A Practical Guide to Providing Facilities for Stock Effluent Disposal from Trucks

Stock Truck Effluent Disposal

Fourth Edition 2013

Road Controlling Authorities Forum (NZ) Inc

National Stock Effluent Working Group

Acknowledgements:

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Graham's experience spans twenty seven years as a Civil Engineering Designer and Project Manager, working in both public and private sector organizations in New Zealand and the United Kingdom. He has been instrumental in the design and development of the Glengarry (near Napier), Wairoa and Gisborne stock truck effluent collection facilities. He has seen the Glengarry site through from concept, construction and now maintenance management and has presented papers on the facility at IPWEA Conferences in both New Zealand and Australia

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Cover Picture:

Photo taken at the opening of the Kauri - Stock Truck Effluent Disposal Facility (Whangarei, Northland): Photo courtesy of Opus International Consultants.

Contents

List of Figures and Tables

Glossary of Terms

TERM	DEFINITION
AEE	Assessment of Environmental Effects
AOM	Asset Owner's Manual
BA	Building Act (2004)
BOD	Biochemical Oxygen Demand
FAR	Funding Assistance Rate
FDE	Farm Dairy Effluent
HSE	Health and Safety in Employment Act (1992)
IPENZ	Institute of Professional Engineers New Zealand
LA	Local Authority
MOTSAM	Manual of Traffic Signs and Markings
NAMS	New Zealand Asset Management Support
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NSEWG	National Stock Effluent Working Group
NZBC	New Zealand Building Code
NZRTA	New Zealand Road Transport Association
NZTA	New Zealand Transport Agency
PIKB	Planning and Investment Knowledge Base (2011)
RC	Regional Council
RCA	Road Controlling Authority
RMA	Resource Management Act (1991)
RTF	Road Transport Forum
STEDF	Stock Truck Effluent Disposal Facility
TRC	Taranaki Regional Council
WRC	Waikato Regional Council
WWTP	Waste Water Treatment Plant

Executive Summary

This guide has been developed on the underlying principal that:

"THE DISCHARGE OF STOCK EFFLUENT FROM TRUCKS ON ROADS IS NOT "SOME-ONE ELSE'S PROBLEM", IT IS THE RESPONSIBILITY OF EVERYBODY INVOLVED TO PLAY THEIR PART." [1]

The National Stock Effluent Working Group (NSEWG) offers support to those wanting to develop and run a Stock Truck Effluent Disposal Facility (STEDF). Part of that support is providing practical and easily readable guidelines based on the latest best practice procedures. This document aims to be that guide, interacting with the reader and informing them of the key aspects to consider and be aware of during the planning, construction and operational phases of a STEDF.

This revised practical guide has been developed by the NSEWG as a replacement to the previous 2005 document. It focuses on latest trends, recent research and development undertaken over the last few years.

This guide focuses on:

- Why facilities are needed
- What types there are ('Destination' and 'In transit')
- What facilities have been built so far and what is proposed
- The funding options for both construction and on-going maintenance
- Legislation and regulations to be considered and applied
- Site selection and design criteria
- Treatment options, operation and maintenance.

Considering the components above, construction costs can range from $200,000 to $400,000 with variances primarily due to the collection method (tank/pond/sewer), the means of effluent treatment, the road or access improvements identified and the need to purchase land.

The process of developing a STEDF can take many years. It is the working group's expectation that these updated national guidelines will help to streamline the future planning and construction of facilities that will lead to less effluent spillage on our country's roads. This will, in turn, reflect favourably on the reputation of not only the transport companies but the agricultural industry as a whole.

[1] *NSEWG (1999)* Industry Code of Practice for the Minimisation of Stock Effluent Spillage from Trucks on Roads

2 Introduction

2.1 Aims of the Guide

The NSEWG was first established by the Road Controlling Authorities (RCA) Forum in 1997. Its objective was to bring together all the appropriate industry groups involved with the movement of stock in order to develop practices and solutions to reduce the amount of effluent falling from stock trucks on to New Zealand roads. This guide is part of that objective as it focuses on the planning and implementation of any given effluent disposal facility, and should be read in conjunction with the supporting document 'Industry Code of Practice for the Minimisation of Stock Effluent Spillage from Trucks on Roads' also published by the NSEWG.

The NSEWG's principal focus is to ensure there is a nation-wide network of effluent disposal facilities, both in-transit (in between stock truck origins and destinations) and at destination points (such as meat processing facilities and stock sale yards). To date the NSEWG has undertaken New Zealand-wide communication in an attempt to ensure that all parties understand and fulfil their roles.

The aim of this guide is to help the reader understand:

- Why facilities are needed, and what is being done nationally
- The issues and challenges involved in establishing a stock effluent disposal facility
- The funding options for both construction and on-going maintenance.

This guide should be used for reference purposes only. Each STEDF site is unique and although some aspects of best practice (for example the receptor grill, concrete surround and road signage) can be directly applied, the overall construction and on-going maintenance will depend on site specific factors where tailored detailed design will be required to ensure long term efficiencies.

2.2 Intended Audience

This guide is designed to help in the planning and implementation of stock truck effluent facilities within New Zealand and is intended to be used as a reference by:

- Regional Council (RC) and Local Authority (LA) staff
- Road Transport Operators
- Meat Processing and Sale Yard Operators
- Consultants
- Contractors, and others involved in the animal effluent collection industry.

An Overview to Stock Effluent Management

3

3.1 What Is Good Practice?

Good practice may be defined as "a level of effort that seeks to meet industry expectations and typically exceeds minimum compliance requirements" [2].

In this context good practice seeks **"TO MINIMISE THE AMOUNT OF STOCK EFFLUENT THAT SPILLS ON PUBLIC ROADS FROM STOCK TRUCKS BY EFFICIENTLY AND EFFECTIVELY CO-ORDINATING AND MANAGING THE STANDING AND TRANSPORTATION OF STOCK, THE CONTAINMENT OF EFFLUENT WHILE IN TRANSIT AND THE DISPOSAL OF COLLECTED EFFLUENT.[3]"**

In order to meet key operational good practice outcomes, Stock Truck Effluent Disposal Facility (STEDF) must:

- Meet RC, LA, RCA, Building Act (BA) rules and comply with consent conditions
- Ensure safe passage of not only vehicles using the facility but also other road users
- Minimise adverse environmental effects
- Allow for on-going operational and maintenance requirements and have appropriate containment sized for the volume of effluent to be collected
- Meet its intended use and have durability and serviceability requirements to meet the required life expectancy
- Provide a clear documented trail of accountability for the respective suppliers and the components they provided (that is: equipment and products) that were incorporated into the construction of the STEDF works.

3.2 Truck Effluent Tanks

In 1991 the Road Transport Forum (RTF) introduced a voluntary programme for fitting effluent holding tanks to livestock truck and trailer units. In 1997, a quality assurance scheme was introduced for livestock carriers whereby effluent holding tanks became mandatory equipment for RTF members. Although the fitting of tanks is not a legal requirement, all new truck and trailer units owned by members are now fitted with holding tanks for livestock effluent, with total holding capacity ranging between 200-300 litres.

Holding tanks have a finite capacity and once full, effluent overflows onto the road.

[2] *IPENZ (Sept 2011) Practice Note 21: Farm Dairy Effluent Pond Design and Construction*

[3] *NSEWG (1999) Industry Code of Practice for the Minimisation of Stock Effluent Spillage from Trucks on Road*

3.3 Why Are Collection Facilities Necessary?

Roads are one of the country's biggest assets, so it should be the aim of all RCAs to protect and maintain them to a high standard wherever possible by encouraging correct and responsible disposal of stock truck effluent. This, in turn, will mitigate issues typically associated with effluent spillage and dumping such as:

- Potential safety hazards to smaller vehicles, motorbikes and cyclists undertaking cornering and braking manoeuvres
- Damage to the road surface caused by effluent
- Pollution of local waterways and sensitive environments
- Loss of amenity values at roadside pull-over areas
- Health hazard concerns.

The problem of spillage of stock effluent from trucks transporting livestock has been around for many years. Most councils with significant rural areas and those that are on main transportation routes have particular sites that are well known for accidental effluent spillage. These sites often include sharp bends, steep hill sections, street intersections and roundabouts. However in many cases blatant or deliberate dumping of effluent by stock truck drivers is occurring with a resulting detrimental effect on the roadside environment.

Typical situations include:

- Layby areas/wide shoulders
- Road maintenance stockpile sites
- Hill climbs while on the move
- Local roads both sealed and unsealed when a truck turns off the main highway.

These issues are in part caused by driver behaviour, however, due to the closure of smaller stock sale yards and the centralising of meat processing facilities the trucks are taking longer journeys over greater distances .The changing pattern of stock movements needs to be taken into account when planning effluent collection facilities.

3.4 Can Deliberate Spillage Result in Prosecution?

The NZTA Road and Traffic Standard (RTS16) "Guide for heavy vehicle management" offers assistance on whether prosecutions can arise from effluent spillages.

The definition of what constitutes a "Load" largely determines how the law can be applied. Under the "Land Transport Act 1998", waste which is discharged by animals being carried on a vehicle, is excluded from the definition of "Load". This definition also applies to most other Land Transport legislation. So it is difficult for the NZ Police to bring about a prosecution against a driver whose vehicle discharges animal waste.

On the other hand it is also recognised that the driver of a livestock truck without livestock that is heading back to the yard after delivering animals, can be prosecuted for discharge of effluent onto the road from either the tray or holding tanks. In this regard effluent is considered a "Load".

3.5 How do I Determine the Extent of the Problem?

In order to correctly assess the scale of an effluent spillage problem research needs to be undertaken that will help identify the extent and nature of the issue. Consultation with key stake holders (including the RCA, LA and RC), and the examining of historic records (such as public complaints, maintenance and emergency operations) are viewed as an essential part of providing a true picture of the situation and may also help identify potential solutions.

Often local perception of the issue can get in the way of providing a practical solution, so identification of stock movement routes and volumes between source and destination regionally must be one of the first things considered when building a case for a one-off facility or network of facilities. A survey of New Zealand Road Transport Association (NZRTA) members (livestock carriers) can often provide a great insight into truck movements, stock numbers transported and extent of the effluent spillage problem.

Summary of information sources:

- Public Complaints
- Maintenance operations (Contractors/Consultants RCAs)
- Emergency operations (Police, Emergency services)
- Survey of NZRTA members.

After collating the information it will become clear as to whether the spillage is:

- A generalised problem of spillage throughout the district
- Centred around principal transportation routes
- Known at one or two specific locations
- The result of substandard road curvature and/or super-elevation application, where road realignment may remove or reduce the problem.

Based on this information the scale of the spillages can be plotted on a map thereby helping to identify the most prevalent areas. Assessment against the national strategic network and previous models can then be carried out and site specific options can be developed. Refer to Section 6 for detailed site selection criteria.

3.6 What Types Of Disposal Sites Are There?

Stock Effluent Disposal Sites Can Generally Be Divided into Two Groups: Firstly 'Destination Sites' and Secondly 'In-Transit Sites'.

3.6.1 Destination Sites

These disposal sites are usually located at truck destinations such as: saleyards, meat processing facilities, farms, and ferry terminals where trucks deliver stock or visit in the normal course of their work. Provision of effluent disposal facilities at all destination sites would result in a significant reduction in effluent on roads and would likely minimise the number of 'In-Transit Sites' required.

The establishment of destination stock effluent disposal facilities is based on the principle that the recipient of the stock should also receive their waste and be responsible for its disposal, as promoted in the NSEWG 1999 "Industry Code of Practice for the Minimisation of Stock Effluent Spillage from Trucks on Roads".

3.6.2 In-Transit Sites

'In-Transit Sites' are usually located on major transport routes (typically state highways) to target stock trucks on long haul journeys. They provide the driver with a convenient opportunity to empty effluent storage tanks en-route, lessening the risk of the tanks becoming full and overflowing before reaching the destination.

Refer to Section 6 for guidelines on how to assess where to locate an 'In-Transit Site'.

3.6.3 What's Been Developed So Far?

Since the initial effluent disposal facilities were constructed in the Waikato at Putaruru and Tapapa in 1995, over 31 In-Transit sites have been built and another 30 are in various stages of investigation and design around the country.

Refer NSEWG Map of Disposal Facilities for locations and status of facilities.

www.rcaforum.org.nz/map-of-disposal-facilities/

The placement and installation of stock effluent disposal sites around the country has been based on the findings of an initial South Island study carried out in 1999 and a follow up North Island study in 2003. The studies as outlined below promoted a national framework of preferred sites that aligned with the aims and goals of the NSEWG.

Study details:

Thull JP (Sept 1999) Management of Stock Effluent Spillage from Trucks in New Zealand (Lincoln University) focusing on the south island
researcharchive.lincoln.ac.nz/dspace/handle/10182/778

OPUS International Consultants (Oct 2003): North Island Stock Truck Effluent Strategy Study Network Modelling Results
www.rcaforum.org.nz/north-island-stock-effluent-modelling-study/

These studies brought together the results of a number of smaller independent studies carried out by Regional and District Councils in both islands and helped to identify a desirable network of in-transit effluent dump sites across both islands. The identification of a desirable network was based on a set of parameters relating to the:

- Proportion of stock that are stood for at least 4 hours prior to transportation (75%)
- Size of effluent holding tanks on trucks (300 litres)
- Premise that effluent dumping facilities are available at every stock destination site
- Identification of stock destinations with an assessment of future rationalisation trends within the industry.

Regional studies have been carried out in principal dairy farming areas that focus on specific local requirements in more detail, these studies include:

TRC (Sept 2001) Regional Stock Truck Effluent Disposal Strategy for Taranaki
www.trc.govt.nz/assets/taranaki/publications/strategies/pdf/effluent-strategy.pdf

WRC (2010) Regional Stock Truck Effluent Strategy for the Waikato Region
www.waikatoregion.govt.nz/PageFiles/18147/Regional%20Stock%20Truck%20Effllluent%20Strategy.pdf

The Waikato Strategy came about because of the recognition that the region was falling behind in its response to stock truck effluent disposal. Other regions had taken a proactive approach and had constructed a network of effluent disposal facilities catering to industry needs. With this realisation the region has re-examined the issue and worked hard to come up with a strategy that will provide a good platform for efforts to reduce stock effluent spillages on its regional roads. It has the vision: **"WORKING TOWARD ZERO DISCHARGE OF STOCK EFFLUENT FROM TRUCKS ONTO WAIKATO ROADS BY 2020".**

REGIONAL STRATEGIES

Most Regional Councils have developed strategies to deal with stock effluent. If you are considering a facility please make contact with your Regional or District Council to discuss your proposal. This will ensure you have the most up to date information.

4 Funding a Stock Effluent Facility

4.1 Funding Assistance Opportunities

Installing a Stock Truck Effluent Disposal Facility (STEDF) provides many benefits to both Regional Councils (RC) and Local Authorities (LA). The road networks are better protected from effluent spills and the receiving environment, including waterways, are spared from random and sometimes regular spillage events. With these and other benefits in mind there are several possible funding options available that provide financial assistance for the design and installation of collection facilities.

In November 2000 the then Transfund NZ now NZTA adopted a policy to fund the design and construction of stock truck effluent disposal sites around the country. Since then many facilities have been constructed using this available funding source with LA and RC contributing depending on the location and circumstance.

NZTA's general principle is that the original owner of the transported stock benefits from the sale of that stock and should therefore pay for the funding and provision of stock effluent disposal sites. As there is no cost effective method of levying stock owners to pay for the construction and maintenance of collection facilities, local rates paid to either a LA or RC are considered a fair method of raising a proportion of the overall costs associated with the facility. NZTA's funding component is recognition that road users are willing to pay for the prevention of effluent spillage on our roads.

CASE STUDY 1

Early in 2012, Waikato Regional Council voted to rate all properties in the region to contribute towards the construction and maintenance of STEDF's (50% from WRC and 50% from NZTA). The rate-take equating to approximately $4 per rural property and $2 per urban property.

Each of the sixteen NZTA (state highways) sub-regions is required to produce and submit to national office its own prioritised 'Regional Ten Year Plan'. In order for a project to be included in this plan the Council promoting the stock effluent facility must notify the Regional NZTA office of its intentions to develop a facility and reach agreement for sharing the associated costs. Should NZTA support the proposal, an application can then be prepared and submitted for the investigation, design and construction phases of the proposal. How the local share is determined is up to each individual Council. The Council could, by agreement, approach other Councils where shared benefits are identified and promote a shared cost framework. In some cases the relevant RC has contributed to the local share.

Note: The above funding policies are often reviewed so it is recommended that you contact your local NZTA office for the latest advice.

4.2 Funding Reference Manuals

In August 2008 the 'Planning, Programming and Funding Manual' was released by NZTA. This manual was to guide the 2009/10 – 2011/12 Regional Land Transport Programmes (RLTP's) and the National Land Transport Programme (NLTP) – the first three year transport programme. Reference was made to design and construction funding for Stock-truck effluent facilities in chapter F 10.7.

www.nzta.govt.nz/resources/planning-programme-funding-manual/

Since then in August 2011 NZTA announced they were progressively replacing this manual with a new manual the 'Planning and Investment knowledge base' (PIKB) that sets out the planning, operational policy and processes for developing the NLTP, to give effect to the Government Policy Statement (GPS). With reference to this new manual the key funding points are detailed in the section titled Stock effluent facilities. Refer to following sections 4.3-4.5 for a summary of the requirements.

www.pikb.co.nz/home/ao-local-transport-programmes-process/5-draft-update-transport-programme-and-input-to-tio/new-and-improved-roads/stock-effluent-facilities/?Search=effluent

4.3 Funding for Investigation and Design

Assuming the facility is to be built on or near a State Highway, NZTA will generally provide funding for the investigation and design. When funding is approved and construction proceeds, construction surveillance will also usually be funded.

4.4 Funding for Construction

Construction costs can generally range from $200,000 to $400,000 depending on:

- The collection method (tank/pond/sewer)
- The means of effluent treatment
- What road or access improvements are identified
- Whether land purchase is required.

NZTA provides funding assistance for construction via the Funding Assistance Rate (FAR).

When a land transport activity undertaken by a council or other approved organisation qualifies for funding from the National Land Transport Fund (NLTF) the FAR determines the proportion of the approved costs of that activity that will be paid from the Fund.

The current FAR for STEDF's is based on the following:

- 50% of the cost of the construction or renewal of the stock effluent facility, plus
- 100% of any necessary road improvement works to enable vehicles to enter and exit the facility safely, regardless of location i.e. alongside a local road or a state highway.

Eligibility for funding is outlined under:

Work category 321: Traffic management for construction of a facility

www.pikb.co.nz/home/ao-local-transport-programmes-process/5-draft-update-transport-programme-and-input-to-tio/new-and-improved-roads/work-category-321-new-traffic-management-facilities/?Search=effluent

Work category 221: Environmental renewals for renewal of a facility

www.pikb.co.nz/home/ao-local-transport-programmes-process/5-draft-update-transport-programme-and-input-to-tio/road-operations-maintenance-and-renewal-programmes/work-category-221-environmental-renewals/?Search=effluent

Eligibility for funding is subject to:

- The facility being part of an agreed regional or national strategy
- The relevant Approved Organisation agreeing to maintain the facility and dispose of the effluent
- The facility being situated as close as practicable to the main road or state highway.
- A formal lease or an agreement to occupy is in place, where the facility is not part of the road reserve (therefore providing access to the facility as though it were a road).

4.5 Funding for Operation & Maintenance

Maintenance of stock effluent disposal facilities (including disposal of stock effluent from the facility) is eligible for funding assistance under Work category 121: environmental maintenance. This provides for the routine care and attention of the road corridor to maintain safety, aesthetic and environmental standards.

www.pikb.co.nz/home/ao-local-transport-programmes-process/5-draft-update-transport-programme-and-input-to-tio/road-operations-maintenance-and-renewal-programmes/work-category-121-environmental-maintenance/?Search=effluent

The FAR for approved organisations to carry out maintenance and effluent removal activities is based on PIKB 2012-15 Table 4 – FAR's for certain circumstances. The current (2012-15) FAR for these activities is set regionally, it varies throughout the country.

Legislation & Regulations

The sensitivity and significance of the receiving environment and the resulting environmental effects are important considerations in the site selection process outlined in Section 6 of this guide. The section below sets out the requirements of the Resource Management Act 1991 and the resource consenting responsibilities of Regional and District Councils under the Act. The implications of the Building Act are also outlined, along with approvals required from the relevant Road Controlling Authority.

Figure 1: Checking Consent Compliance, Glengarry Hill STEDF

5.1 Resource Management Act 1991

The Resource Management Act 1991 ('the RMA') is New Zealand's main environmental legislation that controls how we use and manage our environment. The purpose of the RMA is "to promote the sustainable management of natural and physical resources". It follows a core principle of managing the use, development, and protection of resources while avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The RMA contains various duties and restrictions in relation to both the use of land and water, and to the discharge of contaminants into the environment. Where such activities occur, they may only take place if they are provided for in a Regional or District Plan, or authorised by resource consent. Regional councils prepare regional plans that focus on the management of our air, water, land and soil. City or district councils prepare district plans that focus on managing effects of activities on land and the surface water.

Regional and District Plan provisions determine the degree to which various activities are controlled, and these vary from district to district and from region to region. If the activity you want to carry out is not clearly identified as either a permitted or prohibited activity in the relevant District or Regional Plan, then a resource consent must be obtained.

It is recommended that advice is sought from planning officers at both the Territorial Authority and Regional Council as part of the site selection process to get a clear idea of the types of resource consents required and any issues that might be faced through the consenting process. Depending on the complexity of the proposal, specialist planning advice from a resource management consultant may be required as part of the site selection process.

5.2 Regional Council Requirements

5.2.1 Discharge Consents, Land Disturbance and Water Permits

Each Regional Council has to produce a Regional Plan. Most Regional Plans contain rules around discharges of contaminants to land or water. The design of the stock effluent disposal facility and the location of the site will determine which resource consents are required from the Regional Council. The type of resource consents that may be required by a regional plan could include:

- Discharge of treated effluent to land or water
- Permit for the take of surface or ground water if a fresh water supply is needed
- Discharge of contaminants to air (odour)
- Land disturbance for the control of sediment discharge during construction.

Generally speaking, if the stock effluent facility includes a treatment and discharge based system, then resource consent is likely to be needed.

Resource consent may also be required for the discharge of contaminants to air. This primarily concerns the discharge of odour, and is dependent on the rules of the relevant Regional Plan. The location of the site, proximity of adjacent properties, the design of the facility and wind direction are likely to be relevant factors in the determination as to whether consent will be required.

Other regional consents may be required depending on particular aspects of the stock effluent facility's design. This may include consent to:

- Take water from a nearby stream or groundwater bore
- Discharge effluent sludge to land
- To undertake earthworks.

These activities will also be outlined in the relevant Regional Plan as to activity status and resource consent requirements.

5.3 Territorial Authority (City or District Council) Requirements

5.3.1 Land Use Consent

Each District/City Council is required to produce a District Plan, and it is through these Plans that the land use component of the activity is controlled – often through zoning mechanisms which

generally indicate where certain activities or levels of effects are provided for. The zone rules will outline the activities that are permitted within that zone, and which activities will require a land use consent. The types of activities that may trigger the requirement for land use consent from the Territorial Authority include:

- The establishment and operation of the facility
- Earthworks in terms of site stability; natural hazards; and sediment control during construction
- Vegetation removal
- Noise.

5.3.2 Designations

A designation is a provision in a district plan which provides notice to the community that a requiring authority intends to use land in the future for a particular work or project. Most roads, whether they are local council roads or state highways, are designated. This enables the authority that controls the road to undertake road and state highway works within the designation boundary as if it were a permitted activity in the District Plan.

Designations are listed in the relevant District Plan, are assigned a designation number and have a defined Designated Purpose.

The construction of a stock effluent facility within road reserve generally fits within the usual designated purpose of 'Road/State Highway purposes' as it involves stock transport vehicles using the road network with a facility to safely dispose of stock effluent, which in turn benefits other road users. The particulars of the proposal should be discussed with a planning officer at the territorial authority to confirm whether the facility falls within the purpose of the designation given that the specifics of designations can vary.

The advantage of constructing a stock effluent facility on land designated for road purposes is that it avoids the need to apply for land use consent from the District/City Council. If the stock effluent facility is being constructed within designated land, and the District/City Council confirms that the works are within the purpose of the designation; then an *Outline Plan of Works* needs to be prepared and submitted to the relevant District Council (Section 176A of the RMA). This Outline Plan needs to include basic information such as:

- The height, shape, and bulk of the work
- The location on the site of work
- The likely finished contour of the site
- The vehicular access and circulation
- The landscaping proposed
- Any other matters to avoid, remedy, or mitigate any adverse effects on the environment.

If a stock effluent facility will not be within designated land, or the District or City Council considers that the proposal does not fall within the purpose of the designation, then land use consent may be required. Alternatively, the road controlling authority (requiring authority) may require additional private land for road purposes.

It is important to note that designations do not avoid the requirement to obtain any relevant resource consents under a Regional Plan, such as for the discharge of treated effluent.

5.4 Resource Consent Requirements

If resource consent is required it is often a good idea to obtain specialist planning advice. The council planning officers should generally be consulted as a starting point but it may be necessary to obtain specialist planning advice to prepare an Assessment of Environmental Effects (AEE). All applications for resource consent must be accompanied by an AEE. Generally the more complex the proposal or the more sensitive the site, the more extensive the AEE requirements will be, and the more the application will benefit from professional advice.

The council may ask the applicant to seek the written approval of those parties that may be affected by the facility. Applicants are not obliged to seek their approval, but it is likely to make the processing of an application more straightforward. Affected parties could include adjoining neighbours but the extent to which a person may be affected will depend on the particular details of the proposal. If additional land is required for the construction of the facility, the owner of the land will almost certainly be an affected party.

When consulting with potentially affected parties, it is best to be able to discuss any concerns they may have and incorporate ways in which these concerns may be avoided or mitigated. Depending on the nature of the proposal and location of adjoining properties this may include:

- Planting of trees/vegetation to visually improve the appearance of the facility or to screen the facility from views
- The preparation, of a facility management plan so that adjacent landowners are aware of the sites operation and monitoring and have a contact person in the event of complaints
- Fencing of the effluent treatment ponds
- Water discharge monitoring
- Replacement planting where native vegetation has been removed.

If the parties are happy with the proposed stock effluent facility, then having them sign an Affected Persons Consent form and the relevant design drawings is advantageous. This will avoid the need for the relevant council to notify the application, reducing the likelihood of needing a formal hearing to determine the application.

If all of the necessary information has been provided, within the resource consent application and the application doesn't need to be notified, the council should make a decision on the application within 20 working days.

Depending on the chosen site, consultation with tangata whenua may be necessary to determine the cultural values associated with the discharge location as part of the AEE. Tangata whenua claim genealogical links and blood ties to taonga of the natural world, particularly that which relates to the mauri of water. The direct discharge of farm dairy effluent to water is typically unacceptable to iwi.

5.5 Building Act

Building consents are not usually required for the construction of a stock effluent facility, however there may be some circumstances when consent is needed. Examples include:

- Structures associated with the facility such as retaining walls
- Piped drainage reticulation
- Storage tanks greater than 35,000 litres.

It is therefore important for the designer to have some understanding or input from professionals with knowledge of the requirements of the Building Act (BA). The requirements of the Building Code need to be met whether a building consent is required or not.

Refer IPENZ Practice Note 21 (Farm Dairy Effluent Pond Design and Construction) Section 3.3.

http://www.ipenz.org.nz/ipenz/forms/pdfs/PN21_Dairy_Farm_Effluent_Pond_Design.pdf

TOOL BOX – SUMMARY OF LIKELY CONSENTS REQUIRED

- *Resource Consent to discharge contaminants (to land, water and/or air) from the relevant Regional Council*
- *Land use consent to construct and operate a facility from the relevant District Council – unless the site is on road reserve that is Designated accordingly, in which case an Outline Plan of Works may need to be prepared and submitted to the District Council.*
- *Road Controlling Authority approvals*
- *Building Consents.*

5.6 Health and Safety in Employment Act 1992 (HSE Act)

'The object of the Health and Safety in Employment Act 1992 is to promote the prevention of harm to all people at work, and others in, or in the vicinity of, places of work.

The Act applies to all New Zealand workplaces and places duties on employers, the self-employed, employees, principals and others who are in a position to manage or control hazards'. HSE Act[4]

[4] *Health and Safety in Employment Act 1992 (HSE)*

5.6.1 Road and Site Safety

Safety of staff on the road during the course of work aspect is an activity that can be overlooked. To ensure the safety of all workers (either stock truck drivers or employees engaged with maintenance activities on the site) measures need to be taken to provide a safe working environment. This may include effective written policies for the management of work-related road and site safety. Employers also need to ensure that employees are aware of their roles and responsibilities.

Examples may include:

- In-Transit stock truck effluent disposal facilities are usually situated on or near major transport routes. They require the truck driver to exit the flow of traffic in order to use the facility and afterwards to enter a live stream of traffic to resume their journey. Owners of the site must ensure that it is designed to minimise the potential risk to the truck driver and passing motorists
- Destination sites are often at sale yards or meat works where drivers enter private property to carry out the effluent disposal as part of their delivery or pickup of livestock. In this situation the driver must be aware of site-specific hazards including: other site traffic, loading ramps and pits and pedestrian foot traffic etc.

There are a number of practices that can be applied both during construction and during operational or maintenance activities in order to mitigate these safety hazards. Some examples are listed below:

- Meet visibility standards for traffic entering and exiting the facility
- Ensure adequate warning signage along with clear road markings for traffic approaching or vehicles passing the facility
- Identify appropriate signage
- Provide operation manuals that outline HSE Act requirements along with identification of known hazards
- Provide direct communication with operational staff whether they are employees, contractors or subcontractors so that a mutual understanding of each other's health and safety requirements takes place
- Be aware of local authority rules and regulations and how they relate to the HSE Act.

5.6.2 Effluent Storage

Stock effluent containment facilities, ponds and tanks can present multiple hazards to an employee or member of the public. These can include:

- Effluent pond systems may present a water safety hazard. They could also leak or fail, causing release of effluent and resulting in potential harm to people and the environment
- Tank containment facilities can contain gases and biological threats which may cause harm to those entering tanks for maintenance.

The owner of the facility is responsible for protecting people from these potential hazards. The HSE Act gives the Department of Labour a range of powers to respond to improperly managed hazards.

- In order to mitigate these threats there are a number of initiatives that can be applied both during construction and under operational or maintenance activities. Some examples are listed below:
- Ensure adequate bunding, fencing and signage around pond facilities
- Ensure tank containment facilities have lockable/tamper proof access lids
- Provide operation manuals that outline HSE Act requirements and communicate directly with operational staff in regard to known hazards and controls.

Refer IPENZ Practice Note 21 (Farm Dairy Effluent Pond Design and Construction) Section 3.5

http://www.ipenz.org.nz/ipenz/forms/pdfs/PN21_Dairy_Farm_Effluent_Pond_Design.pdf

Figure 2: Pond Water Testing (Glengarry Hill STEDF)

6 Site Selection

It is generally acknowledged that the public perception of effluent is that it smells and is unpleasant. Consideration should be given when selecting a site to reduce the perception by:

- Educational talks and information packs
- Visits to existing well run facilities and talking to maintenance staff
- Speaking to neighbouring property owners.

Broadly speaking, a process to find a site should firstly be considered at a strategic regional level where a vision can be created to either eliminate or at least minimise discharges of stock effluent onto the region's roads. A number of regions have developed strategies including Waikato, Taranaki, Otago and Southland that inform and promote the need for facilities within the region and where potentially these should be placed, considering key transportation routes and junction points.

Following on from the strategic regional overview, the more detailed investigation looking into the feasibility of individual sites can begin. Developing a range of options within a radius of interest can focus on potential treatment options along with pros and cons presented in a matrix format to find the optimal site. This process will help mitigate potential construction and operational issues, and minimise public complaints further down the track that may delay or even halt a project.

6.1 Regional or Macro Criteria

In order to obtain appropriate funding a facility needs to gain regional acceptance with consideration given to:

- Ease of operation and maximum availability
- Easy access and proximity to main transport routes
- Reducing delays
- Optimal route length and journey time placement from other collection facilities by catching truck effluent collection tanks before they reach known or potential spillage points
- Geographical placement especially in hilly or mountainous terrain
- Land use and property values (i.e. target rural productive/industrial rather than lifestyle block/urban fringe)
- Investigate the possibility of integration into co-purpose facilities such as fuel stops or truck parks.

6.2 Local or Detailed Criteria

Once the effluent is collected, it is usually transported to the treatment plant by either a pipeline or by cartage in a tanker truck. In some circumstances it may be treated on site by oxidation ponds or irrigated to adjacent farmland. The following criteria should be considered in order to fully assess the viability of a collection facility, and the journey the effluent takes from collection to final disposal after treatment:

- The visible nature of such a facility (loss of views or visual amenity)
- Potential for offensive odour (especially in summer or when the wind is blowing)
- Noise effects on neighbouring properties (when unloading effluent, or maintaining the facility)
- Waterway/groundwater levels, drainage and potential pollution
- Public health concerns related to infection
- Cultural values (iwi and the local community)
- Traffic safety (considering increased heavy traffic movements)
- Available space to build a facility and land ownership (for either tank or pond based structures)
- Effects on flora and fauna (vegetation, terrestrial habitats and stream habitats)
- Effect on farming and horticultural activities
- Site gradient
- Availability of power utilities and telecommunications
- Land suitability and stability for treatment pond construction
- Availability of pond construction materials.

It is vital that careful planning and investigation takes place early in the design process. Consultation with affected parties should take place at the early concept stages and community involvement or buy-in is often important. Often, well-presented proposals can be enhanced by public and community involvement, especially when being promoted as finding a solution to a community issue.

6

In order to have minimal impact on highway traffic including safety and journey time, the design for movements in and out of the facility needs to consider:

- Provision of deceleration and acceleration lanes, and where necessary right turn bays for safe entry and exit from the through road
- Adequate signage and road marking
- Check and maintain sight distance criteria
- Appropriate separation from adjacent property access points, side roads and highway traffic lanes
- Where possible locate the facility within the road reserve
- Distance from main road not more than 200-300m
- Useable both directions, if not achievable restricting movements or a dual facility should be considered.

Design Considerations

Once the need for a stock truck effluent disposal facility has been established a site should be selected that will cater not only for the provision of safe access on and off the highway, but must also allow for the effluent treatment and/or disposal type.

Where an in-transit site is to be located on a state highway, NZTA (after consultation with stakeholders including local authorities) will usually procure consultancy services to design the facility, however other arrangements for design are possible. Where a destination site is to be part-funded as an in-transit site, the owner of the site is likely to be responsible for the design and would work with the local authority and NZTA on the detail that would be necessary for funding assistance.

The designer should keep in mind several criteria (listed below) that must be considered for the truck reception area in order for it to be user friendly and easily maintained. Once the design is completed a safety audit will normally be requested by the owner and undertaken by an independent provider.

7.1 Separation of Waste Streams

It will be important to engage meaningfully with tangata whenua early in the design process in order to align ideals on the collection and disposal of effluent. This will provide guidance in the early stages of planning and design for a facility and clarify the treatment options available. (For example iwi do not look kindly on the mixing of human generated waste and stock effluent for onsite treatment thereby making it essential that camper van waste is not dumped at certain types of stock effluent facility such as pond-based systems or land-based disposal.)

For cultural reasons, there needs to be a clear distinction between the types of effluent collected: whether it is human waste (from campervans) or stock effluent (from stock effluent trucks). Therefore any proposal to combine stock effluent collection with campervan waste needs to clearly demarcate respective facilities.

7.2 Site Access

Because every effluent collection facility is slightly different in nature, access needs to be assessed accordingly. If the site is accessed from either a state highway or local road, visibility and sight distance that conform to NZTA's requirements are critical to the design process. Refer to Austroads Manuals related to geometric design and Intersections.

If the highway adjacent to the facility has good visibility, has straight approaches and is flat in nature, the receptor (either single or double grill) could be provided on one side of the highway for use by both directions of traffic. Key features would include:

- Right turn bay or shoulder widening with a physical traffic island
- Grass strip or additional sealed shoulder separating the through traffic with the site traffic.

7

CASE STUDY 2

The Murchison STEDF is located 2km east of the township on State Highway 6 (South Island). Due to adequate visibility and easy road access the facility is located on the north bound side of the road and used in both directions. Of note is the traffic island, and wide sealed shoulders on the state highway. The effluent is collected via dual grills and is stored prior to collection in a concrete tank.

Figure 3: Murchison SH6 STEDF

Provision of right turn bays, deceleration tapers and shoulder widening should be provided into the reception area from the highway in accordance with the NZTA Manual of traffic signs and markings (MOTSAM) – Part 2: markings and the relevant Austroads Manuals related to geometric design and Intersections.

If providing adequate visibility proves difficult and the provision of a right turn bay impractical, receptors on both sides of the state highway may be an option. This would ensure that trucks do not need to cross the centreline and would improve the overall safety of the site.

Options for effluent collection for a facility with receptors on both sides of the road could include:

- Collection from both sides and piped to one holding tank
- Separate holding tanks
- Separate pond based treatment systems
- A joint sewerage piped system.

Most options will be dependent on the land available, site levels and access to utilities including sewer and power.

CASE STUDY 3

The Glengarry STEDF is located on State Highway 5, 30km northwest of Napier. Due to its remoteness, mountainous terrain, availability of land and sandwiching between two passing lanes it was decided to build a pond based facility on each side of the road as shown in the aerial photo below. Challenges included restraints on vertical and horizontal geometry, safety audit requirements, funding and consent requirements.

Figure 4: Glengarry Hill SH5 STEDF

7

7.4 Signage & Road Marking

The facility will require adequate signage on both the highway approaches to warn drivers that the facility is ahead, and on-site to provide guidance about usage.

Highway signage should be developed with reference to the NZTA Manual of traffic signs and markings (MOTSAM) – Part 1: traffic signs. This stipulates the following minimum signage be placed on the approach to the facility or turn off to the site:

- IG-18 Stock Effluent Disposal (Advisory left/right with distance) – to be located approx. 300m in advance of a stock effluent dump site
- IG-19 Stock Effluent Disposal (Direction) - to be located at or close to the entry point to the stock effluent dump site.

There will be sites where several roads lead to the site and a number or combination of the above signs may be required. In situations where known spillages or illegal dumping of effluent occurs on the road leading to the site, repeats of the IG-18 sign may be necessary.

Other signage placed close to the receptor can advise on:

- The purpose of the facility
- Illegal dumping of wastes other than effluent, e.g. campervans, waste oil etc
- Emergency contact details in case of blockage or damage to the facility along
- Advice on where the nearest campervan waste disposal facility is located.

Figure 5: Information Sign

Figure 6: Human Waste Sign

Highway road marking should be developed with reference to the NZTA Manual of traffic signs and markings (MOTSAM) – Part 2: markings. This may include provision of tapers, right turn bays, wide shoulder markings and give way lines for perpendicular road entry points. Reference to previous project examples will also provide guidance.

On-site road marking may include edge lines to delineate edges of the seal, particularly in remote locations along with sight rails and edge marker posts.

7.5 Truck Receptor Approach Area

The majority of stock trucks using the facility will be towing trailers that are between 15 and 20 metres in length. It is also common for trucks to travel in tandem with other vehicles from the same company on long haul trips. With this in mind it is important to allow adequate clear space either side of the receptor to allow one truck to wait safely while another truck discharges effluent. The waiting vehicle must be clear of both the highway traffic and operational requirements of the receptor.

If the facility is adjacent to sale yards or meat processing plants an analysis of the possible frequency of use will indicate if additional parking space should be provided. This will depend on stock sale times/days and or delivery times/processing times.

7.6 Manoeuvring and Turning Paths

Because of the size and nature of stock trucks adequate manoeuvring space must be provided leading into and out of the facility. With the aid of on-road tracking paths based on NZTA RTS18 (Aug 2007) New Zealand on-road tracking curves for heavy motor vehicles an assessment can be made of the area of seal required to accommodate the turning movement and provide adequate clearances. In order to minimise future maintenance costs and promote ease of use, turning circles of 30 metres diameter and greater should be used. This will avoid sealed surfaces being un-necessarily scuffed and subject to undue wear and tear.

The turning paths can be assessed by either the use of printed turning circle template information available with RTS18 or through the use of computer based programs like 'AutoTURN', 'AutoTRACK' or 'Sweep'.

The approach to the disposal receptor should be reasonably flat and provide the best possible visibility for the driver. As truck drivers generally use their mirrors to judge the locations of the discharge pipes in relation to the receptor grills, it is important to allow the truck to be as straight as possible moving onto and off the grill and concrete pad. This will enable the driver to judge the best location to stop and discharge the effluent. Employing this design measure will help to minimise unnecessary over spills on the apron. Refer Fig 7 and 8 below.

Another technique is to install numbered measuring lines from the centre of the receptor at 1m intervals for truck stopping guidance, although anecdotal evidence from drivers suggests that this is of little practical use, and that using mirrors and keeping the truck straight is the preferred method.

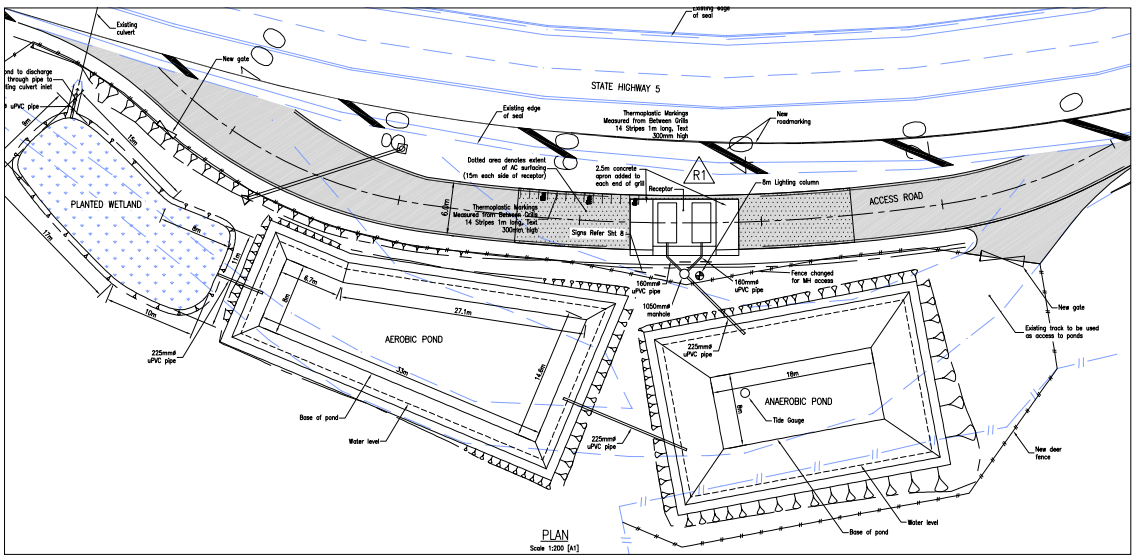

Figure 7: Plan of North Bound Truck Approach and Receptor, Glengarry Facility

Figure 8: North Bound Truck Approach, Glengarry Facility (This is a relatively straight approach to the receptor grills)

7.7 Receptor Design

Over the last 5-10 years, improvements have been made to the standard layout and design of the receptor area. This has been as a result of feedback from operators and truck drivers and provides a more robust solution to minimise pavement and surfacing problems that have plagued older facilities. Changes in truck design over recent years have also resulted in most vehicles having only one rear effluent discharge point on each truck and trailer unit. For ease of use many also have automatic cab controls for the tank discharge valve. This allows for rapid emptying and minimal delays to travel times.

Key features of the new receptor designs include:

- Use of single or double receptors
- Precast or Cast in-situ options
- Wide concrete approach and departure aprons (2 metres minimum from edge of grill)
- Asphalt approaches to the concrete apron (minimum one truck length)
- Concrete edge aprons and kerbed sides (minimising spillage and providing clear delineation)
- Simplified reinforcing details
- Simplified and cost effective grill construction minimising material wastage.

7

The option of providing a single grill receptor rather than a double has several advantages that should be considered when designing a facility. Following consultation with road transport operators and operational observations there is little evidence that two grills are used at the same time by trucks unloading effluent. Truck designs have changed over the last 10 years through most parts of New Zealand and as a result discharge points have been minimised where possible to one outlet per truck or trailer unit. Advantages of a single grill can be:

- Lower construction costs in both steel and concrete, saving around $20,000 per facility
- Lower maintenance costs for cleaning.

Figure 9: Kauri STEDF (Northland) Precast Receptors Being Constructed 2012

Figure 10: Kauri STEDF (Northland) Precast Receptors Finished in Place, Built Late 2012

Figure 11: Glengarry Hill SH5 Cast in-Situ Receptors Being Constructed, 2010

Figure 12: Glengarry Hill SH5 Cast in-Situ Receptors Constructed, 2010

7.8 Tank Based System

Collection systems based on storing the effluent for later pickup can enable facilities to be built with minimal land requirements. These can be located some distance away from local townships or housing settlements. Construction costs are at the lower end of the scale, however the downside is that the running costs are usually fairly high due to the requirement to transport the effluent offsite for subsequent disposal and treatment (which also incurs costs).

The size and type of storage tank will be dependent on:

- Expected daily volumes
- Frequency of emptying
- Retention time, related to possible partial treatment of effluent by anaerobic bacterial action, lowering Biochemical Oxygen Demand (BOD)
- Ground subgrade conditions and level of ground water
- Lid loading expectations (e.g. do the trucks have to drive over it?)
- Consent conditions related to the risk of ground water contamination
- Expected design life.

Considering these issues most tanks end up being specifically designed. Please refer to the examples below.

CASE STUDY 3

The Murchison STEDF is located 2km east of the township on State Highway 6. The storage tank was located beside the receptor with minimal lid loading requirements. The concrete tank has an effective storage volume of 28,600 litres. It includes an internal baffle and is designed to retain the effluent for 10 days (partial treatment) prior to being pumped to an oxidation pond.

Figure 13: Concrete Tank Construction

CASE STUDY 4

The Gisborne STEDF is located adjacent to the Matawhero sale yards and within the 20m road reserve. The storage tank is located under the concrete approach apron to the receptor. The stock trucks drive over the tank to access the receptor. The tank is a 20,000 litre reinforced fibreglass tank (similar to a forecourt petrol storage tank). Due to the overall loading requirements a fibreglass tank was considered the most cost effective solution. A suitable concrete tank would have required a larger excavation, heavy lifting equipment and cost at least twice that of a fibreglass tank.

The effluent is stored for maximum of one week prior to transportation to a dewatering plant and worm farm operation.

Figure 14: Fibreglass Tank

7.9 Sewer Based System

Many STEDF's discharge either: directly into a local municipal sewer scheme or indirectly after partial treatment by anaerobic bacterial action (lowering BOD). The use of a local municipal sewer based disposal system to receive effluent will usually be dependent on the proximity of the local sewer system and how practical a connection is. Disposal into these systems will also be dependent on the sewer treatment process: many TLA's now have WWTP's that have finely tuned biological systems and a load of high BOD effluent may not be compatible.

Sewer based systems can be expensive to construct depending on the connection length and partial treatment requirements. They also are subject to trade waste fees for the disposal of the effluent into the municipal sewerage scheme. Long term, this can prove costly and can attract considerable charges between council departments. Thought needs to be given to the long term financial viability of such facilities in the early planning stages.

Consultation with both local authority water and road engineers early in the design process is essential in understanding what will be acceptable and how it can be achieved.

Comprehensive reference documents include the following:

- NZS 4404 Land Development and Subdivision Infrastructure
- Council (TLA) Engineering Code of Practice
- NZBC Clause G13 Foul Water
- Specific design / research documents owned by Consultants.

7.10 Pond Based System - Reference Documents and Design Accreditation

Pond based systems are usually considered when facilities are located in more remote locations adjacent to State Highways or local roads. They must have adequate land available (2000-3000 square metres) and be located at least 400-500m away from neighbouring residential houses. This will help minimise concerns over odours and night time truck movements. Pond systems generally have higher construction costs but lower running and operational costs.

The specific design requirements of any pond-based treatment system have been well developed. Comprehensive reference documents include:

- IPENZ (Sept 2011) Practice Note 21: Farm Dairy Effluent Pond Design and Construction
- Dairy NZ: (Feb 2010) Farm Dairy Effluent (FDE) Design Code of Practice
- Dairy NZ (Feb 2011) Farm Dairy Effluent (FDE) Design Standards.

These should be referred to when undertaking any stock effluent pond based treatment design. These documents have been developed by professional with considerable experience in the design and operation of stock effluent treatment ponds.

In addition, Irrigation NZ along with Dairy NZ have developed a Farm Dairy Effluent System Design Accreditation Programme for professionals to demonstrate competency in designing stock effluent treatment systems. It is highly recommended that the services of such accredited professionals are engaged to either undertake the design work, or to technically review the design undertaken by another professional designer.

Figure 15: Glengarry Hill STEDF, Pond Construction Early 2010

7.11 Utility Connections

Depending on the type of facility it may be necessary to connect to power, telecommunication, sewerage and water systems. These connections and the distance from the nearest supply point must be considered early in the options selection process, as connection may be expensive and ultimately decide whether the facility is economically viable. The design for these connections must be undertaken by a suitably qualified designer or engineer.

7.12 Lighting

At most receptor locations a minimum of one street light will be required to aid the truck driver in unloading effluent from the tanks during darkness. In remote locations, lighting is essential due to the lack of other lighting sources, and if traffic islands separate the facility from the main highway, lighting is required for road safety reasons as well. Connection to power sources may in some locations prove a challenge both physically and financially and consideration of standalone lighting sources using solar panels and LED lighting could be considered. The price for this type of installation is nowadays similar to conventional power sources.

If you do consider stand-alone lighting sources, consideration needs to be given to the security of the asset in remote locations.

7.13 Remote Telemetry Monitoring

Tank based collection facilities usually require telemetry monitoring to indicate and record water levels. This is carried out through the use of various sensors with the results communicated via telemetry. Uses for the data can include:

- Notification to Contractor/Council of need to empty tank
- Emergency overflow status
- Historic data trends and alarm frequency
- Consent compliance (weekly/monthly/yearly volumes)
- Helps predicted annual running costs.

Telemetry systems are generally designed by specialist companies. It is suggested advice be sought from companies that supply these services to the local council that will run the facility after construction. This may then allow possible integration with other council telemetry monitoring computer systems and allow fast and easy response when required in case of emergency, for example when the effluent tank reaches capacity. This could also link by text or recorded message service directly to the maintenance contractors notifying them of tank effluent levels and advice on when to empty the storage tanks.

CASE STUDY 5

The Murchison STEDF is located 2km east of the township on State Highway 6 (South Island). The storage tank has an effective storage capacity of 28,600 litres and is located beside a double grill receptor. The water level is monitored by Siemens Multiranger/ Echomax level transducer. This device is attached to the roof of the tank and can filter out any disturbance caused by foam or ripples. The tank also has a float switch with flashing alarm light backed up by battery to be able to alert the public if the station is in trouble.

The transducer is connected to a "SCADA" remote monitoring system for a continuous history download and can alert the effluent disposal contractor to when the storage tank needs emptying.

Below is a graph compiled from telemetry site data and screen shots from the SCADA monitoring system.

Of note is the recording of rainfall events that can be used to assess the net volume of effluent by removing potential rainfall flow into the storage tank. This is then used to assess the effects of rainfall on the collection system and associated costs. During 2010/11, it is estimated that 37% of the total volume transported was rainwater.

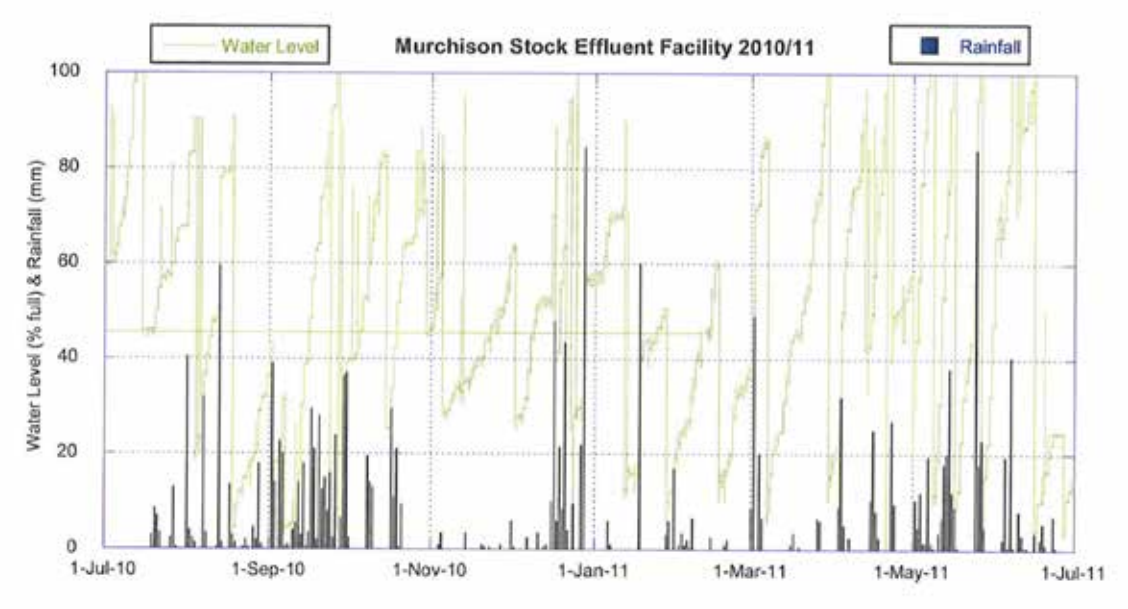

Figure 16: Murchison Telemetry Monitoring System – Graph of Monthly Results

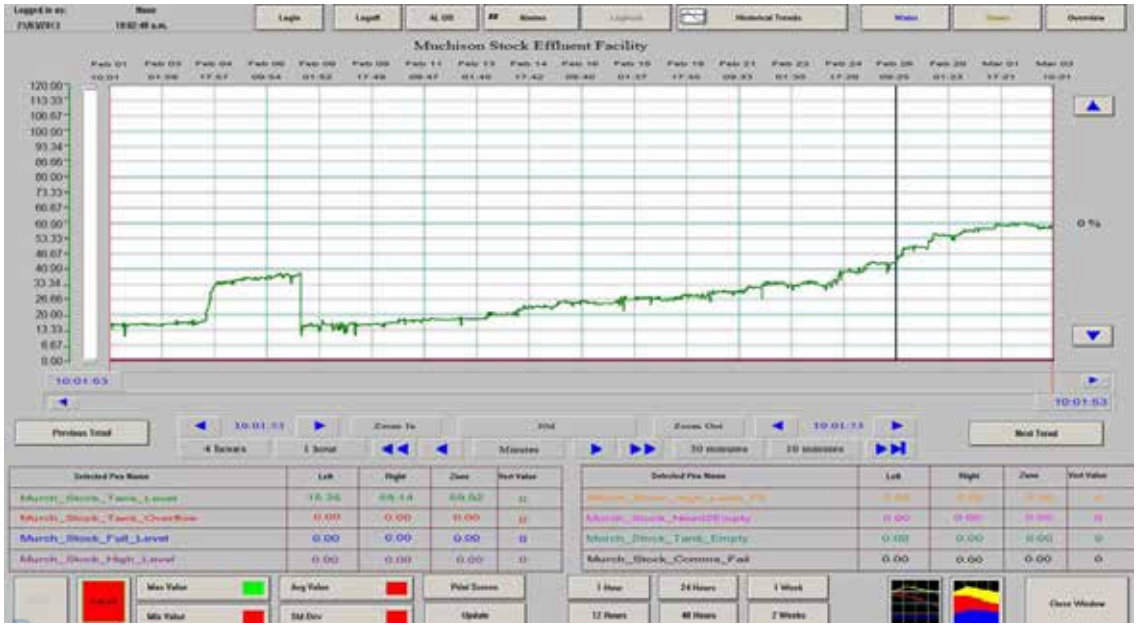

Figure 17: Murchison Telemetry Monitoring System – Graph of Daily Results

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CASE STUDY 6

The Waiotahi STEDF is located in the Eastern Bay of Plenty on SH2. The storage tank has an effective storage capacity of 12,300 litres and is located beside a double grill receptor. The water level is monitored by a 'Waterpilot FMX167 Hydrostatic Level Recorder' that sits on the bottom of the tank and is connected to a "Loncel" remote monitoring and telemetry system. This alerts the effluent disposal contractor (Tankman Ltd) to when the storage tank needs emptying. This facility also has an overflow septic tank with a capacity of 4950 litres installed additional to the main holding tank. This provides plenty of additional capacity in the event of the contractor being delayed in emptying the site.

Below is a screenshot from the telemetry site that can be accessed to download data, an automated text message is sent to the contractor who empties the tank and cleans the site when the tank gets between 75% and 95% full.

Of note is the blip on the Feb 18th when it went over 100%, this was when repairs and calibration of the new level recorder were being carried out by filling the tank with water.

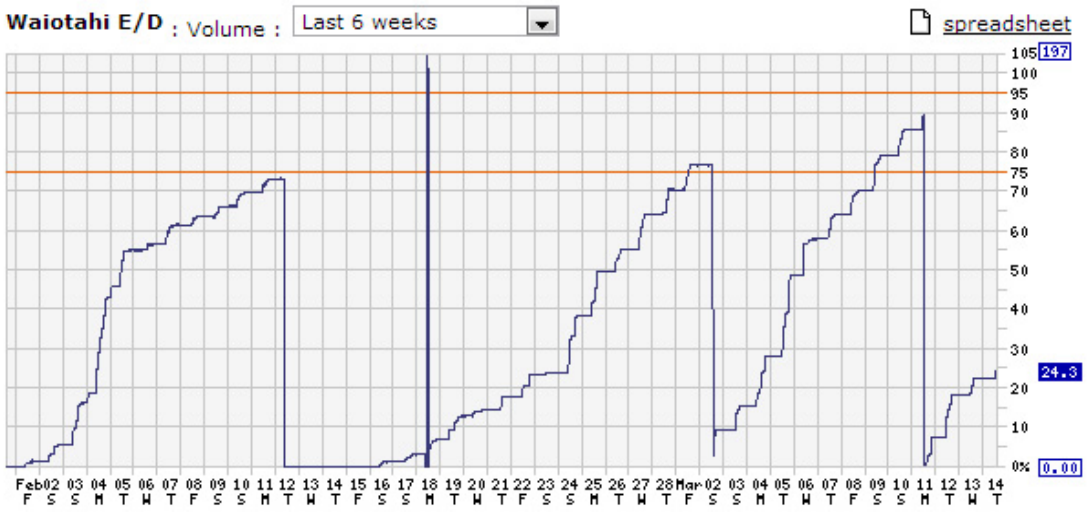

Figure 18: Waiotahi (Opotiki) Telemetry Monitoring System

Effluent Treatment Options

8.1 What Are The Effluent Characteristics?

The characteristics of effluent collected from stock trucks will vary depending on the type of livestock being carried. It is generally accepted that cattle will produce more effluent than sheep, deer and goats, and that the weather and stock standing times are also hugely influential when considering consistency and volumes of effluent produced.

The chemical composition of effluent is often variable but is characterised as having high BOD and suspended solids concentrations. The discharge of a tanker load (say 8,000-10,000 litres) of raw stock effluent may have a disabling effect on smaller conventional municipal sewerage treatment plants, upsetting the biological processes and potentially crippling the plant.

Raw stock effluent contains many different pathogenic bacteria, viruses, protozoa etc. The literature available on the subject would indicate that the appropriate detention time necessary in a two stage anaerobic/ aerobic treatment plant to achieve an acceptable effluent quality would also be sufficient to adequately reduce pathogen population numbers.

Testing carried out on raw effluent by the South Waikato District Council in the early 1990's gave the following results:

PARAMETER	TYPICAL CONCENTRATION RANGE
5 Day Carbonaceous Biochemical Oxygen Demand (CBOD5)	1600 to 7800 g/m3
Total Suspended Solids	7000 to 53,000 g/m3
Faecal Coliforms	1,000,000 to 20,000,000 cfu per 100 ml
Ammonia Nitrogen as N(NH4N)	200 to 1000 g/m3
Total Oxidised Nitrogen (Nitrate + Nitrite) as N	0.3 to 2.0 g/m3
Total Phosphorus	50 to 340 g/m3
pH	7.0 to 8.3
Total Kjeldahl Nitrogen as N	850 to 1600 g/m3

Table 1: Typical Effluent Characteristics (Putaruru Holding Tank)

The figures would apply to typical cattle effluent and could be used in the design of a new treatment system or for assessing the impact on an existing treatment plant.

8.2 What Volume Should Be Expected?

In terms of the design process, effluent volume estimation is not easy and can be subject to a number of influencing factors. Careful consideration of these factors must be undertaken in order to size and design an effective stock effluent treatment or storage system. Factors that will affect the volume collected include:

- Stock standing time, prior to transport
- Time of the year, seasonal stock movement
- Typical weather patterns, rainwater
- Location in relation to main stock transport routes
- Ease of use by stock trucks
- Size of effluent holding tanks on trucks
- Consultation and education within the transport, farming and meat industries.

Consultation with the transport industry clearly indicates that stock standing time is a major contributing factor relating to effluent volumes collected en route. Education within the industry is seen as a key way to minimise volumes and should be considered at the stock pick-up points on farms and sale yard facilities, to ensure standing times are adhered to prior to stock being loaded on the trucks.

Seasonal differences relating to effluent volumes are clearly defined within some parts of the country. In areas such as the Waikato and Southland - two principal dairy farming regions - effluent volumes surge around seasonal and operational events. These include for example: farmers relocating stock for winter grazing, and 'Gypsy Days' where sharemilkers relocate their stock to the next farm of employment. Many transport companies have strategies to cope with these peak movements, however the lack of suitable effluent disposal sites often causes widespread problems resulting in public complaints and council frustration.

Other non-dairy seasonal differences around the country relate to stock lifecycles for beef cattle, sheep and deer, which can involve movement between remote farming operations to either saleyards or meat processing facilities. The economic reality of farming operations and how they interact with livestock agents can result in stock travelling huge distances around both the North and South Islands in order to achieve the best price.

Various attempts to model national or regional stock movements do provide some guidance when designing a facility. The two documents below focus on movements across the south and north islands:

Thull JP (Sept 1999) Management of Stock Effluent Spillage from Trucks in New Zealand (Lincoln University) focusing on the south island

researcharchive.lincoln.ac.nz/dspace/handle/10182/778

OPUS International Consultants (Oct 2003): North Island Stock Truck Effluent Strategy Study Network Modelling Results

www.rcaforum.org.nz/north-island-stock-effluent-modelling-study/

Both studies provided a plan for a broad strategic network of collection sites across New Zealand. The rationale for the site locations was based on: idealised situations with respect to the percentage of stock that have been stood off feed prior to transportation, the size of truck holding tanks, the establishment of the full network of in-transit sites, availability of discharge facilities at all destinations and distance apart.

Experience has found that volumes fluctuate throughout the year due to seasonal operations and commercial demands, with some regions experiencing peak movements in the May - June period when farms are changing hands. All these aspects and any other local knowledge must be taken into account when deciding on the design of the facility.

The studies are still a great source of assessment information. Many of the recommended sites have been progressed, and are either installed or are in various stages of planning and design. Regionally focused models and strategies have been developed since the South and North Island studies. These are focused solutions and take into account the issues mentioned above in more detail.

TOOL BOX – ESTIMATING VOLUMES

- *Types of stock principally being transported and standing times*
- *Number of predicted stock truck movements*
- *Location in relation to journey time and distance between facilities*
- *Volume per truck 200-300 litres*
- *Type of collection: tanks, ponds, sewer (or a combination)*
- *Type of disposal: municipal sewerage facility, oxidation ponds, irrigation, dewatering, worm farm etc.*

Example 1:

A storage tank may be required for up to 10 days storage, before discharge to a municipal sewer scheme in order to semi-process the effluent and lower the BOD to allowable levels. In an anaerobic process, oxygen depletion can potentially create a corrosive environment leading to sewer pipe and process plant damage. This needs to be discussed with council/process engineers.

Example 2:

A pond system may be required to provide storage based on the treatment time needed to effectively lower the effluent BOD, nutrient and pathogen load to an acceptable consented level. This may involve an anaerobic pond, aerobic pond and wetland, each feature providing a key part of the biological process.

8.3 What Are The Available Effluent Treatment Options?

The options available for treatment and disposal of stock effluent can include the following or a combination of:

- Collection and disposal to an existing municipal sewerage treatment plant by sewer pipeline connection by either direct or delayed partial treatment means
- Collection and storage in a holding tank facility for later transportation to an off-site treatment facility
- Discharge to a nearby purpose-built treatment pond system (e.g. 3 pond anaerobic/aerobic/wetland system)
- Discharge to an existing farm/meat processing facility treatment pond system. (refer sections 10 and 11)
- Collection and disposal by irrigation to farmland.

In each option consideration should be given to the removal of large objects, gravel and sand from the effluent stream prior to treatment. This will mitigate pipe blockages and unnecessary wear and tear on the facility and associated infrastructure. This can be achieved by the use of separation grills or screens (say 50mmm spacing) after the receptor to remove bottles, cans etc. and the use of stone traps to remove gravel and sand prior to pumping or sewer conveyance.

The capability of each option to satisfactorily treat stock effluent to a condition suitable for discharge will require detailed biological process design. As new treatment facilities can have a high initial capital cost, it is often more efficient to utilise existing treatment systems where possible. Issues to consider in this situation would include:

- Means of access for stock transport trucks and proximity to main transport routes
- The ability of the treatment facility to accept additional effluent without compromising the final quality of the treated effluent
- Any pre-treatment requirements that may be required. (e.g. influent holding tank to allow controlled dosing into the treatment plant process to avoid overloading)
- Effects on existing resource consents for the facility
- Imposition of treatment charges on the owner of the facility.

8.4 What Are The Disposal Options For Treated Effluent?

The final quality of the treated effluent will be dictated largely by the method of treatment and the consented method of disposal. Options available for disposal could include:

- Discharge to an existing municipal treatment plant. This would generally require continuing compliance with any existing resource consent conditions
- Discharge to land through irrigation to productive or arable land, forestry, etc
- Discharge to land through sub surface infiltration.

Organic solids and sludge produced as a by-product of the treatment process could be dewatered and disposed of to an organic compost or worm farm operation.

With the large number of sites now operative in New Zealand there is a wealth of experience and knowledge available that can be utilised by a designer to assess appropriate solutions for their situation. Contact should be made with the NSEWG to obtain the latest information and developments regionally and nationally. Local Authorities (TLA), Regional Councils and the regional offices of NZTA would also be a useful source of information.

CASE STUDY 7

The Glengarry STEDF is located on State Highway 5 north of Napier. The effluent is collected and treated via a series of anaerobic and aerobic ponds followed by discharge to a planted wetland where infiltration occurs.

Environmental monitoring to date shows an average effluent treatment quality of:

BOD ranging from 30 to 70 g/m3

Total Nitrogen ranging from 60 to 90 g/m3

Total phosphorus ranging from 13 to 18 g/m3

The total volume of effluent collected each week at the facility (including north and south bound receptors) is estimated to be between 25,000 and 40,000 litres depending on the time of year, this information is based on traffic counts undertaken during November 2012 and adjustment for seasonal variations. The following graph shows a week day average of around 20 trucks.

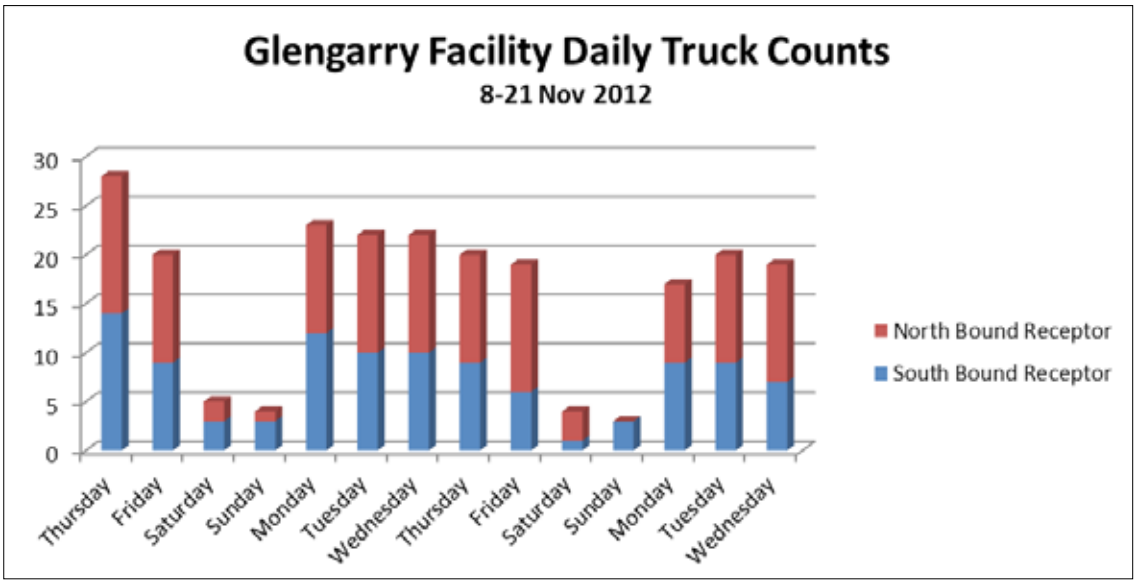

Table 2: Glengarry Hill STEDF Truck Volumes

9 Operation and Maintenance

Once a STEDF has been constructed it is essential that an Asset Owner's Manual (AOM) is prepared and circulated to those involved in the day-to-day running of the site. This manual will seek to outline key objectives necessary for the orderly operation and long term care of the facility along with associated on going and projected capital replacement costs. Broad guidelines for what should be contained in an Asset Owner's Manual is contained within NZTA's Minimum Standard Z/15 – Asset Owner's Manual.

www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/standards/docs/Z15.pdf

How this can be adapted to suit the particular needs of a STEDF are outlined in the following section.

9.1 Stock Effluent Treatment and Disposal - Asset Owner's Manual

Utilising the Z15 framework, an AOM tailored for the needs of a stock effluent facility should look to have the following key aspects. The details will vary depending principally on the treatment type i.e. tanks versus ponds or other such treatment type.

9.1.1 Introduction

The introduction should be a brief statement that outlines the reasons for establishing the facility, key objectives, and what collection system and treatment process has been put in place.

9.1.2 Construction/Contractual Phase

This section details the physical works construction associated with the contract to build the facility. It lists the details of the contract, defects liability period, and itemised maintenance activities associated with the construction works.

9.1.3 Operation and Maintenance Activities

This section details the intended usage of the facility along with an outline of the collection and treatment process and associated regular and periodic maintenance requirements. It sets out the responsibilities each party has and outlines the associated activities.

1. Heads of Agreement/Memorandum of Understanding – details the responsibilities and what is required from each party, whether it be NZTA, Local Council or Regional Council
2. Onsite Maintenance Activities – including site inspections, receptor wash down, vegetation control, tank and pond inspections, short/long term maintenance requirements and suggested frequency
3. Emergency Contact Details (including phone and email) – Local Council Road Operations Engineer
4. Resource Consent Compliance and Monitoring - details the consent number, who it was issued by, what was it issued for (land/air/water), lists the expiry date and conditions of consent in relation to on-site activities.

Figure 19: Maintenance Cleaning (Glengarry Hill STEDF)

9.1.4 Health and Safety Overview

This section details the responsibility of the operator to ensure safe working procedures are adopted when carrying out the activities listed above in section 'Operational and Maintenance Activities'. It looks at specific site hazards in relation to the stock effluent facility, the collection and treatment of the effluent, the access on and off the highway and vehicle movements around the site.

9.1.5 Maintenance, Capital and Depreciation Costs

The maintenance costs will vary hugely depending on location, access, method of treatment, use of mechanical or electrical equipment and consent monitoring requirements.

An annual budget plan should be prepared during the preparation of the AOM that takes into account monthly expenditure across all regular maintenance and monitoring activities. Capital replacement and major maintenance activities including work on receptors, tanks, pipework, pumps and ponds will need to be identified in the Local Authorities/Owners 'Long Term Plan' (LTP) with appropriate consideration given to planning the work and necessary budgeting requirements.

9

A stock effluent treatment facility should be accounted for within the Local Authorities/Owners asset register and depreciated over appropriate lifespans. The accounting policies will need to be considered in relation to the different facility components, including: structures, pipework, earth fill, mechanical and electrical equipment. Guidance related to this subject can be obtained from the following:

- New Zealand Asset Management Support (NAMS)
  www.nams.org.nz/
- The International Infrastructure Management Manual (IIMM) 2011
- Infrastructure Asset Valuation and Depreciation Guidelines 2006
  www.nams.org.nz/pages/75/asset-valuation-and-depreciation-guidelines.htm

Figure 20: Pond Water Testing (Glengarry Hill STEDF)

On Farm Effluent Disposal

It is generally acknowledged by the livestock transport industry that disposal of stock truck effluent to 'On Farm' facilities is not a common practice. Many councils and industry leaders including Dairy New Zealand and Federated Farmers have advised extreme caution when accepting effluent from unknown or mixed sources. Risks of effluent-borne disease and damage to the high value of New Zealand dairy exports places many transport companies with few options for effluent disposal other than the transportation of collected effluent back to a central disposal facility. Factsheets advising industry best practice have been produced by local Councils in chiefly in dairy farming areas and by Dairy New Zealand (Southland campaign). These organisations should be contacted for advice on current practices.

If the current advice is adhered to, and the only effluent accepted is from known sources, stock truck effluent disposal on farms may be an option if it is done in an environmentally safe way. The costs associated with this type of discharge vary depending on volumes.

There are farming operations around the country that do have agreements with local trucking firms in particular, to accept and process effluent waste on a commercial basis. In these situations there needs to be careful management to avoid cross contamination to other farming activities.

When considering 'On Farm' disposal of effluent the following need to be considered along with developing an effective management plan that is sustainable and cost effective:

- Operational farm safety (HSE Act)
- Security of supply (where has the effluent come from, is it from the farm's own stock?)
- Disease transfer security
- Food safety requirements (Dairy, Meat)
- Resource consent implications
- Funding appropriate infrastructure
- Capacity of the farm treatment and disposal system (nitrate levels).

10.1 Accepting Effluent On-Farm

The ability of farmers to accept effluent will be largely depend on their individual farming operation, the equipment and facilities available and the adopted farm management practices. Farmers should also consult with their local district and regional council for advice on policy and rules relating to 'on-farm' stock effluent disposal as it may require a resource consent. It is also important to discuss the proposal with your transport operator as they may have company policy and guidelines that could offer assistance on whether to accept the effluent for disposal. An example of this may relate to effluent collected from a single load of stock going to just one farm or whether the dynamics of a split load may cause doubt on the origin of the effluent.

10.1.1 On-Farm Disposal Methods

Examples of 'On-Farm' effluent disposal methods may include the following:

- Emptying effluent into a receiving sump and then irrigating directly to open fields
- Emptying and conveying effluent to existing dairy farm effluent ponds or purpose built ponds through the use of a receptor and pumped pipeline
- Processing effluent through a solids separation unit and disposing of liquid by irrigation to open paddocks. Solids disposal could be to a worm farm activity, bioreactor facility or a commercial compost operation. Reference IPENZ Practice Note 27 Dairy Farm Infrastructure.

Figure 21: Solids Extraction Unit (IPENZ PN27)

10.2 Consent Requirements

As discussed in Section 5 above, resource consent may be required to discharge effluent to land or water. The relevant Regional Plan for the area will set out the activity status for effluent disposal. Generally speaking, effluent will need to go through some form of treatment before it can be discharged to land. The level of effluent treatment required will vary throughout New Zealand and will depend on the specific rules of the relevant Regional Plan.

Regional Plans typically have controls over the application rate of nitrogen, the location of the discharge and the avoidance of run-off to a water course or the infiltration to a water supply bore. The additional nutrients being applied to land from the stock effluent facility need to be factored in to the existing nutrient regime the individual farm may have in place. The Regional Plan may have guidance or regulations on nutrient management, which will need to be incorporated and adhered to.

Meat Processing Industry Effluent Disposal

11

Despite the efforts of regional and local councils, many meat processing operations still lack the infrastructure to collect stock truck effluent. Some operations do provide excellent facilities including truck wash-downs. Feedback from transport firms indicates that the limited number of effluent disposal facilities that have been established are frequently unavailable and closed off for both trucks unloading stock and en-route disposal. Many of the truck wash down facilities available do not have separate 'effluent disposal only' options and as a result drivers have to wait substantial lengths of time in order to dispose of effluent if the wash bays are occupied.

Consideration should be given to the many benefits that providing on site effluent disposal at meat processing plants can bring. These will help increase credibility within key overseas markets and show responsibility when purchasing stock from the farmer.

Well defined regional strategies offer the greatest opportunity to coordinate resources and create synergy between the needs of the transport firms and meat process operators. There are key similarities between 'On Farm' disposal of effluent and meat processing operations that principally relate to concern over the following:

- Operational site safety (HSE Act)
- Security of facility relating to 24 hour access
- Funding to run the facility and ownership
- Trade waste fees
- Consent condition compliance costs
- Disease transfer security, based on market led consumer expectations (Europe/Asia/N America)
- Food safety requirements.

11.1 Disposal Methods

Requirements for disposal of effluent will be similar to those described previously in the 'On-Farm Disposal Methods', although the treatment and the availability of land for disposal is likely to be much more limited.

The disposal methods require a significant level of infrastructure and management and would usually only be considered when regular effluent disposal is required and in conjunction with another similar on-site activity. A single receptor with a standard design could be utilised to collect effluent if a truck wash operation is not involved. Possible treatment and disposal methods include:

- Irrigate directly to available open fields using a sump and pump operation
- Convey effluent by gravity or pump to existing wastewater treatment system. This could include connection to a local municipal sewerage system, oxidation ponds or purpose built wastewater treatment plants
- Process effluent through a solids separation unit and dispose of liquid by irrigation to open paddocks, local municipal sewerage scheme, oxidation ponds or purpose built waste water treatment plant. Solids disposal can be to a worm farm activity, bioreactor facility or compost operation. Reference IPENZ Practice Note 27 Farm Dairy Infrastructure.

11.2 Consent Requirements

If a stock effluent facility is to be located within the site of an existing meat processing facility, then it may be possible to discharge effluent into the processing facility's existing waste water treatment system. Resource consent may be required from the Regional Council for the discharge of trade wastes depending on the design and eventual discharge location.

As discussed in Section 5, the Regional Plan will determine if resource consent is needed for the stock effluent facility. If the design of the stock effluent facility involves the treated effluent being mixed with other treated process water prior to discharge, then this may be covered by the meat processing facilities existing resource consent for trade wastes or discharge. It may mean that any such consent may need to be changed to allow for the additional volumes being discharged, or to cater for the change in process water being discharged.

Figure 22: Gisborne (Matawhero) STEDF, Receptor Construction Sept 2013

12

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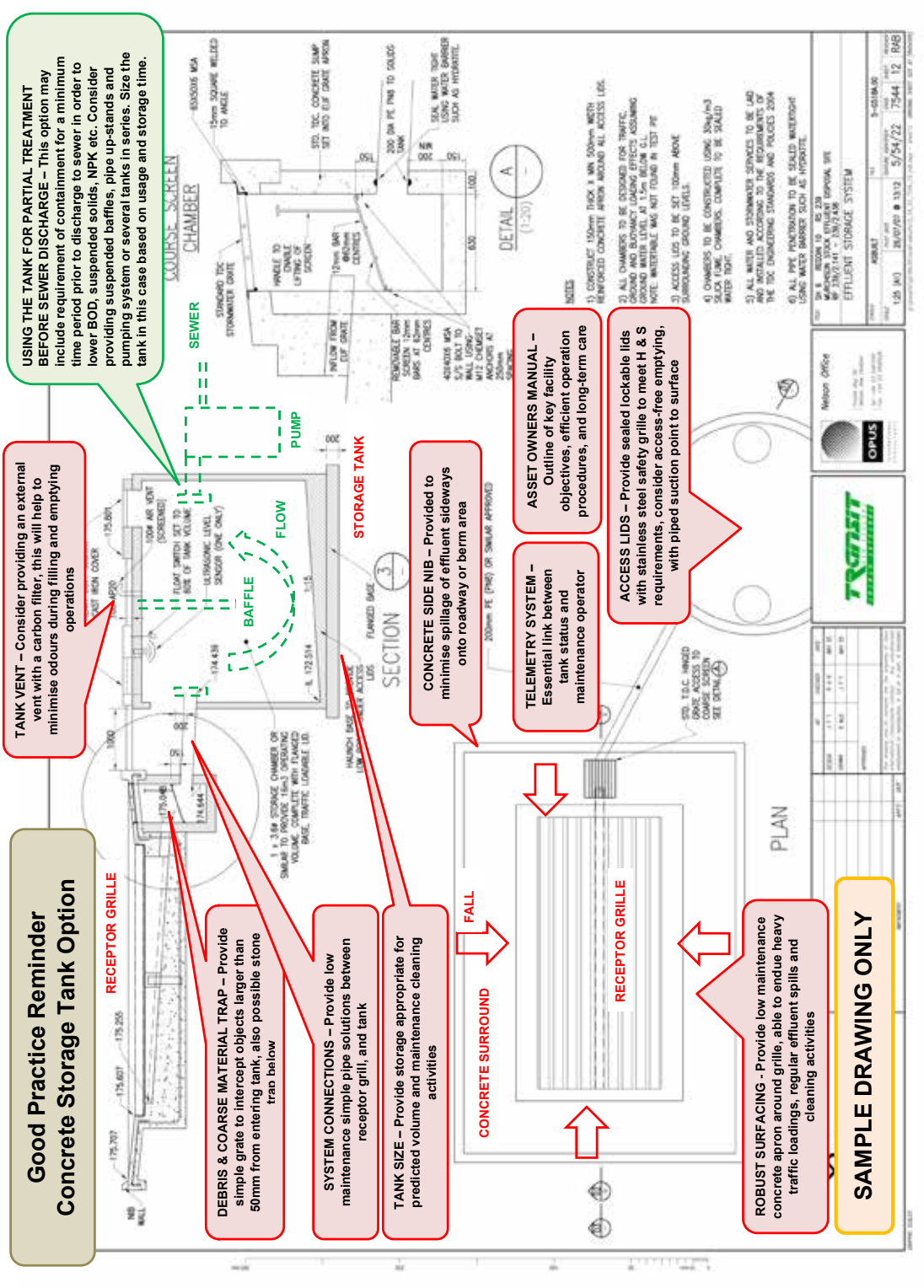
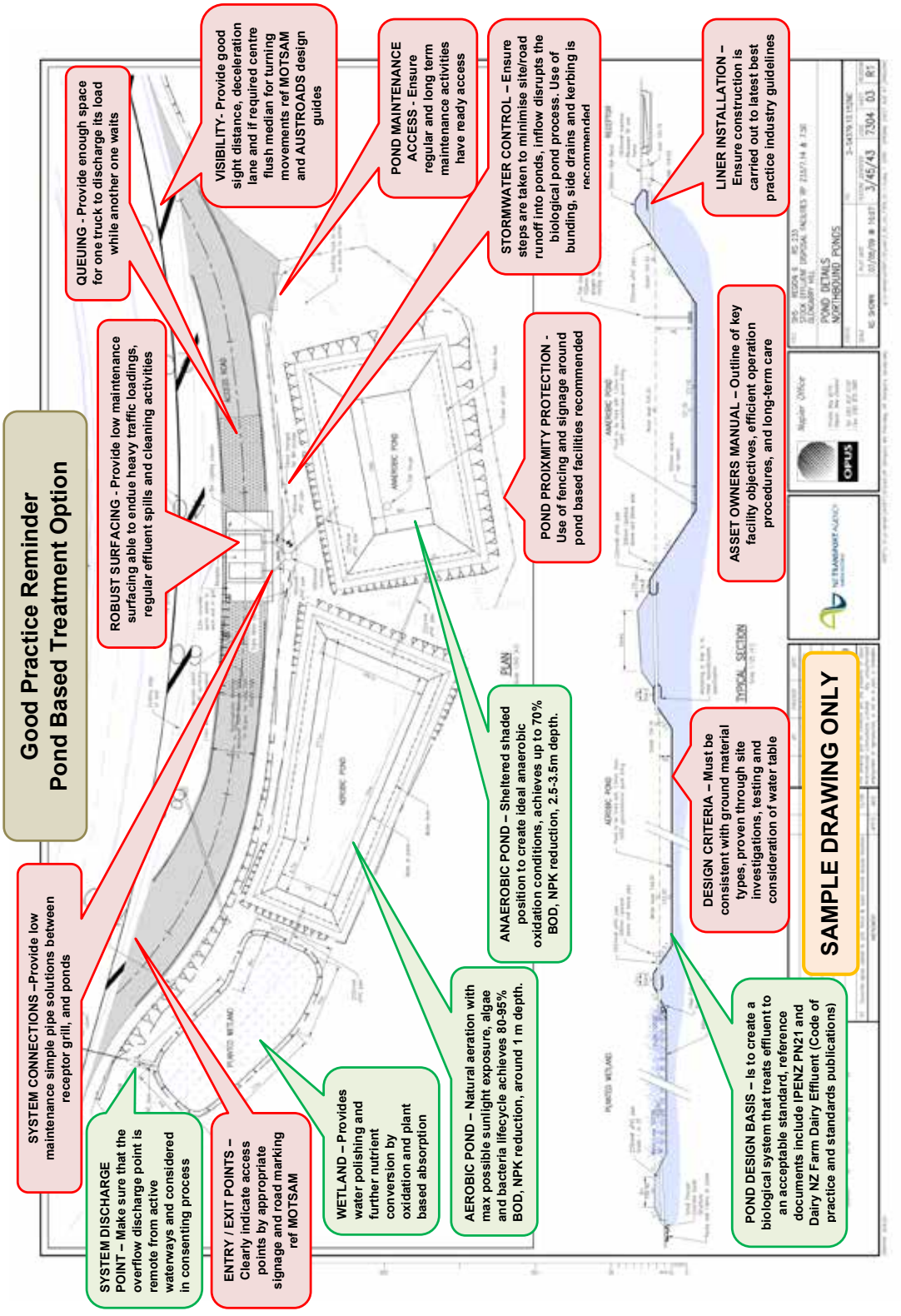
Figure 23: Murchison SH6 STEDF Constructed, 2007

13 Appendices

A Good Practice Reminder – Concrete Storage Tank Option



B Good Practice Reminder – Pond Based Treatment Option



C Map of Disposal Facilities – Built Network (as at Oct 2013)


STATE HIGHWAY NETWORK
SOUTH ISLAND
PRINCIPAL ROAD NETWORK
State Highway Network at 1 January 2005
0 50 100 150 200 250
Kilometres
N
NZ TRANSPORT AGENCY
WAKA KOTAHI
Riverlands Stock Effluent Disposal Facility
Built
Murchison Stock Effluent Disposal Facility
Built
Kaikoura Stock Effluent Disposal Facility
Built
Hokitika Stock Effluent Disposal Facility
Built
Glasnevin Stock Effluent Disposal Facility
Built
Springfield Stock Effluent Disposal Facility
Built
Tinwald Stock Effluent Disposal Facility
Built
St Andrews Stock Effluent Disposal Facility
Built
Pukeuri Stock Effluent Disposal Facility
Built
Shag River Stock Effluent Disposal Facility
Built
Apes Rd Stock Effluent Disposal Facility
Built
Allanton Stock Effluent Disposal Facility
Built
Allison Rd Stock Effluent Disposal Facility
Built
Raes Junction Stock Effluent Disposal Facility
Built
Blaike Rd Stock Effluent Disposal Facility
Built
Collingwood
Motueka
Nelson
Picton
Blenheim
Mokihinui
Westport
Murchison
Reefton
Lewis Pass
Kaikoura
Hanmer Springs
Greymouth
Hokitika
Arthur's Pass
Rangiora
Christchurch
Akaroa
Ashburton
Franz Josef
Hermitage
Haast Pass
Fairlie
Twizel
Timaru
Omarama
Milford Sound
Wanaka
Waimate
Queenstown
Cromwell
Oamaru
Alexandra
Manapouri
Lumsden
Dunedin
Ohai
Clifden
Gore
Balclutha
Invercargill
Bluff
Region Boundary
State Highway
Cartography by Critchlow Associates Ltd Ph 0800 Mapping

D Map of Disposal Facilities - Planned (as at Oct 2013)


STATE HIGHWAY NETWORK
SOUTH ISLAND
PRINCIPAL ROAD NETWORK
State Highway Network at 1 January 2005
0 50 100 150 200 250
Kilometres
N
NZ TRANSPORT AGENCY
WAKA KOTAHI
Hira Stock Effluent Disposal Facility
Under Discussion
Reefton-Springs Junction Stock Effluent Disposal Facility
Under Discussion
Jacksons Stock Effluent Disposal Facility
Under Development
Mataura Stock Effluent Disposal Facility
Under Investigation
Collingwood
Motueka
Nelson
Picton
Blenheim
Mokihinui
Westport
Murchison
Reefton
Lewis Pass
Kaikoura
Hanmer Springs
Greymouth
Hokitika
Arthur's Pass
Rangiora
Christchurch
Akaroa
Ashburton
Franz Josef
Hermitage
Haast Pass
Fairlie
Twizel
Timaru
Omarama
Milford Sound
Wanaka
Waimate
Queenstown
Cromwell
Oamaru
Alexandra
Manapouri
Lumsden
Dunedin
Ohai
Clifden
Gore
Balclutha
Invercargill
Bluff
Region Boundary
State Highway
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Road Controlling Authorities Forum (NZ) Inc

National Stock Effluent Working Group