

# *A staff guide to operating your effluent irrigation system*

*Travelling Irrigator*



## Acknowledgements

Thanks to the following who contributed to the development of this booklet

- Dairy farmers and farm staff throughout New Zealand
- Canterbury Dairy Effluent Group
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- New Zealand Dairies Ltd
- Sefton Lonsdale - RootZone Effluent & Engineering Ltd



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## Operating your effluent irrigation system

Understanding how to operate your effluent irrigation system properly is an essential task on farm. This booklet helps take farm staff through the important parts of operating and maintaining a travelling irrigator effluent system. The book can be used as a training guide for those who are new to travelling irrigator systems, or for staff who are new to the farm to introduce them to the farm's effluent practices and policies.

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### Symbols



Throughout this booklet there are activities that you may wish to complete. Inside the back cover is a flip-out worksheet that has the space available for you to complete the small tasks. Once completed, you may wish to remove the worksheet and pin it up somewhere, as a guide for applying effluent on your farm.



This symbol means STOP IMMEDIATELY – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must STOP IMMEDIATELY and inform your manager or farm owner.



This symbol means WARNING – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must fix the immediate problem if you have permission or have been shown what is required to fix the problem. And then inform your manager or farm owner.



This symbol means CONTINUE – there are examples that show you conditions that are acceptable to continue irrigating effluent.

## Our farm policy for effluent

We must ensure that:

1.	No effluent gets into waterways
2.	No effluent puddles in any paddocks
3.	The effluent system is checked daily (minimum)
4.	If there are problems with effluent, talk to the manager/farm owner
5.	Effluent irrigation events are checked and recorded against the Effluent Management Plan
6.	The Resource Consent is displayed in the shed
7.	The maximum application depth is not exceeded
8.	The maximum application rate is not exceeded
9.	Effluent is not applied if the soils are too wet

## Potential hazards of effluent irrigation



## Why is effluent important?

### Well managed and maintained effluent systems:

- Grow more grass for less cost
- Grow better tasting grass, therefore cows eat more
- Have fewer messy breakdowns
- Have cleaner water for the community
- Ensure regional council rules are met – no fines
- Obtain greater public acceptance.

### What is effluent made up of?

- Wash down water
- Rain
- Faeces and urine
- Spilt milk
- Detergent
- Soil from feet.



### What nutrients are in effluent?

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Sulphur (S).

The value of the nutrients in effluent from 100 cows in an average New Zealand herd is **\$3000 PA**

### What shouldn't be in effluent?



Chemicals



Rubbish/afterbirth



Reject milk

## Before every milking checklist



### 1. Stormwater

Is the stormwater or wash water diversion in the correct position?



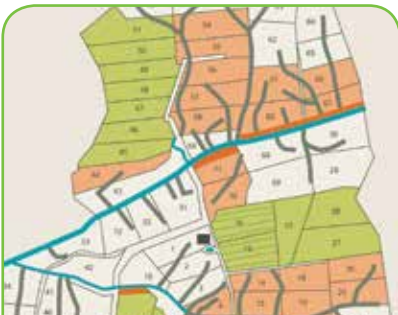
### 2. Stone trap

Is the sump/stone trap clear of rubbish/afterbirth?



### 3. Storage

Is there enough room in the storage pond or tank for another milking? (Refer to pg 5)



### 4. Irrigator

Check the effluent plan. Is the irrigator in the right place? Is there enough run length left for the milking?



### 5. Pump/stirrer

Do you need to turn the stirrer or pump on?



### 6. Yard

Wet the yard before cows come in



### 7. Be gentle

Reduce noise and be gentle with cows during milking



### 8. Turn hoses off

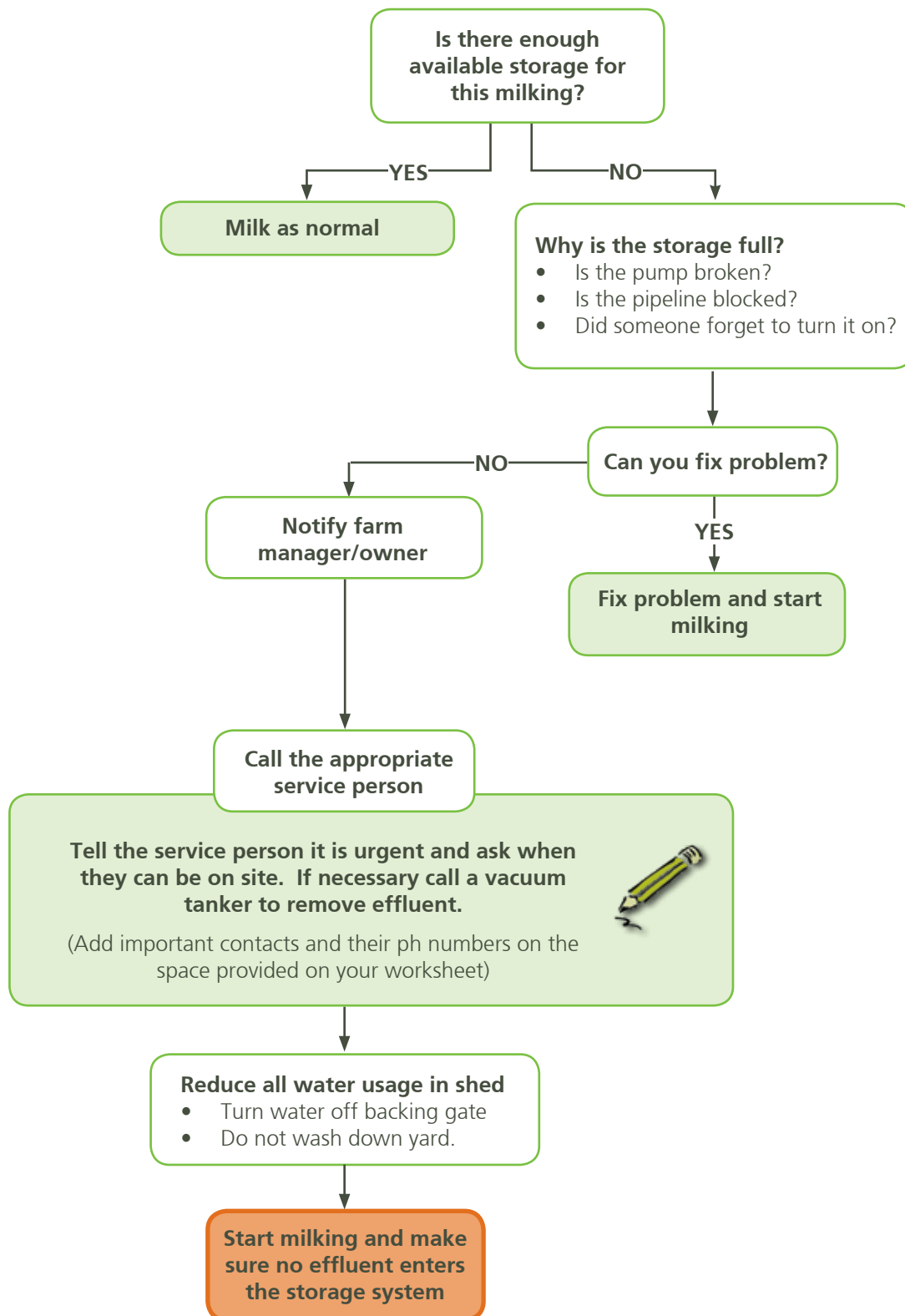
Use less water and turn off the hoses



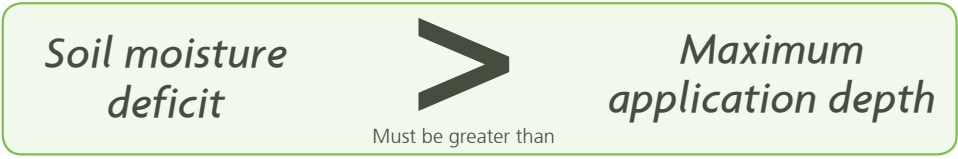
### 9. Scrape the yard

After milking scrape yard with scraper before you hose down

## Before every milking: check effluent storage



## Before irrigating: is it too wet to irrigate?



### If measuring your soil moisture electronically



1. Check the soil moisture data logger or use a soil probe to get the soil moisture figure for the paddock being irrigated
2. Compare today's soil moisture figure against the farm's critical soil moisture figure. The critical soil moisture figure will be the number that decides whether you irrigate or not. Ask your manager/owner what the critical soil moisture figure is for your farm and write it in the space provided on your worksheet.



Using the irrigator

### Check paddocks manually - look and listen. Do not irrigate if:



There is already water puddling on the ground/worms on surface.



You can hear/see water or wet mud under foot when you walk.



It has been raining a lot, snowing or the ground is frozen.

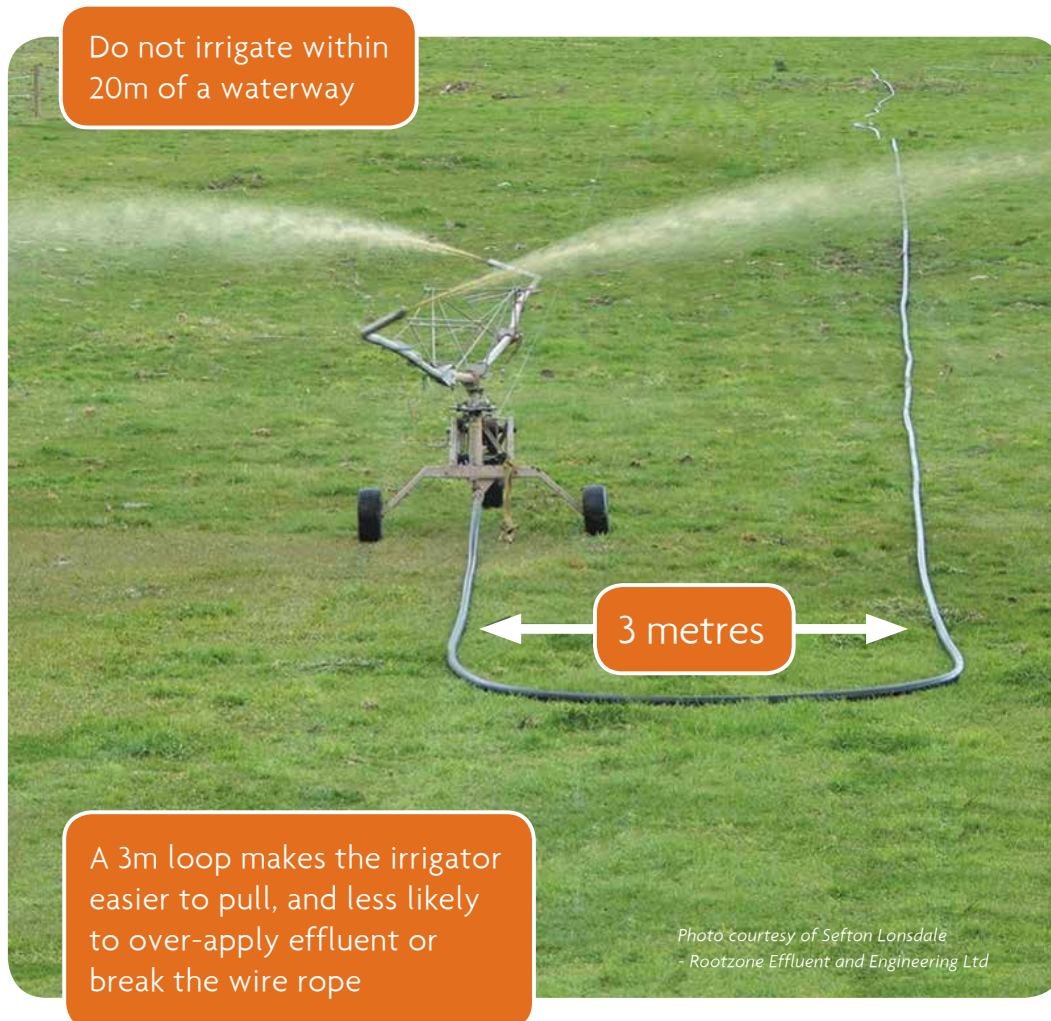


The soil makes a 'worm' when rolled, sticks to your thumb when rolled or free water appears when squeezed.

.....



## Before irrigating: hose layout for travelling irrigator



### Cow and pasture considerations

- Apply effluent onto short pasture. If possible, graze the area 2-3 days before application
- Avoid grazing pasture within 10 days of spraying effluent, to reduce animal health risks and maximise pasture intake
- Avoid grazing springing or just calved cows on the effluent block - this will help avoid metabolic problems
- Avoid water troughs.



# How to operate a travelling irrigator



## 1. Soil

Check the soil moisture. Is it too wet to irrigate?



## 2. Location

Check the irrigator is in the right location. Check run sheet. Make sure irrigator is away from waterways



## 3. Remove anchor

Remove the anchor from the post or ground



## 4. Gear/Brake

Take the irrigator out of gear and take the brake off



## 5. Wind wire

Wind wire rope slowly



## 6. Disconnect hose

Disconnect the drag hose from the irrigator



## 7. Attach

Reverse the bike/tractor towards the irrigator and hook onto the tow ball to move the irrigator to the new run



## 8. Move

Slowly move the irrigator to the new run. Turn boom lengthways and hang onto it at all times



## 9. Run the wire

Slowly run the wire rope down the length of the run. Do not go too fast or the rope will tangle



### 10. Secure anchor

Secure the anchor so it won't pull off/out



### 11. Hose

Disconnect the drag hose. Never pull more than 2 lengths (50m) at a time. Disconnect from the hydrant if necessary



### 12. Tow hose

Tie the rope around the pipe and connect to the tow bar. Tow the hose at the female end to avoid tearing the clips off



### 13. Connect hose

Lay the hose down the run within 3m of the wire to minimise drag. Re-connect the hose to the irrigator



### 14. Gear/brake

Put the irrigator back into gear (fast speed) and insert brake



### 15. Wind wire

Wind up the slack in the wire rope, and check the cut-off on the winch winder



### 16. Cover troughs

Cover any troughs



### 17. Record

Record run on the run sheet



### 18. Check irrigator

Is the irrigator moving forward at the fastest speed with the boom spinning? Is there any ponding?

## Can you see a problem?

The following section illustrates the possible problems that may arise in all areas of effluent irrigation. Make yourself aware of these and the required actions of each problem.











STOP the irrigator immediately. Inform your manager or farm owner of the issue. It is important to stop the irrigator as the problems arising will have adverse affects on the farm and farm environment.



WARNING. If you have had prior experience or approval to fix the problem then do so. Inform your manager or farm owner of the issue or phone the appropriate service person.

### With the irrigator?

Can I see a problem?		What should I do?
The irrigator pressure is too low, or the irrigator has stopped moving. This means the irrigator will apply too much effluent		STOP irrigating and tell your manager/ farm owner 
Irrigator is dirty and needs to be serviced		Tell your manager/ farm owner or call the appropriate service person 
No nozzle or broken nozzle will result in too much effluent being applied		STOP irrigating and tell your manager/ farm owner 
Worn bearings on the irrigator		Tell your manager/ farm owner or call the appropriate service person 

## In the paddock?

Can I see a problem?		What should I do?
Effluent running off in to waterways, streams or rivers		STOP irrigating and tell your manager/ farm owner. Move the irrigator away from waterways 
A bad connection between hoses, foaming or puddling leaking from connection		STOP irrigating and reconnect. If parts need replacing tell your manager/ owner 
A leak in the pipe - effluent is pooling in and around the pipe in the paddock		STOP irrigating and fix the leak temporarily if possible, tell your manager/owner 

## With ponding in the paddock?

Can I see a problem?		What should I do?
Small puddles or ponding after irrigation that don't disappear for a while		Tell your manager/ farm owner 
Large puddles, ponding or sludge remains for many hours and can be seen on pasture		STOP irrigating and tell your manager/ farm owner 

Can you see a problem?

# Can you see a problem?

## With the storage pond?

The following section shows the possible problems that may arise with the effluent storage pond. Make yourself aware of these and the required actions of each problem.

Keep the level of effluent in the storage pond as low as possible:

- To have storage space if you have a breakdown, bad weather or if you are too busy to irrigate
- Irrigate whenever the conditions are right, don't wait until the pond is full
- Check you have enough storage before every milking.



STOP what you are doing immediately. Inform your manager or farm owner of the issue. It is important to stop adding more effluent to the pond as the problems arising will have an adverse affect on the farm and farm environment.



WARNING, inform your manager or farm owner of the issue.

<i>Can I see a problem?</i>		<i>What should I do?</i>
Wet areas or greener areas around the pond may mean that the pond has a leak		Tell your manager/ farm owner and show them the wet/ greener area 
Grass or solid crust on the top of the pond means too many solids in the pond		Tell your manager/ farm owner 
Cracks in pond walls or the sides of the pond falling in		Tell your manager/ farm owner and show them where the problem is. Make sure there are no safety issues 

<i>Can I see a problem?</i>		<i>What should I do?</i>
<p>Pond level too high or high level alarm goes off</p>		<p>DO NOT PUT ANYMORE EFFLUENT INTO THE POND. Tell your manager/farm owner or call the appropriate service person</p> 
<p>The pond never fills up. This may indicate that there is a leak</p>		<p>Tell your manager/ farm owner</p> 

## Troubleshooting

### Problem: Irrigator travels too slow

Possible causes	Fixes
Irrigator is set on a slow speed	Set irrigator to a faster speed
Nozzle sizes are too big, which will reduce the pressure at the end of the irrigator. This will decrease the number of rotations of the boom	Replace nozzles with new or smaller holes. Recommended size is 11mm and a cone shaped nozzle
The drag hose has been laid out wrong	Lay hose out properly
Not enough pressure is coming from pump to operate the irrigator properly	Service pump or get a bigger pump
Arms at end of boom are pointing too high	Lower arms at end of booms
Irrigator is travelling up hill	Run irrigator downhill, but not toward waterways
Drag hose diameter is too small	Replace with a larger diameter hose if the irrigator can pull it and is the pump is capable

### Problem: Irrigator travels too fast

Possible causes	Fixes
Arms at the end of the boom are pointing too low	Raise arms at the end of the boom
Set in wrong gear	Change the gearing

### Problem: Effluent ponding/puddles or runoff

Possible causes	Fixes
Application rate too high	Speed up the irrigator and check nozzles
Soils at saturation point	Pump to holding pond and irrigate later

### Problem: Blocked nozzles

Possible causes	Fixes
Effluent contains solids that cannot be pushed through nozzle like fibre, feed or rubbish	Unblock nozzles
	Use a stirrer to break up clumps of solids in sump/pond
	Install a grate over sump and put a rubbish bucket in the shed



<i>Problem: Irrigator stalled</i>	
Possible causes	Fixes
Irrigator stuck on something	Check for problems remove any obstacles
Hose was laid out wrong	Fix hose and lay out as shown on pg 9
Pump broken	Call for pump service immediately
Irrigator broken	Pump to pond. Check wire, winch gearing, and irrigator components. Repair/replace as required

<i>Problem: Effluent not spraying out of irrigator properly</i>	
Possible causes	Fixes
Not enough pressure from pump to operate irrigator properly	Call for pump service
Nozzles blocked	Clear out/replace nozzles if needed. Avoid solids entering
Nozzle sizes are too big, which will reduce the pressure at the end of the irrigator. This will decrease the number of rotations of the boom	Replace nozzles
Blockage at pump	Remove blockage
	Install a debris basket before sump or stone trap
Silting up of mainline	Keep stone trap clean. Flush line with water

<i>Problem: Effluent spraying into waterway, bores, boundaries</i>	
Possible causes	Fixes
Irrigation run in the wrong place	Stop irrigating and move irrigator
	Check effluent management plan for correct run locations
	Mark run locations on fences

<i>Problem: Hose blowout</i>	
Possible causes	Fixes
Poor or worn couplings	Replace couplings
Pipe kinked	Layout pipe correctly
Couplings installed wrong way around	Put couplings the right way around.

Can you see a problem?

# Maintenance – monthly

## At the shed



### 1. Empty weekly

Clean the effluent sumps and stone trap



### 2. Float switch

Check float switches are clear and working



### 3. Storage

Check level of storage ponds

## At the irrigator



### 1. Grease

Grease all moving parts



### 2. Nozzles

Check nozzles are not blocked or damaged



### 3. Tyres

Check tyre pressure is firm



### 4. Battery

Battery of irrigator failsafe/monitor



### 5. Winch and wire

Winch and gearing is operating and wire rope is not frayed



### 6. Hoses and joints

Clean connections and check hoses have no cuts, splits or bulges

*At the storage pond*



**1. Pipes**

Check pipes are running in and out are not blocked



**2. Walls**

Check pond walls are stable



**3. Leaks**

No signs of leaks



**4. Fence**

Check fence is safe and secure



**5. Smell**

Does the pond smell bad?

# Maintenance – 6 monthly

## At the shed



### 1. Pump

Strip pump, oil and clean and check the pump seals/impeller



### 2. Pressure

Check the pressure at the pump, compare against ideal



### 3. Flush

Flush clean water through delivery line to clean out pipes and irrigator

## At the irrigator



### 1. Wheel bearings

Check the wheel bearings



### 2. Pressure

Check pressure in the paddock, and compare against ideal



### 3. Rate & depth

Measure application rate and depth (see page 23)

## Pipes, hoses and nozzles



### 1. Hydrants

Check the condition of the hydrants



### 2. Couplings

Check the condition of the couplings



### 3. Replace nozzles

Replace the nozzles once a year

## Sump/stone trap



### 1. Rubbish

Collect any rubbish out of the sump and/or the stone trap



### 2. Prepare

If sump/stone trap is wide enough use front end loader, otherwise use a shovel and wheel barrow



### 3. Scoop

Slowly scoop out the contents taking care not to spill it. Use the low ratio on the tractor to avoid ripping up the entry

## Maintenance – annually

### At the storage pond



### 1. Desludge pond *(Recommendations do not apply to synthetically lined ponds, call a professional to desludge synthetically lined ponds)*

1. Remove the crust with excavation machinery – warning: gases may be released when crust is first broken so keep clear and away from pond edge
2. Stir the pond to mix the solids before emptying
3. Never empty the pond completely
4. Be careful to not damage the sides/bottom or the liner of the pond when emptying
5. Pond sludge has more nutrient value than normal effluent, so apply to bigger area at lower rate
6. Repair any damage to the pond before putting any effluent back in.



### 2. Grass edges

Control/spray the grass and the weeds around edge of the pond

# Maintenance – spreading effluent solids

## Spreading direct to pasture

### Muck spreader/slurry tanker

1. Transfer sludge to a muck spreader or slurry tanker
2. Check effluent plan for disposal location
3. Add water to the sludge to make it easier to spread
4. Avoid danger zones e.g. waterways, bores, boundaries, creeks etc.



### Tractor

1. Check the effluent plan for disposal location
2. Add some water to the sludge to make it easier to spread
3. Spread the load lightly across as larger area as possible
4. Do not dump in one spot.



### Stockpiling/composting

1. Check sealed storage area is ready and that the liquid will drain safely into the effluent system or be collected
2. Carefully transport sludge to the storage area
3. Empty sludge onto pile
4. Check that there is no run off.

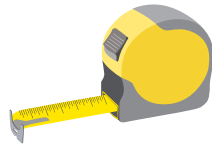


# Monitoring

## Understanding application depth

Application depth is how much volume is going on to your soil – usually referred to as depth (mm) – similar to the rainfall you collect in a rain gauge e.g. 20mm.

How much



Depth (mm)



## Understanding application rate

Application rate is how fast it is going on – usually referred to as (mm/hr) similar to the intensity of rainfall e.g. 10mm in 1 hr.

How long



Drizzle



Downpour



## Maximum application rate and depth for different soil types?



Maximum application rate and depth may be set by regional councils. Ask your manager/farm owner for this farm's maximum. It is not to be exceeded. If there are no figures from the council then the amount of effluent you can apply at one time, and the speed you can apply it at, is dependent on the soil type. Using the table below and having a discussion with your manager or farm owner, fill in the appropriate areas of the worksheet.

Soil type	Maximum application depth	Maximum application rate
Sand	15mm	32mm/hr
Loamy sand	18mm	32mm/hr
Sandy loam	22mm	20mm/hr
Fine sandy loam	24mm	17mm/hr
Silt loam	24mm	10mm/hr
Clay loam	18mm	13mm/hr

## How to test application depth and rate

### Test location

Test the application depth at the location which puts the pump under the greatest work load, e.g. at the greatest distance from the pump, or at the highest elevation above pump station.

### Collection containers

When testing you can use either rectangle trays with straight sides, rectangle trays with sloped sides or standard round buckets. You will need about 20 of these. You must use a different calculation depending on the type of collection container.

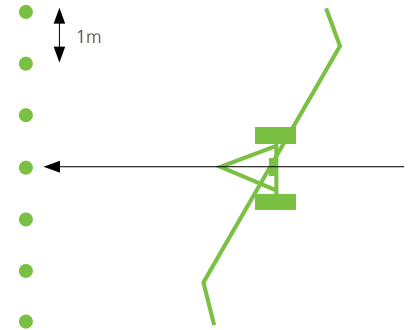


### Step 1:

#### Containers

Before applying effluent, put containers in a line across the path of the applicator:

1. 1-2 metres apart
2. use enough containers across the spray width of the irrigator
3. put a stone in each container to stop it blowing over.



### Step 2:

#### Run irrigator

Run the irrigator as normal:

1. record the actual amount of time that effluent is falling in the containers.

How long





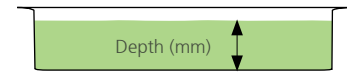
### Step 3:

Measure the depth of effluent in every 'wet' container.

**Tip:** Make sure container is level (not on a slope) before you measure.

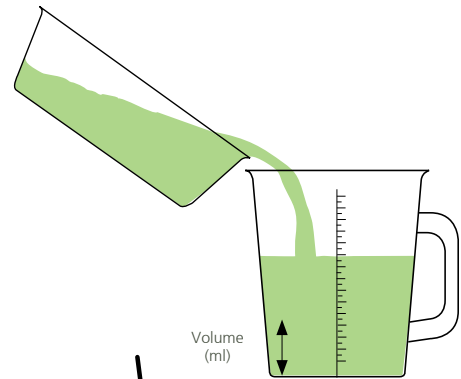
#### For RECTANGLE TRAYS WITH STRAIGHT SIDES:

1. use a tape measure
2. remove the stone
3. measure how deep the effluent is in each container (mm)
4. write down depth for each container.



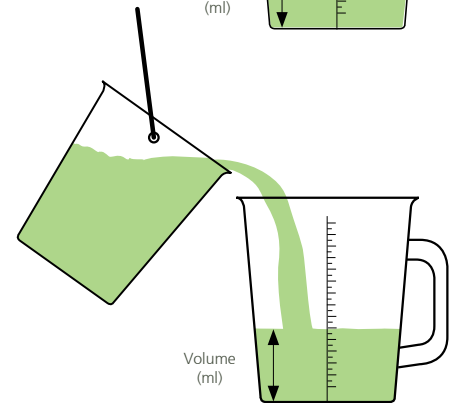
#### For RECTANGLE TRAYS WITH SLOPING SIDES:

1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.



#### For ROUND BUCKETS WITH SLOPING SIDES:

1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.



## How to calculate application and depth rates

### Rectangle trays with STRAIGHT sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

Container 1    Container 2    etc ...

								<b>TOTAL (mm)</b>
	+		+		+		+	

<b>TOTAL (mm)</b>	$\div$	<b>NUMBER OF CONTAINERS</b>	<b>=</b>	<b>AVERAGE APPLICATION DEPTH (mm)</b>
-------------------	--------	-----------------------------	----------	---------------------------------------

<b>AVERAGE APPLICATION DEPTH (mm)</b>	$\div$	<b>TIME (hrs)</b> (e.g 1hr 15 mins = 1.25 hrs)	<b>=</b>	<b>AVERAGE APPLICATION RATE (mm/hr)</b>
---------------------------------------	--------	---	----------	---

Note: Maximum application depth = The CONTAINER with the deepest measurement.

**Tip:** To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.



## Round buckets with SLOPED sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

Container 1	Container 2	etc ...			TOTAL (ml)			
+	+	+	+	+	+			
			TOTAL (ml)	÷	NUMBER OF CONTAINERS	=	AVERAGE VOLUME (ml)	
			CONTAINER WIDTH (mm)	÷	2	=	CONTAINER RADIUS (mm)	
		3.14	X	CONTAINER RADIUS (mm)	X	CONTAINER RADIUS (mm)	=	CONTAINER AREA (mm <sup>2</sup> )
		1000	X	AVERAGE VOLUME (ml)	÷	CONTAINER AREA (mm <sup>2</sup> )	=	AVERAGE APPLICATION DEPTH (mm)
				AVERAGE APPLICATION DEPTH (mm)	÷	TIME (hrs) (e.g 1hr 15 mins = 1.25 hrs)	=	AVERAGE APPLICATION RATE (mm/hr)

NOTE: Maximum application depth = The CONTAINER with the deepest measurement.

**Tip:** To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.

For assistance and advice on testing application depths and rates on pivot systems, please contact DairyNZ.

# Worksheet



## Important contacts

MANAGER \_\_\_\_\_

FARM OWNER \_\_\_\_\_


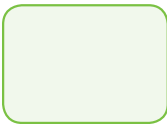

EFFLUENT SYSTEM SERVICE REPAIR \_\_\_\_\_

VACUUM TANKER \_\_\_\_\_

REGIONAL COUNCIL \_\_\_\_\_

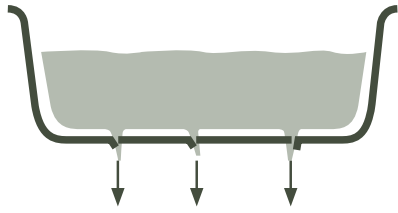
## Farm policy

- 1 No effluent gets into waterways
- 2 No effluent puddles in any paddocks
- 3 Effluent system is checked daily (minimum)
- 4 If there are problems with effluent, talk to the manager/farm owner
- 5 Effluent irrigation events are checked and recorded against the Effluent Management Plan
- 6 The resource consent is displayed in the shed
- 7 **Pg 22 The maximum application depth is not exceeded**  
Our consented max application depth is.....mm  
Based on our soil type .....our maximum application depth is.....mm
- 8 **Pg 22 The maximum application rate is not exceeded**  
Our consented max application rate is.....mm  
Based on our soil type .....our maximum application rate is.....mm
- 9 **Pg 6 Effluent is not applied if the soils are too wet**

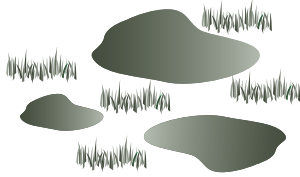
**Irrigate**  **Less than**  **Greater than**  **Do not irrigate**

Write critical soil moisture figure here

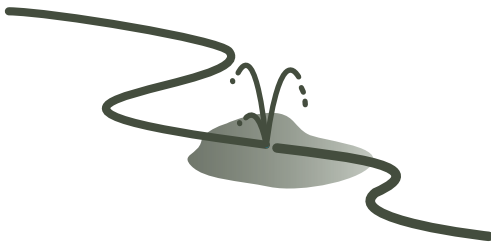
# Emergency



The pond is leaking



Puddles on grass



Burst pipes



Overflowing



Blockage

## Emergency Numbers:

Farm manager/owner

.....

Regional council

.....

Effluent systems repairs

.....

*dairynz.co.nz*