it may rise to a height greater than 4 m **and** the volumetric capacity of the pond exceeds 20,000 m^3, then the pond is classified as a large dam.	Building consent for dam needed.

Summary of regional council requirements for effluent storage ponds

Region	Effluent discharge to water	Effluent discharge to land	Effluent pond size	Seepage/permeability
Northland	Yes*	Permitted	Recommend design criteria from Dairy & Environment Committee (DEC) manual (NRC can calculate this for you)	No more than minor contamination of groundwater by seepage
Auckland	Yes*	Permitted	Not specified but recommend use of Dairy Effluent Storage Calculator (DESC)	Any new/modified ponds are certified as meeting 10^{-9} m/s and are sealed. IPENZ Practice Note 21 should be used as the basis for design, construction, and monitoring and certification
Waikato	Yes*	Permitted	Not specified but recommend use of DESC	10^{-9} m/s
Bay of Plenty	Yes*	Controlled	Recommend use of DESC	Both renewal and new consents within the Rotorua Lakes catchment require ponds to be sealed to Pond Construction Practice Note standard. It is strongly advised that all new ponds are built to this standard
Taranaki	Yes*	Controlled	Not specified for storage ponds	Not specified, but ponds must be sealed
Horizons	No	Controlled	According to DESC	10^{-9} m/s. Recommend that all effluent construction follows IPENZ Practice Note 21. Future discharge consents in the region will require this via a consent condition
Hawke's Bay	No	Controlled; discretionary in sensitive catchments	Recommend use of DESC	10^{-9} m/s
Wellington	No	Controlled	Not specified recommend use of DESC	Seepage to be imperceptible

(Cont'd on opposite page)

Region	Effluent discharge to water	Effluent discharge to land	Effluent pond size	Seepage/permeability
Tasman District	Yes*	Permitted	Recommend use of DESC	Any new/modified ponds have to be shown to meet the sealing standards of IPENZ Practice Note 21
Marlborough District	No	Permitted excluding the Wairau/ Awatere catchment (controlled)	Not specified	Not specified
West Coast	Yes*	Permitted	Effluent treatment – specified on a per number of cows basis. For storage purposes – a minimum of 30 days is required	Can apply for a resource consent for seepage to groundwater providing special conditions are met
Canterbury	No	Controlled	3 days minimum but recommend use of DESC	10^{-8} m/s (1 mm/d)
Otago	No	Permitted	Not specified	Storage system sealed to prevent seepage
Southland	No	Controlled	Recommend use of DESC	Plans and specifications containing the information describing the proposed design and construction process to avoid adverse effects on water quality

**with consent*

Note: this table is indicative rather than definitive, and in all instances, the rules of the relevant regional/district council should be consulted directly.

Design

Pond size

To determine the pond size required for a deferred irrigation storage pond, there are a number of factors to consider. The best way to determine pond size is by using the "Dairy Effluent Storage Calculator".

Get an effluent specialist or refer to the back page in this book for people who can help do the calculation for you. When using the Dairy Effluent Storage Calculator (DESC) take the following into consideration:

- Local rainfall variability: Coverage of rain-gauge sites in the calculator is patchy in some regions
- There is some variation in the amount of storage that different regional councils require. We recommend that sizing be based on DESC calculations rather than a council minimum storage requirement where the latter gives a lesser volume
- The DESC determines pond volume and does not allow for freeboard or sludge accumulation volume.

If you choose to calculate the pond size **without** using the Dairy Effluent Storage Calculator the following factors should be considered:

Factors to consider	Explanation
Number of days storage required	
Daily effluent volume produced	Typical 50-70 l/cow/day Range 30-90 l/cow/day Best to measure actual production. Use input water to the shed over milking plus 10% for urine and faeces, or measure the effluent being pumped away
Rainfall	mm/yr
Soil saturation levels	Consider soil type and weather conditions where effluent if applied would pond or runoff
Maximum nutrient loading	Check resource consent or permitted activity requirements
Irrigation method/pumping rate	This influences how frequently you can irrigate and how much will be pumped at a time
Solids accumulation in pond	
Minimum pump draw-down level	Consider pump sump
Minimum free board	0.3 m minimum (or regional council requirement if greater than this)
Breakdown and contingency	
Future development allowance	Cow numbers, feed pad, wash-down system
Times of the year you do not want to irrigate	

If you calculate pond size **with** the Dairy Effluent Storage Calculator the following information will be required by your designer:

Climate					
Area mean annual rainfall			mm/yr		
Effluent block					
Total area of effluent block		ha	Total effective ha		
Soil type(s): e.g. clay, peat, pumice, sandy loam			(http:smap.landcareresearch.co.nz)		
Area of low risk soil			ha		
Area of high risk soil			ha		
Wash water					
No. of cows milked in the spring (peak)					
Milking time			hours/day		
Milking plant wash water			litres hot and cold/day		
Bulk milk tank wash water			litres hot and cold/day		
Yard wash			litres/day		
Total wash volume			litres/day		
Lactation season start date					
Lactation season end date					
Irrigation					
Winter-spring application depth			mm (dependent on irrigator application rate)		
Spring-autumn application depth			mm		
Winter-spring daily volume pumped			m^3/day (dependant on pump and system)		
Spring-autumn daily volume pumped			m^3/day (dependant on pump and system)		
Irrigate all year?	Yes / No	**Time period you will not irrigate**	/ to /		
Irrigator type(s)		**Pump(s)**	HP / KW		
Catchments					
Yard area	m^2	**Radius yard area (3.14 x r^2)**	m^2	**Storm water diversion?**	Yes / No
Other yards areas	m^2	**Shed area**	m^2		
Feed pad area	m^2	**Milking shed and other roofed area**	m^2		
Storage ponds					
Pond(s) present?	Yes / No	**Size(s)**			
Emergency storage period			/days		

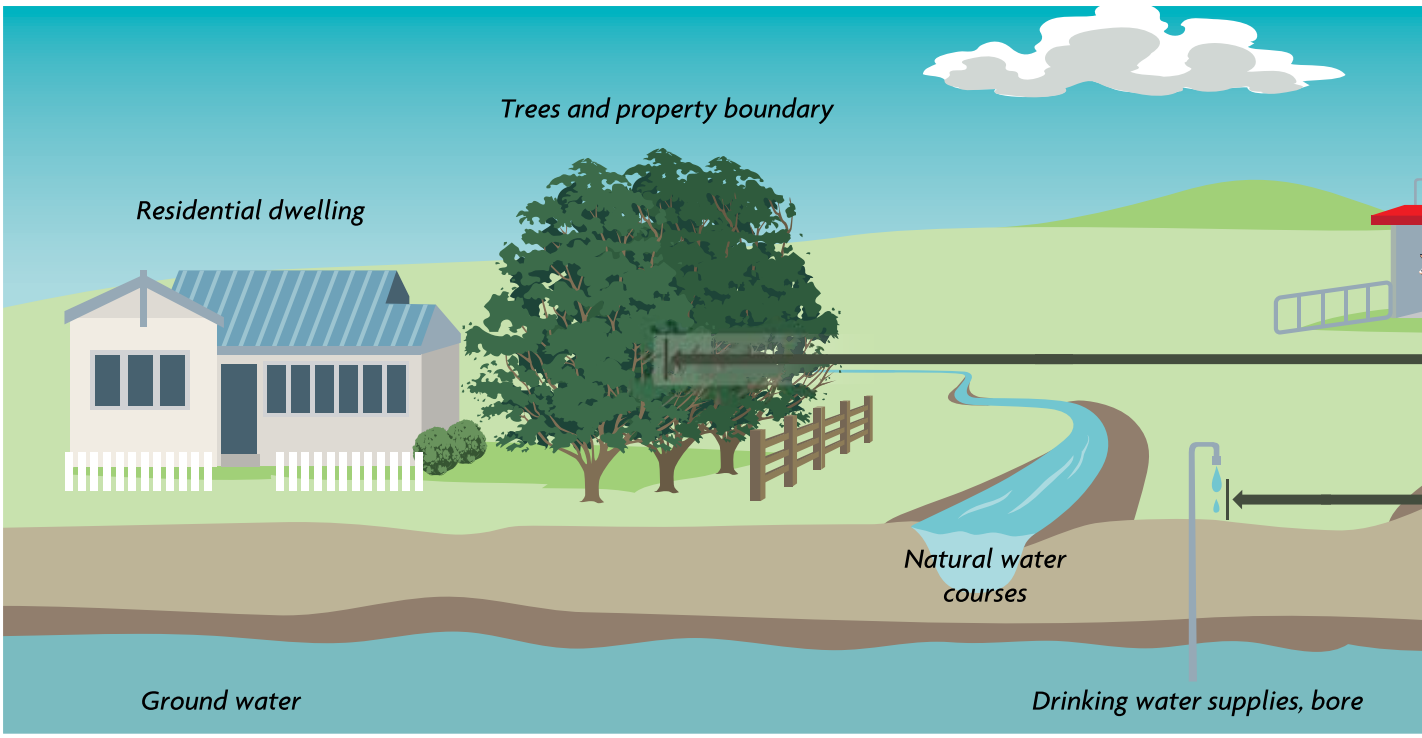
Pond location

A site investigation before design and construction starts is important to make sure the pond can be built to be structurally sound given the site conditions and to meet regulations. When assessing a site for its suitability, the following factors should be considered:

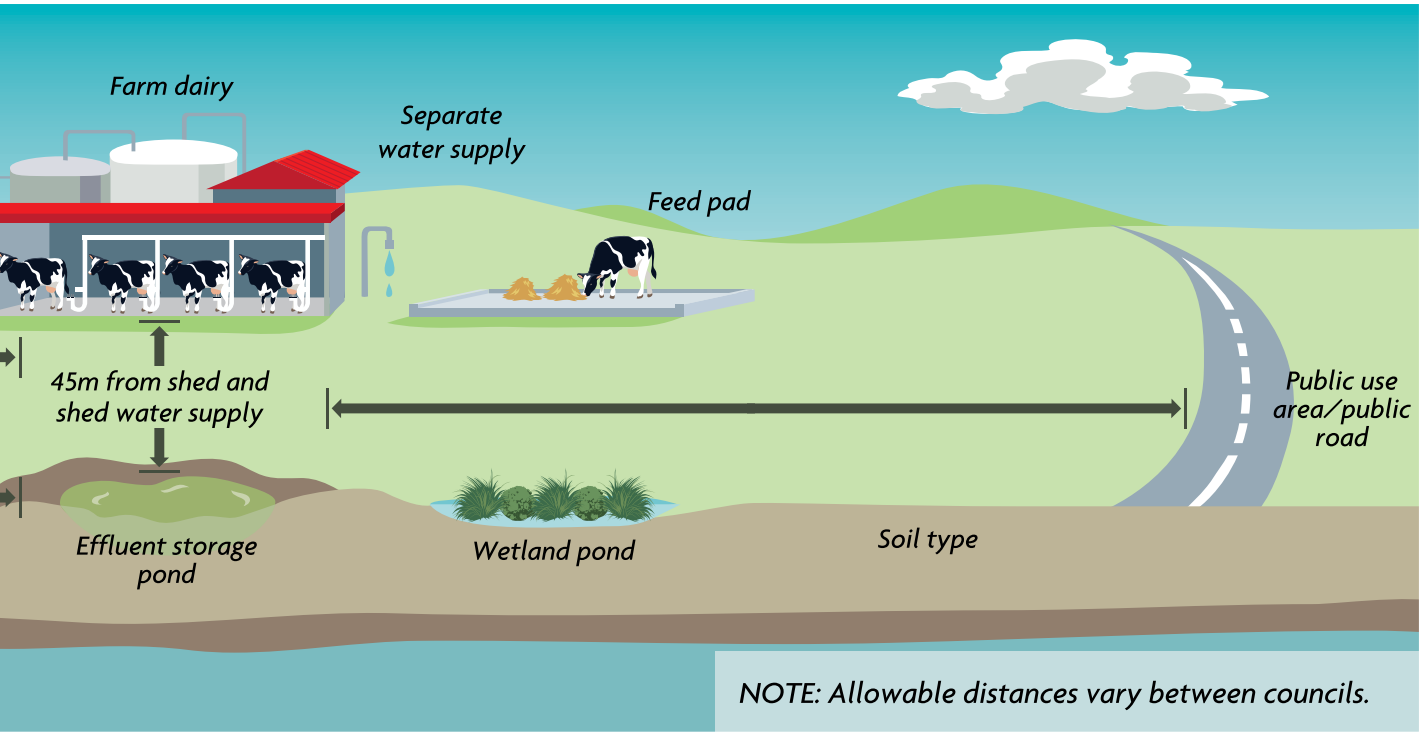
Factors to consider	Notes		
	Site 1	Site 2	Site 3
Location of effluent source – minimise the distance between source and storage			
Location of existing ponds			
Final destination of effluent – minimise distance to reduce pumping costs			
Proximity to surface water bodies or artificial watercourses			
Any potential slope instability			
Risk of inundation from flooding or stormwater			
Installed subsurface drainage present			
Groundwater height			
Proximity to bores or drinking water supplies			

(Cont'd on opposite page)

Features to consider



Factors to consider	Notes		
	Site 1	Site 2	Site 3
Proximity to coastal marine areas			
Presence of trees			
Proximity to stopbanks			
Proximity to residential dwellings/prevailing wind			
Proximity to property boundaries			
Type of soil material present at the site			
Does the site have any peat soils?			
Soil profile to at least 1m below the finished bed depth			
Does soil texture vary through the profile with the potential for problems due to layering of the materials?			
What soils are available for bank construction?			
What soils are available for lining the inside of the pond?			
Variation in the soil profile across the pond site			
Dairy company and council requirements in terms of proximity to key features (e.g. residential dwellings and dairy shed)			
Odour issues – risk if pond too close to neighbours			



Site investigation process

While the site investigation itself will probably be carried out by an engineer, the responsibility for proving that a pond and the liner are adequate rests with the farmer. As you go through the site investigation with your engineer, make notes and record test results.

Step 1	**Overall terrain description**	• Slope stability • Surface groundwater • Vegetation type
Step 2	**Dig test pit**	Dig pit 2 m x 2 m in the centre of the proposed pond location to a depth of 1 m below the finished depth of pond
Step 3	**Describe soil**	• Overall soil type profile • Physical properties of the soil • Variation to natural profile e.g. imported fill or voids • Groundwater inflows • Any collapsing of the pit sides
Step 4	**Assess soil properties to see if liner required**	If you think existing in-situ soil is suitable, test it using Step 5. If think you need to use an imported clay liner, samples of imported soil to be used need to be tested at a laboratory. Getting a sample ready for the lab: • Sample must be fresh and contain no organic matter, so exclude any topsoil • Need a 10 kg sample • Place in airtight plastic bag • Label bag
Step 5	**Test soil**	For a full list of the required tests that need to be carried out refer to Practice Note Part 2: Clay Liners for Ponds

Step 6	**Assess water table**	Assess the water table height throughout the season by:
		1. Checking for any soil discoloration in your test pit. The following colours are an indication
		  • Red brown – free draining
		  • Mottled grey – lack of drainage
		  • Dark grey or blue tinged – permanently wet
		2. Install a peizometer to periodically measure the water level
		3. Local knowledge

IMPORTANT: Peat Soils

Due to the unstable nature of peat soils, if you have these on your farm and are constructing ponds and tanks you need to consider the following:

- An increased level of site investigation and design is required
- Specialist engineering tests and designer input is essential
- Ponds and tanks should be constructed above ground
- Gas venting and drainage collection is critical
- Use synthetic liners as clay and concrete liners are not suitable
- Long term maintenance costs may be higher

Site Investigation

In comparison to most other soil types peat soils require an increased level of ground investigation. The main issues that need to be worked out are peat thickness, strength, compressibility and groundwater level.

Before ground investigations begin, a desktop study should be completed by your designer. Once this is done your designer should carry out the onsite investigations. There should be a minimum of 3 holes around the perimeter of the proposed tank or pond. The investigation should extend to the full depth of the peat, or to twice the width of the proposed tank or pond bank.

Your designer should then perform a number of specific engineering tests to determine the suitability of the site and the design requirements.

During the investigation and design stage make sure you discuss with the designer the "cost versus benefit" of different design options for peat vs. the long term maintenance costs of each.

Solids separation

Effluent systems can include a solids separation component. This can be either mechanical (press type systems) or non-mechanical (weeping wall type systems). This document does not discuss the requirements or considerations for building a solids separation system other than those that impact on effluent storage ponds.

If solids are removed prior to the effluent reaching the storage pond, then issues around managing the solids in the pond are reduced or eliminated. However, the solids will still require appropriate storage and management.

Mechanical removal of solids

Mechanical removal normally occurs before effluent enters the storage pond. When using this system, discuss the specific storage design requirements for effluent liquid and solids from the separator with the separator suppliers.

Non-mechanical removal of solids

Non-mechanical separation methods are generally weeping wall or settling pond systems. These fundamentally change the pond design requirements. In this case the pond component of the solids removal system needs to be designed specifically for solids removal.

View *Practice Note 27 'Dairy Farm Infrastructure'* for more details on solid separation systems.

Sludge bed with double weeping wall and PVC battens.

Pond effluent sump/abstraction point

All ponds need to have a formed sump or abstraction point from which the effluent gets transferred through to the irrigator. There are a number of options available including floating pontoons, jetties, self-priming pumps and positive displacement pumps. Refer to Practice Note for more information.

Pond liner options

Choosing a suitable liner

There are two options available when choosing an effluent pond for your farm; an above ground tank or a lined pond.

Options	Pros	Cons
Above ground tank	• Can usually be installed year round • Little costs associated with earthworks • Not significantly affected by water table	• Can be more expensive than lined ponds • May require a building consent from district council • Some size restriction on what is available commercially
Lined pond	• Less cost than above ground options • Can be less intrusive on the farm • More accommodating of shape and design • No size restriction	• Wider range of costs depending on lining options and earthworks needed. • Installation can be weather affected especially for clay lined ponds in some wetter parts of the country

Lined pond options

Liners can be formed from compacted clay or specially manufactured materials such as polyethylene, polypropylene, synthetic rubber, geosynthetic clay or concrete.

Options	Pros	Cons
Compacted clay	• May have suitable clay on site • Moderate cost	• Requires soils to be laboratory tested and meet specific criteria • Requires technical expertise to compact clay correctly to achieve sealing requirement • Cracking can appear when ponds are empty, risk of leaking • Warranties may be more difficult to obtain • Potentially high cost if importing clay from off-site • May require periodic re-lining after cleaning • Not favoured by all councils – you need to check • Not suitable for peat soils
Concrete (engineered cementious composite)	• Less earthwork preparation required than clay • Flexible to withstand ground movement • Withstands mechanical damage	• Relatively new product for effluent ponds in New Zealand • Moderate to high cost • Not suitable for peat soils
Synthetic liners	• Good range of liners available • Good warranties available • Installation allows for gas and ground water dissipation	• Moderate to high cost • Some variation in quality of synthetics on market, need to assess questions outlined on the next page • May be more expensive than compacted clay

Synthetic liner product considerations

There are some very good synthetic lining options in the market, but there are also a number of cheap synthetic products advertised as liners that are not suitable for effluent ponds. We suggest you ask suppliers these few key questions before finalising your decision:

Warranties	• What kind of warranty is provided? Check pg 24 for list of required warranties • UV warranty is not enough; it should also cover seams and defects in lining. Do they check welds and joints? • Is the company likely to be around in future if a defect does occur?
Quality assurance	• What written quality assurance information is provided for the installation of your effluent pond liner? • Are they prepared to give references for previous installations?
Independent testing of the liner	Has the synthetic lining product been tested using international standards and does it meet international standards (Geosynthetic Research Institute – GRI)? What are the attributes of the liner, ask about: • Thickness (min of 1 mm recommended) • UV and ozone resistance • Thermal stability • Flexibility • Elasticity • Tear strength • Environmental stress cracking • Resistance to puncture • Repair in service • Surface friction • Chemical resistance
Leakage into the environment	What advice is the pond installation company recommending regarding leak detection?

If you want further information on synthetic liner product options refer to the Practice Note Part 3: Geomembranes (Synthetic Liners) Selection.

Liner design considerations

For both clay and synthetic liners there are a number of detailed design considerations that must be taken into account including leakage rates, soil compaction, construction materials, machinery, and installation requirements. For further information on clay liners refer to Practice Note Part 2: Clay Liners for Ponds and for further information on synthetic liners refer to Practice Note Part 3: Geomembranes (Synthetic Liners) Selection.

Water and gas drainage

Drainage of water and gas from beneath and around the pond is an important consideration. In some situations, including locations with high water tables, peat soils or susceptible soils, water drainage networks under the pond are critical. For more information on water and gas drainage refer to Practice Note.

Health and safety design features

In general, Health and Safety in Employment Act (1992) requirements relate to ongoing operation rather than initial construction, and therefore relate more to the pond owner than to the engineering or construction company. Supervising engineers have some health and safety responsibility for construction workers during construction.

Preventing injury by accidentally falling into the pond is the main concern under the Health and Safety in Employment Act (1992).

Regardless of how big the pond or the type of lining, it is recommended that all ponds have the following health and safety features:

- **Fencing:** All ponds fenced off with a permanent and electric wire netting fence to prevent stock and children from accidentally falling into the pond.
- **Escape ladders:** All ponds must have at least one permanently placed ladder or alternative escape means in case a person falls into the pond. A floating rope/buoy system can also be very effective.
- **Anchor points:** Pontoons should have anchor points to improve stability.
- **Signage** and direct personal communication of hazards with farm staff, contractors and visitors.
- Construction should be undertaken with competent advice.

See video on dairynz website for health and safety around storage ponds dairynz.co.nz/environment/effluent/effluent-storage/

Construction

It is important that the contractor building your pond is aware of and understands the detailed construction recommendations and best practices outlined in the IPENZ Practice Note. For guidance on what to expect from a contractor in terms of good construction practice refer to Practice Note.

Pre-construction communication check

Before the equipment turns up on site make sure you have worked through the following checklist. This checklist outlines the required information that must be communicated to the contractor, installer or person supervising the work before construction begins.

Before construction	Completed	Comment
Have detailed construction drawings and specifications from experienced practitioner available for the contractor to follow		
Have written contracts in place		
Before accepting the contractor's offer, a proposed construction programme including timing for completed work needs to be agreed and confirmed		
Ensure contractor has a copy of the resource consent issued by regional and/or district council permitting pond construction		
The contractor needs to be aware of any resource consent conditions		
Agree with engineer and contractor on the level of construction management needed for the project		
Ensure contractors have appropriate insurance in place		
Agree on who and how monitoring of construction will be carried out to ensure specifications are being met		
Know the location, line and level of underground services, and the steps to take to prevent damage or accidents		
Ensure that any relocation of water troughs, pipes, irrigation, infrastructure required has been agreed		
Are any pre-construction compaction trials required and are all parties in agreement about who will pay for this work?		
Has a Health and Safety induction been carried out?		
For clay liners: Have copies of all investigation and pre-construction test results		

Post-construction

Documentation checklist

Ensure you receive the following within one month of the installation being completed:

Documents required	Provided ✓
As-built plan	
An accurate to scale plan with all key items located and with dimensions of all key components provided including:	
• Key levels of base and embankment crests in relation to fixed point, for example a level at the farm dairy, so any future settlement or impact of pond cleaning can be assessed	
• Location, depth and diameter of all pipes entering and leaving pond	
• Location of power cables	
• Details of any under-drainage and gas drain provisions	
• Location of subsoil drains and leak detection features	
• Dimensions, depth, batter slope and construction methodology	
Practical Completion Certificate	
Defects Liability Certificate	
Producer Statement – PS1 Design	
Producer Statement – PS4 Construction Review	
Warranty certificate from lining contractor (material and workmanship warranty)	
Technical operation manuals from suppliers	
If a synthetic liner is installed you should also receive the following:	
• Certificate(s) from the geomembrane manufacturer confirming full QA compliance with the relevant approved GRI test specification for the batch from which the installed geomembrane was supplied	
• Site records, including installers subgrade acceptance, panel numbering and placement, trial welds and seam tests, and other supporting quality assurance documentation	
• Material warranty for a minimum period of 20 years from the geomembrane supplier, that has been prior approved by the manufacturer for the stated period	
• Installation (workmanship) warranty from the geomembrane installer for a minimum period of 5 years	
• Certification by the installer that they have completed their work to the drawings, specifications and any other relevant documents. This is usually a signed Producer Statement	

Operation and maintenance

The ongoing compliance of the effluent pond is your responsibility as the resource consent holder. How the system is operated and maintained has a big impact on compliance with regional council conditions. Non-compliance can occur from leaks or by exceeding the freeboard and overflowing the pond.

To ensure the operation and maintenance is done properly the following may be useful:

	Completed ✓
Operation manual	
Effluent pond operation manual or new section in existing effluent system manual is prepared and includes: • Frequency of pond de-sludging • Where the pond may be accessed for de-sludging • How and what equipment may (and may not) be used • The location of where removed sludge is to be stored/deposited • Pond area ground water monitoring requirements • Frequency and instructions for the drop test • Contact details for repair of liners • Maintenance requirements for pumps, valves and mixers • General maintenance of weeds • Meeting and monitoring resource consent conditions. • Health and Safety considerations.	
Staff training	
Appropriate farm staff should be familiar with the operation and maintenance requirements and provided with adequate training to operate and maintain the pond.	

Pond inspections

Inspection of pond should be made:

- Monthly – for general condition (photographs will help to track changes over time)
- After de-sludging – for any obvious signs of damage
- After unusually heavy rain (more than 50 mm in 24 hrs).

Take copies of this page and include them in your maintenance schedule. Check the following during an inspection:

What to look for	Any problems
1. Is there enough freeboard?	
2. Is the pond at the correct level?	
3. Could there be groundwater entering raising the water level?	
4. Is the vehicle access and crest of the pond in good condition?	
5. Is there any visible or obvious damage to the liner?	
6. Is the liner tugging or tearing from the anchor trench?	
7. Any excessive erosion, drying, cracking or damage to clay liner?	
8. Any leaks or damage to pipes?	
9. Any obvious bund failures or damage?	
10. Have there been any recent modifications to the pond that have not been recorded?	
11. Check pipes running in and out are not blocked	
12. Check pond walls and embankments are stable	
13. Are there signs of leaks into surrounding paddock? *(greener grass or wetness in the surrounding area)*	
14. Check fence is safe and secure	
15. Does the pond smell bad?	
16. Has the pond changed colour?	
17. How much sludge is in the pond?	
Comment of any actions taken	
Name **Signature**	**Date**

If you think there is a problem with the pond, contact your effluent specialist or engineer for assistance.

Short form agreement for consultant engagement

Between

(Client)

And

(Consultant)

Collectively referred to herein as the "Parties" and individually as a "Party"

Project	**Location**
Scope and nature of the services	
Programme for the services	
Fees and timing of payments	
Information or services to be provided by the client	

The Client engages the Consultant to provide the Services described above and the Consultant agrees to perform the Services for the remuneration provided above. Both Parties agree to be bound by the provision of the Short Form Model Conditions of Engagement (overleaf), including clauses 2, 3, 9 and 10 and any variations noted below. Once signed, this agreement, together with the conditions overleaf and any attachments, will replace all or any oral agreement previously reached between the Parties.

Variations to the short form model conditions of engagement (overleaf)

Client authorised signatory (ies)	**Consultants authorised signatory (ies)**
Print name	**Print name**
Date	**Date**

Short form model conditions of engagement

1. The Consultant shall perform the Services as described in the attached documents.
2. Nothing in this Agreement shall restrict, negate, modify or limit any of the Client's rights under the Consumer Guarantees Act 1993 where the Services acquired are of a kind ordinarily acquired for personal, domestic or household use or consumption and the Client is not acquiring the Services for the purpose of a business.
3. The Client and the Consultant agree that where all, or any of, the Services are acquired for the purposes of a business the provisions of the Consumer Guarantees Act 1993 are excluded in relation to those Services.
4. In providing the Services the Consultant shall exercise the degree of skill, care and diligence normally expected of a competent professional.
5. The Client shall provide to the Consultant, free of cost, as soon as practicable following any request for information, all information in his or her power to obtain which may relate to the Services. The Consultant shall not, without the Client's prior consent, use information provided by the Client for purposes unrelated to the Services. In providing the information to the Consultant, the Client shall ensure compliance with the Copyright Act 1994 and shall identify any proprietary rights that any other person may have in any information provided.
6. The Client may order variations to the Services in writing or may request the Consultant to submit proposals for variation to the Services. Where the Consultant considers a direction from the Client or any other circumstance is a Variation the Consultant shall notify the Client as soon as practicable.
7. The Client shall pay the Consultant for the Services the fees and expenses at the times and in the manner set out in the attached documents. Where this Agreement has been entered by an agent (or a person purporting to act as agent) on behalf of the Client, the agent and Client shall be jointly and severally liable for payment of all fees and expenses due to the Consultant under this Agreement.
8. All amounts payable by the Client shall be paid within twenty (20) working days of the relevant invoice being mailed to the Client. Late payment shall constitute a default, and the Client shall pay default interest on overdue amounts from the date payment falls due to the date of payment at the rate of the Consultant's overdraft rate plus 2% and in addition the costs of any actions taken by the Consultant to recover the debt.
9. Where Services are carried out on a time charge basis, the Consultant may purchase such incidental goods and/or Services as are reasonably required for the Consultant to perform the Services. The cost of obtaining such incidental goods and/or Services shall be payable by the Client. The Consultant shall maintain records which clearly identify time and expenses incurred.
10. Where the Consultant breaches this Agreement, the Consultant is liable to the Client for reasonably foreseeable claims, damages, liabilities), losses or expenses caused directly by the breach. The Consultant shall not be liable to the Client under this Agreement for the Client's indirect, consequential or special loss, or loss of profit, however arising, whether under contract, in tort or otherwise.
11. The maximum aggregate amount payable, whether in contract, tort or otherwise, in relation to claims, damages, liabilities, losses or expenses, shall be five times the fee (exclusive of GST and disbursements) with a maximum limit of $NZ500,000.
12. Without limiting any defences a Party may have under the Limitation Act 2010, neither Party shall be considered liable for any loss or damage resulting from any occurrence unless a claim is formally made on a Party within 6 years from completion of the Services.
13. The Consultant shall take out and maintain for the duration of the Services a policy of Professional Indemnity insurance for the amount of liability under clause 11. The Consultant undertakes to use all reasonable endeavours to maintain a similar policy of insurance for six years after the completion of the Services.
14. If either Party is found liable to the other (whether in contract, tort or otherwise), and the claiming Party and/or a Third Party has contributed to the loss or damage, the liable Party shall only be liable to the proportional extent of its own contribution.
15. Intellectual property prepared or created by the Consultant in carrying out the Services ("New Intellectual Property") shall be jointly owned by the Client and the Consultant. The Client and Consultant hereby grant to the other an unrestricted royalty-free license in perpetuity to copy or use New intellectual Property. Intellectual property owned by a Party prior to the commencement of this Agreement and intellectual property created by a Party independently of this Agreement remains the property of that Party. The ownership of data and factual information collected by the Consultant and paid for by the Client shall, after payment by the Client, lie with the Client. The Consultant does not warrant the suitability of New Intellectual Property for any purpose other than the Services or any other use stated in the Agreement.
16. The Consultant has not and will not assume any obligation as the Client's Agent or otherwise which may be imposed upon the Client from time to time pursuant to the Health and Safety in Employment Act 1992 ("the Act") arising out of this engagement. The Consultant and Client agree that in terms of the Act, the Consultant will not be the person who controls the place of work.
17. The Client may suspend all or part of the Services by notice to the Consultant who shall immediately make arrangements to stop the Services and minimise further expenditure. The Client and the Consultant may (in the event the other Party is in material default) terminate the Agreement by notice to the other Party. Suspension or termination shall not prejudice or affect the accrued rights or claims and liabilities of the Parties.
18. The Parties shall attempt in good faith to settle any dispute by mediation.
19. This Agreement is governed by the New Zealand law, the New Zealand courts have jurisdiction in respect of this Agreement, and all amounts are payable in New Zealand dollars.

Where to go for help

Key industry contacts		
DairyNZ	Effluent Specialists	0800 4 DairyNZ (0800 4 324 7969)
Fonterra	Sustainable Dairying Team	0800 65 65 68
Tatua	Environmental Manager	07 889 3999
Open Country Dairy Ltd	Environmental Manager	09 589 1372
Synlait	Environmental Manager	03 373 3000
Miraka	Environmental Manager	0800 647 252
Oceania	Environmental Manager	03 686 6403
Westland Milk Products	Farm Liaison Officer	03 756 9800
Irrigation NZ		03 341 2225
NZ Milking & Pumping Trade Association	Executive Officer	027 492 3296
New Zealand Contractors Federation	nzcontractors.co.nz	0800 692 376

For a copy of any of the following go to dairynz.co.nz

- IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction, Version 2. March 2013
- Farm Dairy Effluent (FDE): Design Code of Practice and Design Standards
- Farm Dairy Effluent (FDE): Planning the right system for your farm
- IPENZ Practice Note 27: Dairy Farm Infrastructure

dairynz.co.nz