

Meadowvale Stud Farm Piggery
Monitoring Programme
Annual Report
2005-2006

Technical Report 2006–45

ISSN: 0114-8184
Document: 186084

Taranaki Regional Council
Private Bag 713
STRATFORD

August 2006

Executive summary

The Meadowvale Stud Farm piggery operates a piggery located at Midhirst, in the Manganui River catchment. This report for the period July 2005-June 2006 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

The Company holds a total of two resource consents, which include a total of 25 conditions setting out the requirements that the Company must satisfy. The Company holds resource consent 0351 to allow the discharge of treated effluent to land and into the Rumkeg Creek and consent 5249 allowing the discharge of emissions into the air from the piggery site.

The Council's monitoring programme for the year under review included eight inspections, two wastewater and receiving water physicochemical sampling surveys and one summer biomonitoring survey of the receiving waters.

During the year, the Company has demonstrated that an improvement is desirable in relation to issues of environmental performance and compliance with the resource consents. One unauthorised discharge relating to partially treated piggery effluent being discharged to a waterbody and an odour complaint emanating from piggery operations were recorded by the Council.

Meadowvale Stud Farm Piggery had addressed several piggery operational and maintenance issues during the monitoring period. These included desludging the second anaerobic pond, removal of solids from the aerobic pond, making repairs to the solids separator, construction of a concrete pad in front of the separator, installing a new pump to help with solids removal and irrigation, addressing minor leaks, and making repairs to sumps in an attempt to prevent unauthorised overflows.

The summer bio monitoring survey indicated there had been no recent significant downstream effects on the biological communities of the receiving waters. During this period the consent holder had reduced wastewater discharges to surface water by partial irrigation to land.

The absence of 'sewage fungus' growth on the Rumkeg Creek streambed was a direct result of discharging the treated effluent under flow conditions which provided adequate dilution and also maximizing irrigation to land.

A consent condition requires discharge to land in preference to discharge to water, and the supply of irrigation records. These records were not supplied for the period.

The riparian planting programme required by a consent condition is almost complete and will greatly improve the natural habitat, water quality and add aesthetic value along the Rum keg Creek.

The consent holder is to address the issue of directing all liquid wastes from the solids separation and surrounding compost storage areas back to the separator sump to prevent any overflow going directly into the final pond. This will reduce the loading on the final pond and improve effluent quality prior to discharge.

This report includes recommendations for the 2006-2007 year including an increase in the inspectorial component of the monitoring programme.

Table of contents

	Page
1. Introduction	1
1.1 Compliance monitoring programme reports and the Resource Management Act 1991	1
1.1.1 Introduction	1
1.1.2 Structure of this report	1
1.1.3 The Resource Management Act (1991) and monitoring	2
1.1.4 Evaluation of environmental performance	2
1.2 Process description	3
1.3 Resource consent	4
1.3.1 Water and Land discharge permit	4
1.3.2 Air discharge permit	5
1.4 Monitoring programme	6
1.4.1 Introduction	6
1.4.2 Programme liaison and management	6
1.4.3 Site inspections	6
1.4.4 Physicochemical sampling	6
1.4.5 Biomonitoring survey	7
2. Results	8
2.1 Water	8
2.1.1 Inspections	8
2.1.2 Results of discharge monitoring	10
2.1.3 Results of receiving environment monitoring	11
2.1.4 Biological receiving water monitoring	14
2.1.5 Gauging water flow	15
2.1.6 Liaison with consent holder	15
2.1.7 Treated effluent discharge records	16
2.2 Air	16
2.2.1 Inspections	16
2.2.2 Results of air monitoring	16
2.3 Register of incidents (air and water)	17
2.4 Discussion of plant performance	19
2.5 Environmental effects of exercise of water and land discharge permit	20
2.5.1 Exercise of water discharge consent	20
2.5.2 Exercise to land discharge consent	21
2.6 Environmental effects of exercise of air discharge permit	21
2.6.1 Exercise of air consent	21
2.7 Evaluation of performance	22
2.8 Recommendations from the 2004-2005 Annual Report	23
2.9 Alterations to monitoring programmes for 2006-2007	23
2.10 Exercise of optional review of consents	24
3. Recommendations	25
Glossary of common terms and abbreviations	26

Bibliography and references	28	
Appendix I	Resource consents held by Meadowvale Stud Farm Piggery	30
Appendix II	Biomonitoring report	31
Appendix III	Flow rating for Rumkeg Creek	33

List of tables

Table 1	Summary of treated wastewater analyses from the Meadowvale Stud Farm piggery for the period 1992 to June 2004	10
Table 2	Summary of treated wastewater analyses from the Meadowvale Stud Farm piggery for the period July 2004 to June 2005	11
Table 3	Location of sites in Rumkeg Creek, a tributary of the Manganui River	12
Table 4	Results from Meadowvale Stud Farm piggery and Rumkeg Creek, sampled on 29 September 2004	13
Table 5	Results from Meadowvale Stud Farm piggery and Rumkeg Creek, sampled on 4 May 2005	13
Table 6	Biomonitoring sites in Rumkeg Creek and the Manganui River, surveyed in relation to Meadowvale Piggery	14
Table 7	Summary of performance for consent 0351 - discharge of treated piggery effluent to Rumkeg Creek and land	22
Table 8	Summary of performance for consent 5249 - discharge of emissions into the air and waste management activities	22

List of figures

Figure 1	Piggery and disposal system	3
Figure 2	Aerial photograph of sites	12

List of photographs

Photo 1	Concrete pad in front of solids separator.	8
Photo 2	Drying sludge removed from the anaerobic pond	9
Photo 3	Sludge removal from second anaerobic pond (photos A to D)	9
Photo 4	Piggery effluent discharging to an unnamed tributary	17
Photo 5	Tributary including wastewater run-off entering the Rum Keg Creek	18
Photo 6	Offal pit full of carcasses	19

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2005 to June 2006 by the Taranaki Regional Council and it is the second annual monitoring programme to be associated with resource consents held by Meadowvale Stud Farm.

The consent holder operates a piggery situated at Midhirst, in the Manganui catchment, a subcatchment of the Waitara River. The piggery has operated from its current site since 1945 and has held consents since 1977. The piggery has a total of 2200 pigs, which equates to 1550 (50kg) pig equivalents.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by Meadowvale Stud Farm relating to discharges to land, water and air.

One of the intents of the Resource Management Act (1991) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Taranaki Regional Council has generally integrated its environmental monitoring programmes and reports the results of the programmes jointly.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by Meadowvale Stud Farm in the Waitara catchment, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the Meadowvale Stud Farm.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretation, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2006-2007 monitoring year.

A glossary of common abbreviations and scientific terms and a bibliography are presented at the end of the report.

1.1.3 The Resource Management Act (1991) and monitoring

The Resource Management Act primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- (a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;
- (b) physical effects on the locality, including landscape, amenity and visual effects;
- (c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- (d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, including impact monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the Meadowvale Stud Farm Piggery in the Waitara catchment during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or trivial (such as data supplied after a deadline) non-compliance with conditions.
- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the year were negligible or minor at most, items of concern were resolved positively, co-operatively, and quickly, the Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with.
- **improvement desirable** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental impacts against the company, and/or abatement notices may have been issued; there were adverse environmental effects arising from activities and intervention by Council staff was required, and there were matters that required urgent

intervention, took some time to resolve, or remained unresolved at end of the period under review.

- **poor** performance is used when there were grounds for prosecution or infringement notice

1.2 Process description

Piggery wastewater from the various collection sumps passes through a separator screen which provides primary treatment by separation of solid components from the waste. These solids are composted, bagged and sold as garden fertiliser. The separator reduces solids, the biochemical oxygen demand (BOD₅) and some nutrients contained in the liquid wastewater which is directed to the treatment pond system.

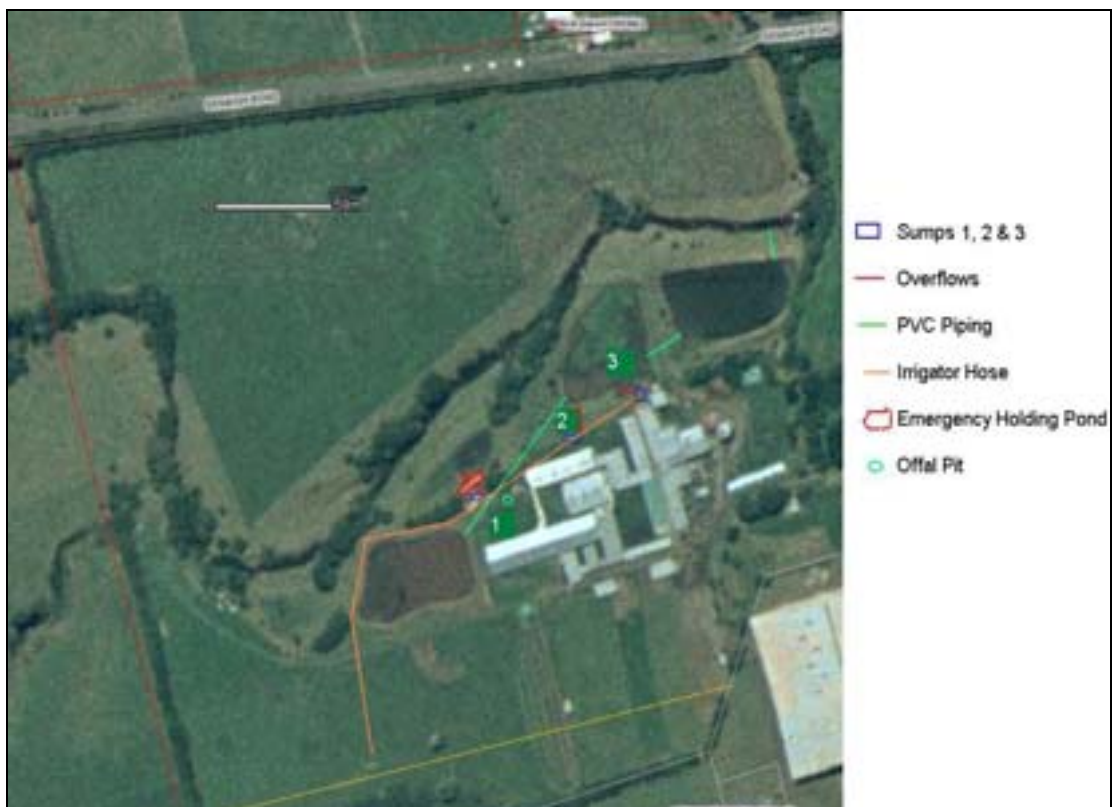


Figure 1 Piggery and disposal system

The treatment pond system consists of three ponds (Figure 1). These have been designed to operate as an initial anaerobic pond, followed by two aerobic ponds. However, the second pond appears to be operating as an anaerobic pond. Therefore in effect there are two anaerobic ponds and one aerobic pond. These ponds are adequately sized for the requisite treatment of the piggery wastes provided that the system is regularly maintained.

From the treatment pond system, effluent is discharged to the Rumkeg Creek or spray irrigated to surrounding farmland which includes neighbouring properties. Rumkeg Creek is a tributary of the Manganui River in the Waitara catchment and joins the Manganui River 750m downstream of the discharge.

Wastewater from the treatment system is to be discharged to natural water only when flow conditions in Rumkeg Creek provide for no less than 250 times effluent

dilution. When low receiving water flow conditions preclude this discharge, treated wastewater is to be spray irrigated onto nearby farmland. As insufficient land is available for this purpose on the consent holder's property, agreements have been reached with neighbouring property owners to use their land also.

1.3 Resource consent

1.3.1 Water and Land discharge permit

Section 15(1)(a) of the Resource Management Act stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

Sections 15(1)(b) and (d) of the Resource Management Act stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Meadowvale Stud Farm holds consent 0351 to discharge treated piggery effluent from a ponds treatment system into the Rumkeg Creek, a tributary of the Manganui River in the Waitara catchment (during high flow conditions) and to discharge piggery effluent to land (see resource consent in Appendix I). This consent was issued by the Taranaki Regional Council on 5 September 2003 as a resource consent under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2015.

The discharge of treated wastewater of this nature may affect the water quality of a stream, particularly if there is insufficient dilution. Some effects may be obvious (eg appearance, turbidity) while biological effects may be more subtle.

The discharge of piggery effluent to land greatly improves soil fertility. However it has the potential to contaminate groundwater and surface water if managed inappropriately.

Fourteen special conditions are attached to Resource Consent 0351:

Discharge to water

Special Conditions 1, 2 and 3 define the mixing zone and prohibit certain effects on the receiving waters.

Special Condition 4 requires the consent holder to operate and maintain the treatment and discharge system to ensure compliance.

Special Condition 5 requires the maintenance of a minimum dilution rate at all times in the receiving water.

Special Condition 6 requires the consent holder to monitor, maintain and supply records of the discharge.

Special Condition 7 requires riparian fencing and planting within 3 years, at a stipulated rate.

Discharge to land

Special Conditions 8 and 9 limit effluent application rates to land in terms of nutrient loadings.

Special Condition 10 limits the areas and locations of land discharge.

Special Condition 11 prohibits discharge of contaminants to surface water.

Special Condition 12 limits surface ponding of the discharge.

Special Condition 13 requires the consent holder to monitor and maintain records of the land discharge.

Special Condition 14 requires that the discharge to land shall be maximised and used in preference to discharge to water.

1.3.2 Air discharge permit

Section 15(1)(c) of the Resource Management Act stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Meadowvale Stud Farm holds air discharge permit 5249 to discharge emissions into the air from a pig farming activity and associated activities, including solids composting, effluent treatment and irrigation and other waste management activities. This permit was issued by the Taranaki Regional Council on 2 September 1998 as a resource consent under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2009.

Piggery effluent has the potential to have significant odour especially when discharged to land. Nine special conditions are specified in resource consent 5249.

Special Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise any actual or likely adverse effects on the environment.

Special Conditions 2 and 3 require the consent holder to minimise offsite odour effects by reference to certain activities and control measures.

Special Condition 4 requires the anaerobic pond to be desludged.

Special Condition 5 controls alterations to the pig farming and effluent disposal processes, operations, equipment or layout which may significantly change the nature or quantity of contaminants emitted from the site.

Special Condition 6 requires the consent holder to minimise the emissions and impacts of air contaminants discharged from the site.

Special Condition 7 requires the consent holder to operate the piggery and associated activities substantially in accordance with information provided.

Special Condition 8 limits the discharges of suspended or deposited dust at or beyond the boundary of the site.

Special Condition 9 provides for review of any or all of the conditions of this consent.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the Resource Management Act sets out an obligation for the Taranaki Regional Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.

The Taranaki Regional Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

The monitoring programme for the Meadowvale Stud Farm Piggery site consisted of four primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.4.3 Site inspections

The Meadowvale Stud Farm Piggery site was visited eight times during the monitoring period. With regard to consents for the discharge to water and land, the main points of interest were the piggery waste collection areas, the separator and composting system and the treatment ponds system with potential or actual discharges to receiving watercourses, including potential odour.

As far as practical, inspections in relation to air emissions were integrated with inspections undertaken for other purposes eg, effluent discharges. The air monitoring programme had been costed on the basis of an integrated approach to resource monitoring.

1.4.4 Physicochemical sampling

The Taranaki Regional Council undertook sampling of both the discharge from the site and the water quality of Rumkeg Creek upstream and downstream of the discharge point and mixing zone.

The treated effluent discharge was sampled on two occasions, and the samples analysed for carbonaceous biochemical oxygen demand (CBOD₅), chloride, conductivity, suspended solids, dissolved reactive phosphorus (DRP), un-ionised ammonia, pH, turbidity and temperature.

Rumkeg Creek was sampled on the same two occasions, upstream and downstream of the treated discharge and the samples analysed for filtered carbonaceous biochemical oxygen demand (FCBOD₅), chloride, conductivity, suspended solids,

dissolved reactive phosphorus (DRP), un-ionised ammonia, pH, turbidity and temperature.

The monitoring programme allows for the discharge and receiving water to be sampled on two occasions under treated effluent discharge conditions.

1.4.5 Biomonitoring survey

A biological survey was undertaken in February 2006 at four established sites including the Rumkeg Creek and the Manganui River, which the Rumkeg Creek enters 750m downstream of the piggery's discharge. Both waterbodies were surveyed to assess any impacts of the piggery effluent discharge on the immediate receiving waters (Rumkeg Creek) and the larger Manganui River.

Taranaki Fish and Game Council in the past had noted impacts on the biological quality of the Manganui River particularly in the vicinity of the Rumkeg Creek confluence. These impacts, and the appearance of 'undesirable heterotrophic growths' on the bed of the Rumkeg Creek from time to time, had indicated the inability of the receiving waters to adequately assimilate the discharge of treated piggery wastes under low flow conditions (see References in the biomonitoring reports (Appendix II)). As recently as August 2003 (prior to consent renewal), these growths had been recorded on the bed of Rumkeg Creek.

2. Results

2.1 Water

2.1.1 Inspections

Inspection of 13 July 2005

This inspection of the piggery operation, in particular the piggery wastes collection system, effluent irrigation area to land and discharge of treated wastes to receiving waters was carried out during fine weather conditions. The final pond was discharging treated effluent into Rum Keg Creek at a rate of one litre per second. The records received from the consent holder show this discharge was measured at 0.91 litres/second and Rumkeg Creek had a flow of 315 litres/second. The dilution ratio in this instance was 1: 346, indicating the dilution of the wastewater was in compliance with consent conditions.

The solids separator had some maintenance issues which had been completed but liquids from the separator were overflowing and draining directly into the final pond. A new concrete pad in front of the separator (Photo 1) had improved the handling of wastes although this area may require extending in the future to prevent the area becoming too boggy and contributing odours. Wash down facilities with drainage directed back to the separator would be an improvement to this operation.

The consent holder was instructed to channel all wastes from around the separator area directly back to the separator sump, which pumps back to the first pond. The second anaerobic pond was found to be very full to the point of overflowing. The consent holder was instructed to operate this pond level with a safe working freeboard to prevent any unauthorised overflow discharge entering Rumkeg Creek. The consent holder was also advised that cleaning out these ponds would lower the high level of solids content, making the anaerobic process more efficient in reducing



Photo 1 Concrete pad in front of solids separator.

the BOD level. On inspection it was found that effluent was sprayed to a paddock which was unsuitable for irrigation and that ponding had occurred with overflowing into a nearby unnamed tributary which discharged into the Rumkeg Creek, causing a foam line and slight discolouration. Samples were taken (see section 2.3) from Rumkeg Creek and from the tributary stream prior to Rumkeg Creek, some 50 metres below the overflow point.

Inspection of 22 September 2005

A site meeting was held with the Consent holder and the Council to discuss the previous year's annual draft report and to follow-up the outstanding piggery maintenance issues. It was suggested that the high volume of solids in the anaerobic pond had contributed to the pond short-circuiting and overloading resulting in the ponds system not performing to specification. The consent holder agreed that the pond required urgent attention in relation to cleaning out and this was instructed to be carried out as soon as practical. The final aerobic pond had been cleaned out by way of a drain digger, digging solids from the side of the pond and laying solids on the top of the bund wall. A discharge valve had been installed on the pond outlet and a good working freeboard was maintained on all three ponds. A new concrete

pad placed in front of the separator was an improvement although channelling would be required to direct all wastewater back to the separator sump. The offal pit was found to be covered and looked secure. A number of small maintenance issues had been actioned and the general appearance of Meadowvale Piggery looked tidy. On inspection of the Rumkeg Creek bed it was evident that no 'sewage fungus' was present on the streambed downstream of the treated effluent discharge. The piggery was not discharging on this occasion. It was noted that no nuisance odours were emanating from the piggery perimeter.

On the 17 October 2005 and 31 October 2005 TRC had further discussions with the consent holder in relation to the urgency of cleaning out the middle anaerobic pond. On 16 November 2005 contractors began work cleaning this pond.

Inspections of 17 and 18 November and 9 December 2005



Three further inspections were performed in relation to the pond operating systems and to check for possible odours coming from the recent pond de-sludge programme. A drain digger was initially used to perform the cleaning operation. This was partially successful in removing approximately 30m² of sludge from around the sides of the pond (Photo 2).

Photo 2 Drying sludge removed from the anaerobic pond

On 9 December 2005 contractors pumped out the anaerobic pond and irrigated effluent to a neighbouring farm, 500 metres west of the Meadowvale Piggery (Photo 3). The effluent discharge was black in colour with very little associated odour. Although the effluent application rate to pasture appeared to be high there was no runoff to the nearby waterway. Meadowvale Piggery had been advised that it was advisable to clean out the anaerobic pond every two years.



Photo 3 Sludge removal from second anaerobic pond (photos A to D)

Inspection of 22 February 2006

This inspection of the piggery operation and pond system was carried out during fine weather conditions. There was no treated effluent discharging at the time of inspection. Maintenance issues were still causing problems. The separator unit had failed causing liquefied solids to flow overland towards the third pond. The overall piggery site was looking good and the irrigators were working well.

Inspection of 28 April 2006

This inspection was carried out during fine weather conditions. No treated effluent was being discharged into the Rumkeg Creek on this occasion. It was noted that solids were visible on the surfaces of the second and final ponds and this was discussed with the consent holder outlining the importance of solids removal. Drainage in front of the separator will be required to direct the flow of liquids to the separator sump. This had been discussed with the consent holder on different occasions. The portable deodoriser was not operating and appeared that it had not been in operation for some time. The availability of this unit is important if site odour becomes an issue. Both offfal pits were found to be secure although maintenance was required. Some noticeable odours were found to be emanating from these pits. The piggery was again visited on 10 May 2006 to perform compliance sampling.

Inspection of 19 June 2006

This final inspection for the monitoring period was carried out during fine weather conditions. Treated effluent was being discharged into the Rumkeg Creek and receiving of wastewater water samples were collected on this occasion. The waste water discharge flow to the Rumkeg Creek was measured at 0.7 litres/second and Rumkeg Creek had a flow of 1099 litres/second. The dilution ratio in this instance was 1:1300 well above the required consent requirement of 1:250. Records received from the consent holder indicated preceding dilution of the wastewater in compliance with the consent condition. There were no visual effects from the piggery treated effluent discharge at the edge of the downstream mixing zone in Rumkeg Creek. There were signs of recent flooding up the bank of the Rumkeg Creek. Maintenance had been completed on the separator which was working at the time of this inspection. It was noted that general piggery odours were emanating onsite.

2.1.2 Results of discharge monitoring

2.1.2.1 Treated piggery wastewater

Prior to the 2005-2006 monitoring period the treatment ponds system had been sampled for various reasons. These results are summarised in Table 1. (Note that the treatment system has varied in design over the sampling periods).

Table 1 Summary of treated wastewater analyses from the Meadowvale Stud Farm piggery for the period 1992 to June 2005

Parameter	Unit	Number of samples	Range	Median
Conductivity @ 20°C	mS/m	15	107-398	247
pH		12	7.8-8.6	8.1
Total carbonaceous BOD ₅	g/m ³	16	44-230	115
Filtered carbonaceous BOD ₅	g/m ³	6	6-46	11
Ammoniacal nitrogen	g/m ³ N	17	23.4-410	221
Dissolved reactive phosphorus	g/m ³ P	13	12.8-49.8	35.4
Turbidity	NTU	16	22-270	93
Suspended solids	g/m ³	19	97-750	300

These results illustrate the variability in piggery effluent quality measured from this system over the period prior to the current consent monitoring programme. Some of this variability has been related to stormwater infiltration into the system and may also have coincided with changes in the configuration and degrees of treatment provided by the treatment system over the thirteen-year period surveyed.

The current treatment system's effluent was monitored on two occasions during the 2005-2006 period after the anaerobic and final ponds had been cleaned out. These results are summarised in Table 2 for comparative purposes.

Table 2 Summary of treated wastewater analyses from the Meadowvale Stud Farm piggery for the period July 2005 to June 2006

Parameter	Unit	10 May 2006	19 June 2006
Conductivity @ 20°C	mS/m	156	171
pH		8.1	7.8
Total carbonaceous BOD ₅	g/m ³	180	360
Ammoniacal nitrogen	g/m ³ N	154	192
Dissolved reactive phosphorus	g/m ³ P	34.1	30.4
Turbidity	NTU	150	280
Suspended solids	g/m ³	390	290

Monitoring of the wastewater quality during the 2005-2006 year indicated poorer effluent quality in comparison with historical quality in terms of median TCBOD₅ and turbidity and some improvement in quality in terms of median nutrient concentrations. However, a wide range of waste loadings (TCBOD₅, turbidity and nutrients) were measured during the period with higher concentrations for several parameters in the later part of the 2005-2006 period.

2.1.3 Results of receiving environment monitoring

2.1.3.1 Receiving waters physicochemical monitoring

Figure 2 shows the Meadowvale's piggery site in relation to the receiving waters of Rumkeg Creek and Manganui River. Te Popo Stream also borders the Meadowvale property on the southern side. Environmental monitoring sites (Table 3) are also illustrated in relation to the piggery operation.



Figure 2 Aerial photograph of sites

The sites monitored for physicochemical purposes are listed in Table 1.

Table 3 Location of sites in Rumkeg Creek, a tributary of the Manganui River

Site	Site code	Map reference	Location
Rumkeg Creek	RKC000197	Q20:186124	20 meters upstream of piggery discharge
Piggery effluent	PGP002001	Q20:189125	At discharge outlet from aerobic pond
Rumkeg Creek	RKC000198	Q20:188127	Denbigh Road Bridge

2.1.3.2 May 2006 survey

Results of the survey performed on 10 May 2006 are presented in Table 4.

Table 4 Results from Meadowvale Stud Farm piggery and Rumkeg Creek, sampled on 10 May 2006

Site location Site code		Rumkeg Creek u/s RKC000197	Piggery final effluent PGP002001	Rumkeg Creek d/s RKC000198
Parameter	Unit			
Time	NZST	1005	1000	0950
Temperature	°C	12.0	12.5	12.0
Conductivity @ 20°C	mS/m	10.2	156	10.8
Chloride	g/m ³		72.1	
pH		7.5	8.1	7.5
Total carbonaceous BOD ₅	g/m ³	-	180	-
Filtered carbonaceous BOD ₅	g/m ³	2.0	-	2.5
Ammoniacal nitrogen	g/m ³ N	0.483	154	0.937
Unionised ammonia	g/m ³ NH ₃	0.00401	5.169	0.00777
Dissolved reactive phosphorus	g/m ³ P	0.037	34.1	0.129
Turbidity	NTU	20	150	22
Suspended solids	g/m ³	13	390	17
Appearance		Turbid, dirty brown	Discharge: 1.4 l/sec	Turbid, dirty brown (staff gauge= 0.30m)

These results indicate that the treated effluent discharge dilution ratio at the time of sampling was above the required minimum ratio of 1:250 as set out in special consent condition 6. Special consent conditions 2 & 3 (unionised ammonia, filtered carbonaceous BOD₅ and turbidity) limits were in compliance, 50 metres downstream from the treated effluent discharge point.

2.1.3.3 June 2006 survey

Results of the survey performed on 19 June 2006 are presented in Table 5.

Table 5 Results from Meadowvale Stud Farm piggery and Rumkeg Creek, sampled on 19 June 2006

Site location Site code		Rumkeg Creek u/s RKC000197	Piggery final effluent PGP002001	Rumkeg Creek d/s RKC000198
Parameter	Unit			
Time	NZST	1250	1245	1240
Temperature	°C	8.5	9.5	8.5
Conductivity @ 20°C	mS/m	8.5	171	8.8
Chloride	g/m ³	-	-	-
pH		7.4	7.8	7.4
Total carbonaceous BOD ₅	g/m ³	-	360	-
Filtered carbonaceous BOD ₅	g/m ³	0.6	-	1.0
Ammoniacal nitrogen	g/m ³ N	0.100	192	0.554
Unionised ammonia	g/m ³ NH ₃	0.00051	2.628	0.00282
Dissolved reactive phosphorus	g/m ³ P	0.015	30.4	0.078
Turbidity	NTU	4.0	280	4.7
Suspended solids	g/m ³	2	290	3
Appearance		Turbid, dirty brown	Discharge: 1.45 l/sec	Turbid, dirty brown (staff gauge= 0.40m)

These results indicated a high dilution ratio in Rumkeg Creek (1:758) with minimal impacts on the receiving waters in compliance with special condition 2, 3, and 4 of the consent. Although compliance with consent conditions was apparent, wastewater quality results showed an elevated BOD₅ result which may have been influenced by low temperatures affecting recent pond performance.

2.1.4 Biological receiving water monitoring

The Council's standard 'kick-sampling' technique was used at four established sites (Table 6) to collect streambed macroinvertebrates from Rumkeg Creek and the Manganui River in order to assess whether the Meadowvale Piggery discharge had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and SQMCI_s scores for each site.

Table 6 Biomonitoring sites in Rumkeg Creek and the Manganui River, surveyed in relation to Meadowvale Piggery

Site No	Site code	Map reference	Location
1	RKC000196	Q20:186-124	400 metres upstream of Denbigh Road bridge
2	RKC000198	Q20:188-126	Denbigh Road bridge
M1	MGN000195	Q20:190-130	Upstream of confluence with Rumkeg Creek
M2	MGN000200	Q20:191-131	100 m downstream of SH3 bridge

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring.

Significant differences in either the MCI or the SQMCI_s between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

The macroinvertebrate survey conducted on 28 February 2006 indicated that the discharge from the Meadowvale Piggery in the month preceding this survey had had no detrimental effects on the macroinvertebrate communities of either Rumkeg Creek or the Manganui River into which the creek runs. Further, no undesirable heterotrophic growths were observed on the streambed at the time of the survey. This is consistent with the compliance of the discharge with special conditions of resource consent 0351, where a discharge dilution ratio of least 1:250 is required in Rumkeg Creek.

The macroinvertebrate communities of Rumkeg Creek contained moderate proportions of 'sensitive' taxa at all sites and the communities were generally dominated by both 'sensitive' and 'tolerant' taxa. Taxonomic richness (number of taxa) was similar to the median number of taxa previously recorded at the site upstream of the piggery discharge and increased significantly at the site 50 m downstream of the discharge due to the increase in the number of rare taxa (i.e., less than five individuals).

The macroinvertebrate communities of the Manganui River contained high proportions of 'sensitive' taxa at both sites and the communities were generally

dominated by 'sensitive' taxa. Taxonomic richness (number of taxa) was slightly lower than the median number of taxa previously recorded at these sites.

The presence of a number of 'highly sensitive' taxa at all four sites indicated good preceding water quality. MCI and SQMCI_s scores indicated that the stream communities in Rumkeg Creek were of moderate health, and similar to medians of previous surveys. The MCI scores were lower than those recorded in the Manganui River, most likely due to the higher nutrient loading from this predominantly agricultural catchment, and more widespread periphyton cover.

In the Manganui River, MCI values were lower than the median MCI values recorded from previous surveys, and the slight decrease between the upstream control site and site downstream of the confluence with Rumkeg Creek was probably a result of the more open nature of this lower site, as well as greater nutrient contributions from Rumkeg Creek.

2.1.5 Gauging water flow

To determine flow rates in the Rumkeg Creek a rating curve is maintained by Council. This enables the consent holder to assess treated wastewater discharge compliance with the minimum dilution ratio of 1:250 (one part effluent to two hundred and fifty parts receiving water flow).

The staff gauge installed on the Denbigh Road Bridge provides the consent holder with the stream level (or height) and a rating chart produced by Council showing water flow rates at any given stream rate. This rating was updated during the 2005-2006 period from reported hydrological gaugings.

2.1.6 Liaison with consent holder

During the 2005-2006 monitoring period the Taranaki Regional Council liaised with the consent holder concerning several operational issues additional to those required in the monitoring programme.

Topics discussed were: odour issues emanating from the piggery site, solids levels in the second and third ponds, treated effluent discharge rates, maintaining pond levels with sufficient freeboard to prevent any overflow and irrigated effluent to pasture.

17 October 2005

The Council contacted the consent holder to provide a plan on removing sludge from the anaerobic pond by 24 October 2005.

31 October 2005

A site visit to the piggery showed that removal of sludge had not started but the consent holder was waiting on contractors to perform this operation. Other piggery operations issues were discussed on this occasion.

16 November 2005

The consent holder notified the Council that a contractor had started to desludge the anaerobic pond. And that no odour was associated with this desludging programme.

2.1.7 Treated effluent discharge records

Discharge to water

Special Condition 6 of consent 0351-3 requires a minimum dilution rate of 1 part effluent to 250 parts receiving water at the point of discharge and maintained at all times during discharge events.

Special condition 7 of consent 0351-3 requires the consent holder shall monitor and maintain discharge records, including date, time, rate, staff gauge reading and duration of discharge. These records are to be supplied to the Council quarterly or as requested.

During the 2005-2006 monitoring period the Council received from Meadowvale piggery, records showing 109 daily discharges to the stream. These records indicated that the consent holder maintained a minimum dilution rate of 1 part effluent to 250 parts receiving water at the point of discharge on all occasions.

Discharge to land

Special condition 14 of Consent 0351-3 requires that the consent holder shall monitor and maintain records of discharge, including date, application area, rate and duration of discharge. These records are to be supplied to the Council quarterly or as requested.

Special condition 15 of consent 0352-3 requires the consent holder to maximise discharge to land in preference to discharge to water.

During the 2005-2006 monitoring period no records were received by Council in relation to discharge to land. The Company is thereby non-compliant with special condition 14. This matter was being pursued with the Company at the time of preparation of this report and greater emphasis will be placed with this section of the monitoring programme during the 2006-2007 monitoring period.

The Council strongly encourages producers to use systems that discharge pig manure to land rather than water. The nitrogen content of piggery manure is usually the major determinant of land area required.

2.2 Air

2.2.1 Inspections

As far as was practicable, inspections in relation to air emissions were integrated with inspections undertaken for other purposes eg, effluent discharges. The air monitoring programme had been costed on the basis of an integrated approach to resource monitoring.

2.2.2 Results of air monitoring

Odours emitted from normal piggery operations are influenced mainly by weather conditions (ie wind direction), operating of the oxidation treatment ponds, solids storage & disposal, irrigating to land and general piggery hygiene operations.

The offensiveness of odour is reliant on individual perception, Council methods of measurement, and management practices of the pork producer. The Environmental Management System (EMS) deals with piggery operational practices ensuring the

effect of odour is taken into account when the pork producer is undertaking activities relating to areas of the piggery.

All inspections carried out during the monitoring period noted that odours were more prevalent around the separator and pond areas. The consent holder has been made aware of these issues and improvements are to be made.

2.3 Register of incidents (air and water)

The Taranaki Regional Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The register ('unauthorised incident register') includes events where the Company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Incidents may be alleged to be associated with a particular site. If there is an issue of legal liability, the Council must be able to prove by investigation that the identified Company is indeed the source of the incident. (or that the allegation cannot be proven).

In the 2005-2006 year two unauthorised incidents were recorded by the Council in relation to the Meadowvale Stud Farm Piggery. One incident recorded was for discharging of wastes to land or natural water and one odour incident regarded odour at the boundary of Meadowvale Stud Farm Piggery.

Incident of 13 July 2005

During a routine compliance monitoring inspection undertaken by the Investigation Officer it was found that effluent was sprayed to a paddock which was unsuitable for irrigation and that ponding had occurred, (Photo 4) overflowing into a nearby unnamed tributary which discharged into Rumkeg Creek (Photo 5), causing foaming and slight discolouration in the receiving water.



Samples of the receiving waters were taken on this occasion. The discharge to the waterbody was in contravention of the resource consent conditions which requires that *'the discharge shall not result in any discharge of contaminants to surface water'*. These results are presented in Table 7.

Photo 4 Piggery effluent discharging to an unnamed tributary

Table 7 Results from Meadowvale Stud Farm piggery water quality survey on 13 July 2005

Site location	Site code	Rumkeg Creek u/s of tributary 10 metres upstream	Trbutary d/s of wastewater discharge 1 metre u/s RumKeg Creek	Rumkeg Creek d/s of tributary 63 meters downstream
Parameter	Unit			
Time	NZST	1235	1230	1240
Temperature	°C	10.4	11.0	10.2
Conductivity @ 20°C	mS/m	9.3	41.6	9.6
pH		7.5	7.1	7.5
Total carbonaceous BOD ₅	g/m ³	-	160	-
Filtered carbonaceous BOD ₅	g/m ³	0.5	-	>8
Ammoniacal nitrogen	g/m ³ N	0.008	35.5	0.484
Unionised ammonia	g/m ³ NH ₃	0.00006	0.11602	0.00352
Dissolved reactive phosphorus	g/m ³ P	0.006	2.44	0.033
Turbidity	NTU	1.8	65	2.7
Suspended solids	g/m ³	<2	80	2
Appearance			Turbid & foamy	Slight discolouration

The discharge significantly impacted on the small tributary stream (eg elevated TCBO₅, turbidity, suspended solids and nutrients). It also had some impact downstream in Rumkeg Creek as emphasised by the increase in FBOD₅ well above acceptable levels. Nutrients also increased at this site.



The consent holder was advised that should such an incident reoccur, or should any other form of consent non-compliance be discovered, serious consideration will be given to the option of issuing an infringement notice, or even prosecution.

Photo 5 Tributary including wastewater run-off entering the Rumkeg Creek

Incident of 10 August 2005

Investigating Officers visited the Meadowvale Stud Farm Piggery in relation to an odour complaint. The investigation found odours at the boundary bordering on 'objectionable'. The on site inspection found significant odours emanating from the solids separator unit, and from the first and second anaerobic ponds. The deodoriser unit was operating at the time of this inspection but had very little effect. The resource consent conditions for discharge of emissions into the air from a pig farming activity including solids composting, requires that *'there shall be no objectionable or offensive odour to the extent that it causes an adverse effect at or beyond the boundary of the site'*.



Photo 6 Offal pit full of carcasses

The investigating officers found the large piggery offal pit was full and the contents required burying and securing. If managed correctly, the disposal of carcasses will have minimal effect on the environment

2.4 Discussion of plant performance

During the year, the Company's performance has demonstrated that an improvement is again desirable with issues relating to environmental performance and compliance with the resource consents.

Meadowvale Piggery Stud Farm has addressed several piggery operational maintenance issues during the monitoring period. These include desludging the middle anaerobic pond, removal of solids from the aerobic pond, making repairs to the solids separator, construction of a concrete pad in front of the separator, installing a new pump to help with solids removal and irrigation, addressing minor leaks, and making repairs to sumps in an attempt to prevent unauthorised overflows.

Pond wastewater levels had been high at times during periods of low river flows jeopardising the integrity of the pond bund walls. The Council requested that a 500mm freeboard be maintained at all times. This will also reduce the likelihood of any unauthorised overflows into the Rumkeg Creek.

An integral component of the piggery wastewater treatment is the solids separation process. The benefits of solids/liquid separation of piggery effluent include: 10-30% reduction in BOD₅ and COD from the raw effluent and also an increase in pump protection from the large particles removed.

Removal of solids from the anaerobic ponds system is important in preventing the ponds from overloading and short-circuiting. Overloaded ponds reduce the effectiveness in breaking down organic matter. A well maintained pond treatment system comprising of an anaerobic and aerobic pond in series can achieve up to 95%

BOD removal and up to 70% nitrogen reduction. The BOD₅ concentration recorded from the final piggery effluent at the time of the survey performed toward the end of the 2005-2006 monitoring period was very high compared to previous results. There may be several contributing factors which caused this high BOD₅ in the final treated effluent which require further investigation.

The absence of 'sewage fungus' growth on the Rumkeg Creek streambed was a direct result of discharging final effluent under suitable conditions which provide adequate dilution or to land irrigation.

The removal of track metal and replacing with a concrete pad in front of the solids separator and storage area has been a big improvement although this area now requires the leachate discharge being directed back to the separator sump and not overflowing into the final pond. This will help keep the area clean and tidy and minimise some odour issues.

Disposal of treated wastewater to land was also performed although no records of discharge were received by Council. Discharge to land should be maximized in preference to discharge to water especially during periods of low flow conditions. The nitrogen content of piggery manure discharged to land is usually the major determinant of the land area required. For this reason it is important to keep accurate discharge records to maintain 200kg N/hectare/year. It is also important to regularly monitor irrigating equipment and land suitability when irrigating to prevent any further unauthorised discharges to a waterbody.

Piggery operational improvements to manage odour discharges to air are required to prevent further potential odour problems. The RMA (1991) effectively requires that *'there should be no offensive or objectionable odour beyond the boundary of the farm'*. Compliance with managing discharges to air is mentioned in the EnviroPork work book and it would be prudent to discuss these guidelines with the New Zealand Pork Industry Board.

The de-odorising unit installed around the solids separator system has had some success in odour control. (It will be important to ensure that de-odorising crystals are replenished). The placement of the portable unit in the proximity of any odour source and determination of wind patterns is important in establishing control of odours.

When loading/trucking out solids or stored compost has been performed, the de-odorising unit has helped reduce odour intensities.

2.5 Environmental effects of exercise of water and land discharge permit

2.5.1 Exercise of water discharge consent

The physicochemical monitoring had indicated that the discharge of treated piggery effluent into the Rumkeg Creek had resulted in no adverse downstream environmental effects. The absence of 'sewage fungus' growth on the Rumkeg Creek streambed was a direct result of discharging final effluent under high flow conditions and otherwise irrigating to land. The consent holder complied with the required dilution ratio of 1:250 on all occasions.

Piggery effluent is about ten times more concentrated than dairy effluent and consequently has greater polluting potential. Piggery wastes assimilation may remove much of the available oxygen in the receiving water and add excess amounts of nutrients (nitrogen and phosphorus), leading to the formation of nuisance biological growths on streambeds.

2.5.2 Exercise to land discharge consent

Wastewater discharge to land is generally preferred to discharging to flowing surface waters. However, land discharges can have adverse effects on waterbodies, groundwater and grazing stock if not appropriately managed.

The application of nutrients (in particular, nitrogen, phosphorus, and potassium) in excess of plant utilisation can result in leaching of nutrients to groundwater. In addition, irrigating too close to a waterbody or in excess of soil hydraulic conductivity can result in runoff to waterbodies.

It is important that the consent holder keeps records of all land discharges to minimise any environmental effects and to be able to monitor the application as part of best management practices to eliminate any irrigation runoff to neighbouring waterbodies (Te Popo Stream and Rumkeg Creek) thus preventing any further unauthorised discharges to a waterbody.

2.6 Environmental effects of exercise of air discharge permit

2.6.1 Exercise of air consent

Operation of the piggery has resulted in some objectionable odour off site from time to time. Odour has been the result of general operations and adverse weather conditions. As the piggery is located on a small site within a residential area in Midhirst there is no real buffer zone.

One complaint concerning piggery odour emissions was received by the Council during the 2005-2006 period. This complaint was directly involved with the piggery operations.

The RMA (1991) effectively requires that there should be no offensive or objectionable odour beyond the boundary of the farm.

The pork industry ('EnviroPork') guide to managing environmental effects, deals with management practices ensuring the effect of odour is taken into account when undertaking activities relating to farm operations.

2.7 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 8 and Table 9

Table 8 Summary of performance for consent 0351 - discharge of treated piggery effluent to Rumkeg Creek and land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Operation and discharge in accordance with application	Inspection of data and discharge point monitoring	Yes
2. Maximum concentrations in receiving water after mixing	Physicochemical sampling	Yes
3. Maximum increase in turbidity after mixing	Physicochemical sampling	Yes
4. Constituents not permitted in receiving water after mixing	Monitoring inspections of receiving waters	Yes
5. Operation and maintenance of treatment and discharge system	Monitoring Inspections	Yes
6. Minimum dilution rate in receiving waters	Consent holders discharge records and monitoring	Yes
7. Records of discharge	Consent holders discharge records received by Council	Yes
8. Riparian fencing and planting	Monitoring inspections and liaison with consent holder	Yes
9. Maximum effluent application rate to land	Not yet assessed by Council	N/A
10. Mitigating measures for high effluent application rate to land	Not yet assessed by Council	N/A
11. Proximity of discharge to dwelling or water body	Inspections	No
12. Contamination of surface water not permitted from land irrigation	Monitoring inspections	No
13. Extended surface ponding not permitted	Monitoring inspections	No
14. Records of discharge to land	Consent holders records	No
15. Maximisation of discharge to land over water	Consent holders records and monitoring inspections	Yes
16. Optional review provision	Next permit review - June 2007	N/A

Table 9 Summary of performance for consent 5249 - discharge of emissions into the air and waste management activities

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of action to minimise adverse environmental effects	Monitoring inspections	Yes
2. Action to minimise offsite odour effects	Monitoring inspections	No
3. Objectionable odour at site boundary not permitted	Monitoring inspections	No
4. Desludging of an anaerobic pond and related notification prior to action	Monitoring inspections	Yes
5. Consultation and approval prior to alterations to plant or process	Liaison with consent holder	Yes
6. Minimisation of impact and emissions through use of equipment and suitable methods	Monitoring inspections and liaison with consent holder	No
7. Operation in accordance with application	Monitoring inspections	Yes
8. Objectionable dust levels at site boundary not permitted	Monitoring inspections	Yes
9. Optional review provision	Permit has no review date	N/A

N/A = not applicable

During the year, Meadowvale Stud Farm Piggery has demonstrated that an overall improvement is desirable in environmental performance and compliance with the resource consents

2.8 Recommendations from the 2004-2005 Annual Report

In the 2004-2005 Annual Report, it was recommended:

1. THAT monitoring of air emissions from the Meadowvale Stud Farm piggery in the 2005-2006 year continue at the same level as in the 2004-2005 period.
2. THAT monitoring of discharges from the Meadowvale Stud Farm piggery in the 2005-2006 year is amended from that undertaken in 2004-2005, by reducing the physicochemical sampling component to two occasions during the four inspection visits.
3. THAT the consent holder be advised to clean the second anaerobic pond and final (aerobic) pond of accumulated solids, thereby providing the necessary retention time in the system for adequate wastes treatment.
4. THAT the consent holder be advised that in the interim period, prior to implementation of Recommendation 3, that maximisation of land discharge (required by Special Condition 15 of consent 0351) be complied with, and that close attention be given to maintenance of sufficient dilution of any discharge of treated wastes in the receiving waters to prevent the development of any 'undesirable biological growths' on the bed of Rumkeg Creek.
5. THAT the consent holder provides the Council with details of the location of areas to be irrigated with piggery wastes.

Recommendations 1, 3 and 4 have been achieved.

Recommendation 2 two of the three physiochemical sampling component were achieved.

Cleaning of the second anaerobic pond and final aerobic pond (recommendation 3) had been achieved as recommended.

Recommendation 5 had not been achieved.

2.9 Alterations to monitoring programmes for 2006-2007

In designing and implementing the monitoring programmes for air/water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki emitting to the atmosphere/discharging to the environment.

In consideration of the Meadowvale Piggery's environmental performance as regard to treated piggery wastewater discharge and its effects, it is recommended that piggery inspections carried out by Council increase from four to six regularly spaced inspections per year.

It is also recommended that provision be made for physicochemical impact monitoring to continue from twice per year to three times per year, under normal stream flow conditions (ie not during stream freshes). This extra sampling run will only to be undertaken if the downstream receiving waters are showing signs of adverse environmental effects (ie presence of 'sewage fungus' in the Rumkeg Creek or high waste loadings from the treatment system).

2.10 Exercise of optional review of consents

Consent 0351 held by Meadowvale Stud Farm Piggery provide for an optional review in June 2007.

Consent 5249 held by Meadowvale Stud Farm Piggery does not provide for an optional review.

3. Recommendations

1. THAT monitoring of air emissions from the Meadowvale Stud Farm piggery in the 2006-2007 year continue at the same level as in the 2005-2006 period.
2. THAT monitoring of wastewater discharges from the Meadowvale Stud Farm piggery in the 2006-2007 year increases from two to three physicochemical surveys if receiving water conditions require such an increase.
3. That the piggery inspections in the 2006-2007 period be increased from four inspections as in the 2005-2006 period to six inspections and these inspections to be carried out bi-monthly.
4. THAT the consent holder be required to clean the second anaerobic pond and final (aerobic) pond of accumulated solids every two years or as required thereby providing the necessary retention time in the system for adequate wastes treatment.
5. THAT the consent holder be advised that in the interim period, prior to implementation of Recommendation 4, that maximisation of land discharge (required by Special Condition 15 of consent 0351) be complied with, and that close attention be given to maintenance of sufficient dilution of any discharge of treated wastes in the receiving waters to prevent the development of any 'undesirable biological growths' on the bed of Rumkeg Creek.
6. THAT the consent holder provides the Council with details of the location of areas to be irrigated with piggery wastes and provide records as required by Special Condition 14 of Consent 0351.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

biomonitoring	assessing the health of the environment using aquatic organisms
BOD	biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate
BODF	biochemical oxygen demand of a filtered sample
bund	a wall around a tank to contain its contents in the case of a leak
CBOD	carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate
condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
fresh	elevated flow in a stream, such as after heavy rainfall
g/m ³	grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures
l/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats
mS/m	millisiemens per metre
mixing zone	the zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	ammoniacal nitrogen, normally expressed in terms of the mass of nitrogen (N)
NH ₃	unionised ammonia nitrogen, normally expressed in terms of the mass of nitrogen (N)
NO ₃	nitrate, normally expressed in terms of the mass of nitrogen (N)

NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water
pH	a numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
physicochemical	measurement of both physical properties(e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
sewage fungus	Growths of bacteria and/or fungi responding to increased concentrations of organic material in the water.
SS	suspended solids,
temp	temperature, measured in °C
turb	turbidity, expressed in NTU
UIR	Unauthorised Incident Register entry- an event recorded by the Council on the basis that it had potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan

Bibliography and references

Taranaki Regional Council 2005: Meadowvale Stud Farm Piggery Monitoring Programme Annual Report 2004-2005 Technical Report 2005-60.

Hope K, 2005: Biomonitoring of the Rumkeg Creek sampled in relation to the Meadowvale piggery, February 2005. TRC report KH24.

Fowles CR & Colgan BG, 2004: Biomonitoring of the Rumkeg Creek sampled in relation to the Meadowvale piggery, March 2004. TRC report CF330.

Fowles CR & Colgan BG, 2004: Biomonitoring of the Manganui River sampled upstream and downstream of the confluence with Rumkeg Creek, March 2004.

Taranaki Regional Council 2004: Meadowvale Stud Farm Piggery Monitoring Programme Annual Report 2003-2004 Technical Report 2004-75.

New Zealand Pork Industry Board
Pork Industry guide to managing environmental effects
EnviroPork 2005

Ministry For The Environment June 1992:
Resource Management Water Quality Guidelines No.1. Guidelines for the Control of Undesirable Biological Growths in Water

Appendix I

Resource consents held by Meadowvale Stud Farm Piggery

Appendix II

Biomonitoring report

Appendix III

Flow rating for Rumkeg Creek

Rumkeg Creek above Confluence

River Height vs Flow Values

Prepared for Meadowvale Stud Farm Limited

(Update March 2006)

A staff gauge has been installed on the Rumkeg Creek Denbigh Road Bridge for monitoring of the river level (or height).

Table 1 shows river levels at this bridge and the corresponding flow for each level. All flows are expressed in litres per second.

River Level	Flow (litres/second)	River Level	Flow (litres/second)
0.1	20	0.5	2,726
0.11	24	0.51	2,959
0.12	29	0.52	3,205
0.13	34	0.53	3,465
0.14	39	0.54	3,739
0.15	46	0.55	4,036
0.16	54	0.56	4,350
0.17	62	0.57	4,681
0.18	72	0.58	5,028
0.19	82	0.59	5,393
0.2	95	0.6	5,789
0.21	110	0.61	6,207
0.22	126	0.62	6,647
0.23	144	0.63	7,109
0.24	164	0.64	7,592
0.25	189	0.65	8,098
0.26	216	0.66	8,625
0.27	246	0.67	9,174
0.28	279	0.68	9,744
0.29	315	0.69	10,337
0.3	359	0.7	10,991
0.31	406	0.71	11,674
0.32	459	0.72	12,386
0.33	516	0.73	13,127
0.34	577	0.74	13,897
0.35	648	0.75	14,695
0.36	725	0.76	15,523
0.37	808	0.77	16,380
0.38	897	0.78	17,266
0.39	993	0.79	18,181
0.4	1,101	0.8	19,180
0.41	1,217	0.81	20,219
0.42	1,341	0.82	21,296
0.43	1,474	0.83	22,413
0.44	1,615	0.84	23,568
0.45	1,772	0.85	24,763
0.46	1,939	0.86	25,996
0.47	2,118	0.87	27,269
0.48	2,307	0.88	28,581
0.49	2,507	0.89	29,932



At 0.30m (river level) the flow is 359

River Level	Flow (litres/second)
0.9	31,365
0.91	32,845
0.92	34,372
0.93	35,946
0.94	37,567
0.95	39,235
0.96	40,950
0.97	42,712
0.98	44,520
0.99	46,376
1	48,591

