A CONSISTENT AND COLLABORATIVE APPROACH TO TRADE WASTE CONSENTING AND CHARGING

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ABSTRACT

Timaru District Council (TDC) was issued with a new ocean outfall resource consent in February 2011. It has subsequently separated Timaru City's domestic and industrial wastes and is constructing a new treatment plant for domestic wastewater (WWTP).

Prior to submitting a Resource Consent application, TDC and the city's major industries jointly decided that each industry would be responsible for their own on-site trade waste treatments. This was agreed as the best method of avoiding a costly centralized industrial WWTP.

To ensure that Resource Consent compliance will still be achieved by this approach TDC decided to develop new conditional trade waste consents for its major industries to improve the quality of trade wastes discharged.

TDC and Cardno BTO developed a mass balance model that has allowed them to assess resource consent compliance in the outfall over a range of possible trade waste limit scenarios for each industry and to utilize all available dilution.

A new charging method has also been proposed. The proposed formula allocates TDC's fixed and variable trade waste costs against each industry's fixed consented median flow and variable monthly discharge flow measurements respectively.

Extensive consultation was conducted with all the major industries regarding the imminent changes to the trade waste consents and charging strategy. This has ensured the methodology has been consistent and collaborative.

KEYWORDS

Trade waste, consenting, charging, Timaru, industrial, ocean outfall/ discharge

1 INTRODUCTION

1.1 TIMARU DISTRICT COUNCIL'S WASTEWATER TREATMENT STRATEGY

Timaru is currently constructing a domestic wastewater treatment plant (WWTP) and separating the conveyance of its industrial and domestic waste discharges. Under the new system, presented in Figure 1-1, raw domestic wastewater from Timaru will be treated in oxidation ponds. It will then be combined with pond treated waste from the outer towns of Temuka, Geraldine and Pleasant Point in a secondary treatment stage consisting of maturation ponds and wetlands within the domestic WWTP. Upon leaving the plant the combined, treated domestic wastewater will be blended with milliscreened trade waste from Timaru's major industries. The blended wastewater will be discharged through an existing ocean outfall.

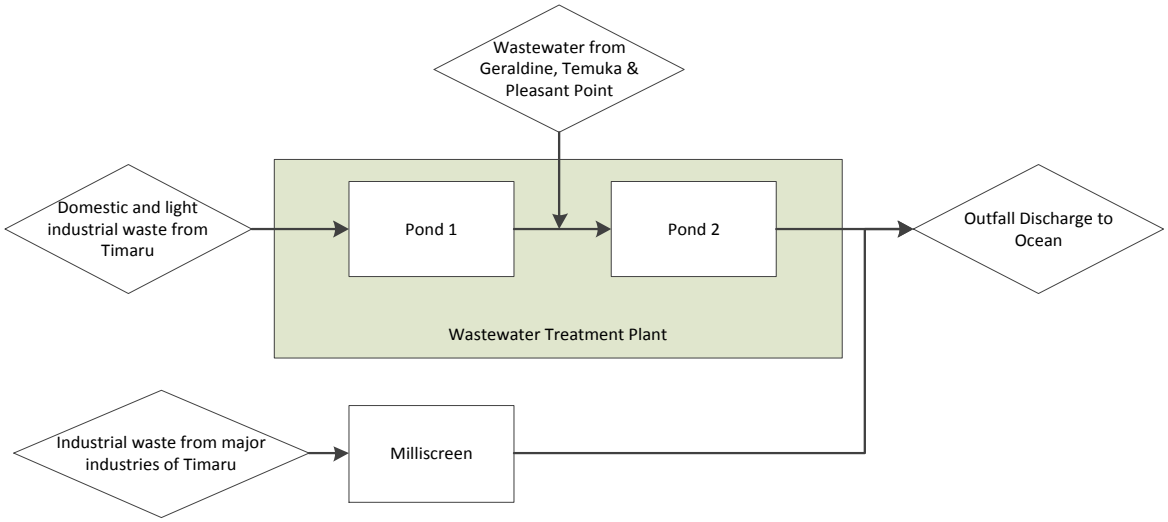

Figure 1-1 Wastewater Network Configuration after WWTP Installation

1.2 OCEAN OUTFALL DISCHARGE CONSENT LIMITS

Environment Canterbury granted Timaru District Council (TDC) a new resource consent for its ocean outfall discharge in February 2011. The Stage II conditions of this consent will begin to apply from December 2013. Key consent conditions include a set of 'effluent trigger values' for four specific contaminants in the combined industrial and domestic wastewater, as shown below. These conditions have driven the need to develop new conditional trade waste consents for Timaru's major industries; overall TDC requires significant improvements from industry as evidenced by the high strength and variability of trade waste historically discharged by the industries.

Table 1.1 – Timaru's Outfall Discharge Stage II Consent Limits

Contaminant	Reported As	Trigger Values		Allowable No. of Exceedances/year
Flow	m^3/day	40,000		0
pH	No units	5-9		0
Carbonaceous Biochemical Oxygen Demand	g/m^3	Median	1300	8
		90%ile	1600	3
Total Suspended Solids	g/m^3	Median	1200	8
		90%ile	1400	3
Total Fats Oil and Grease	g/m^3	Median	420	8
		90%ile	1000	3
Ammonia Nitrogen	g/m^3	Median	42	8
		90%ile	55	3

1.3 INDUSTRIAL DISCHARGERS

Timaru is the industrial hub for South Canterbury and accepts trade waste from 13 major industries. These industries are diverse and undertake the following activities:

1. Meat processing (two industries)
2. Potato processing (two industries)
3. Rendering (two industries)
4. Fish processing (two industries)
5. Woolscouring
6. Brewing
7. Tanning and leather processing
8. Juice extraction
9. Industrial heat supply (steam) manufacture and distribution

There is also the possibility of new industries establishing in Timaru due to the provisions for industry that TDC has made in the Washdyke industrial zone.

1.4 OVERALL AIMS

For TDC to be assured of complying with their own discharge consent limits, TDC could have simply assigned all major industries with TDC's own discharge consent conditions as their trade waste consents. This would have had a significant financial impact on some industries, particularly on those that by nature of their process produce highly contaminated trade wastes that would require advanced levels of treatment. The main aim of issuing new trade waste consents for major industries has therefore been to develop consent conditions which ensure TDC comply with their outfall resource consent conditions while attempting to avoid burdening industries where possible with potentially cost prohibitive trade waste treatments.

2 THE CONSULTATION PROCESS

TDC was granted their outfall consent conditions from Environment Canterbury (ECan) in February 2011 following a consent application process that commenced several years earlier. Due to the staging of consent conditions this provided nearly three years for TDC to consult with industries over the effects that the outfall consent would have on each industry's trade waste discharge consent. The approach to managing the expectations of industries has been to consult with them regularly throughout this period. Table 2.1 is a timeline of progress and consultation activity undertaken with the industries. This has prepared them as early as possible for their trade waste consent conditions, and therefore, for what treatment or manufacturing process changes they may need to undertake to comply. It has also meant the form of proposed trade waste consent has evolved over time to adapt to industry requests for flexibility for future expansion plans or processing changes.

A successful outcome of the process is that a number of industries have recognized the value that is being lost in their waste streams and have taken steps to invest in loss reduction technologies to achieve a financial return at the same time as trade waste consent compliance.

Table 2.1 – Timeline of Consultation with the Major Industries of Timaru

Date	Consultation Activity
February 2009	Cardno BTO's involvement in the project commences– industries are sent requests for background process information.
April 2009	Site visits conducted with main trade waste producing industries to gain an understanding of the processes and the waste streams.
June 2009	Each industry is provided with a report that gives an account of their historical discharge flows and loads and benchmarks their trade waste against that of a typical industry undertaking their type and volume of process.

Remainder 2009	Negotiations with major industries culminate in each industry preparing plans for how they will improve their trade waste quality.
February 2010	An Industrial Treatment Strategy is delivered to TDC as a supporting document in the AEE. The treatment strategy and industrial plans support TDC's Resource Consent application for industries to be granted permission to not have to send their waste to a centrally operated secondary treatment facility.
February 2011	TDC is granted their outfall resource consent. The resource consent's conditions allow industries not to send their waste to a centrally operated secondary treatment facility.
March 2011	Development of a contaminant balance model commences. Investigation of individual industry treatment options is also commenced.
June 2011	First drafts of proposed trade waste consent conditions for the major industries (for flow and the four key contaminants) are delivered to Council.
October 2011	Industries are sent reports with first draft trade waste consent conditions (for flow and the four key contaminants) and information on the treatment options investigations.
November 2011	Meetings are held with industries to discuss the first draft trade waste consent conditions and possible treatment technologies or process changes for meeting these conditions.
December 2011	TDC presented with first draft trade waste consent documents to get Council input over how the formal consents should be written, the process for dealing with trade waste consent failures, and the limits for contaminants other than the four key contaminants (i.e. metals).
January 2012	Industries are issued copies of the minutes of the November meetings. These include summaries of actions the industries have agreed to take to work towards complying with their draft discharge consents.
August 2012	Meetings are held with industries to discuss progress towards achieving the first draft consents since October 2011. Process expansion plans are discussed.
November 2012	A meeting is held with TDC to discuss the possibility of having both maximum and median consent limits for industries. Also presented the proposed new charging strategy to TDC and discussed its implications.
February 2013	Meetings are held with industries (only those industries that requested further meetings) to present proposed maximum and median discharge trade waste consent limits. Feedback on industrial expansion plans is discussed.
March 2013	Final draft trade waste consents issued to industries. Industries invited to make formal submissions on these consents.
April 2013	Date closed for formal submissions on final draft trade waste consent conditions.
June 2013	Responses to submissions are issued, along with revised trade waste consent conditions where appropriate.
July 2013	Meetings with industries who made submissions on their discharge trade waste consent conditions and/or have issues to resolve.
September 2013	Conclude final trade waste consents.
December 2013	The Stage II consent conditions apply to the outfall discharge quality.

3 TRADE WASTE DISCHARGE CHARACTERISATIONS

A characterisation of the trade waste discharges from each industry was carried out and was kept up to date throughout the consenting process. TDC had collected water meter flow records and had tested trade waste sample concentrations for, in some cases, up to 15 years and this data was extensively analysed as part of the assessments. In addition the characterisations required industries to provide information on their waste quality such as their plant's process configuration, units processed, and seasonal variations in units processed.

Average values of flow and the four key contaminants are presented in Table 3.1 for each industry.

Table 3.1 – Average Industrial Waste Discharge Concentrations

Industry Process Type	Average Daily Flow (m^3/day)	Average Discharge Concentration (g/m^3)			
		BOD	TSS	FOG	NH_3-N
Industry 1	350	360	230	130	10
Industry 2	170	630	370	290	10
Industry 3	1,800	1,250	970	570	28
Industry 4	270	1,300	730	220	26
Industry 5	850	5,200	7,770	4,100	70
Industry 6	1,500	2,810	2,840	340	55
Industry 7	370	19,600	13,010	8,730	170
Industry 8	50	7,230	4,830	3,410	150
Industry 9	250	1,840	580	90	1
Industry 10	250	930	660	240	44
Industry 11	620	1,020	530	110	1
Industry 12	70	1,050	1,750	70	11
Industry 13	80	20	1,630	30	2

Industrial discharge volume and quality varies greatly from industry to industry. Average proportions of flow and the loads of the four key contaminants are presented in Figure 3-1 to Figure 3-5. These graphs indicate that a large portion of the overall contaminant load is being discharged by a few large industries. The existing and evolving quantity and quality of the trade waste was an important consideration in developing the trade waste consent conditions. Equally important was a literature based benchmarking analysis that identified potential improvements in trade waste quality for each industry that might be economically achieved using forms of primary treatment.

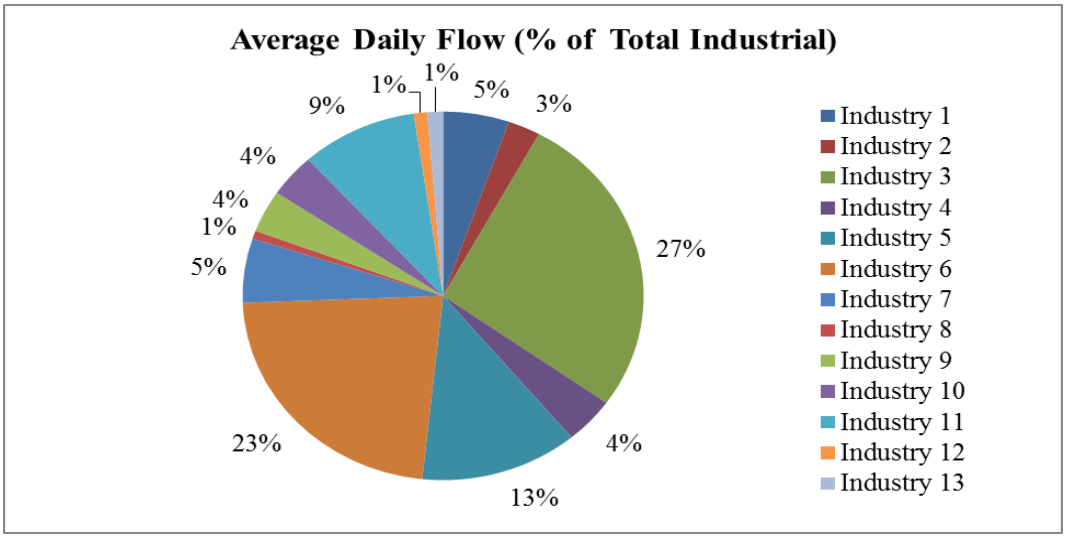

Figure 3-1 - Average Daily Flow Proportions from the 13 Major Industries of Timaru

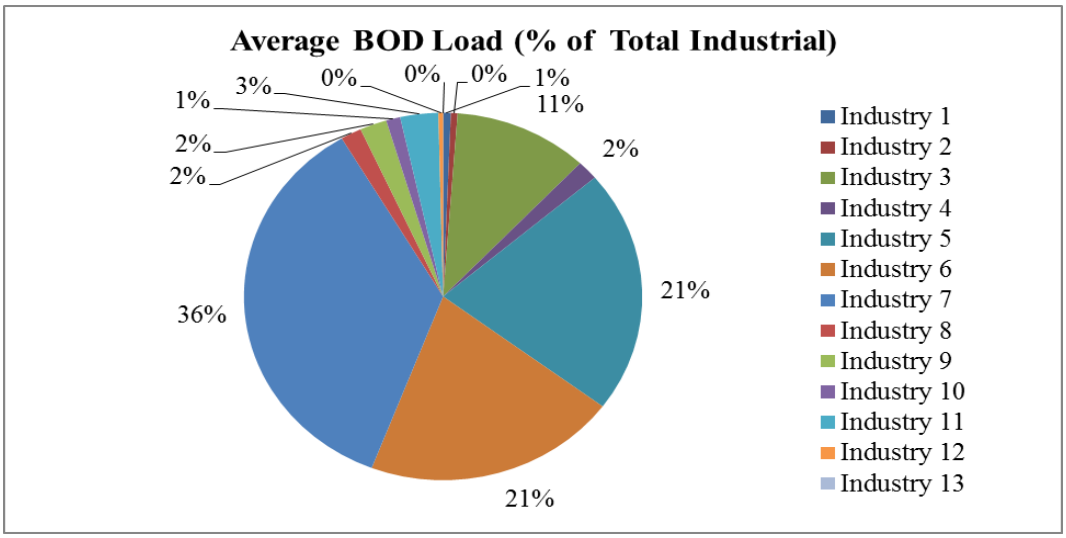

Figure 3-2- Average Daily BOD Discharge Load Proportions from the 13 Major Industries of Timaru

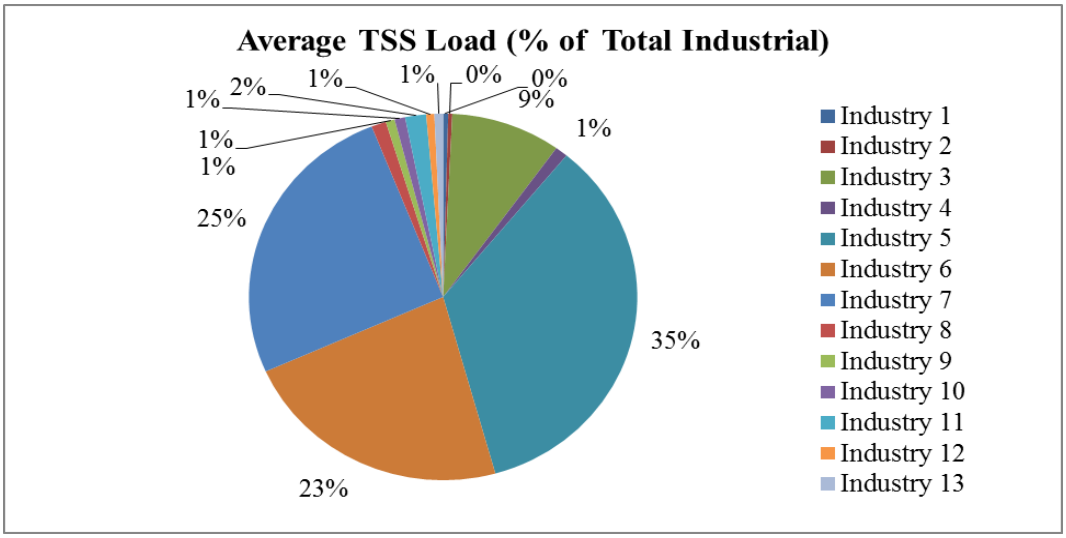

Figure 3-3 - Average Daily TSS Discharge Load Proportions from the 13 Major Industries of Timaru

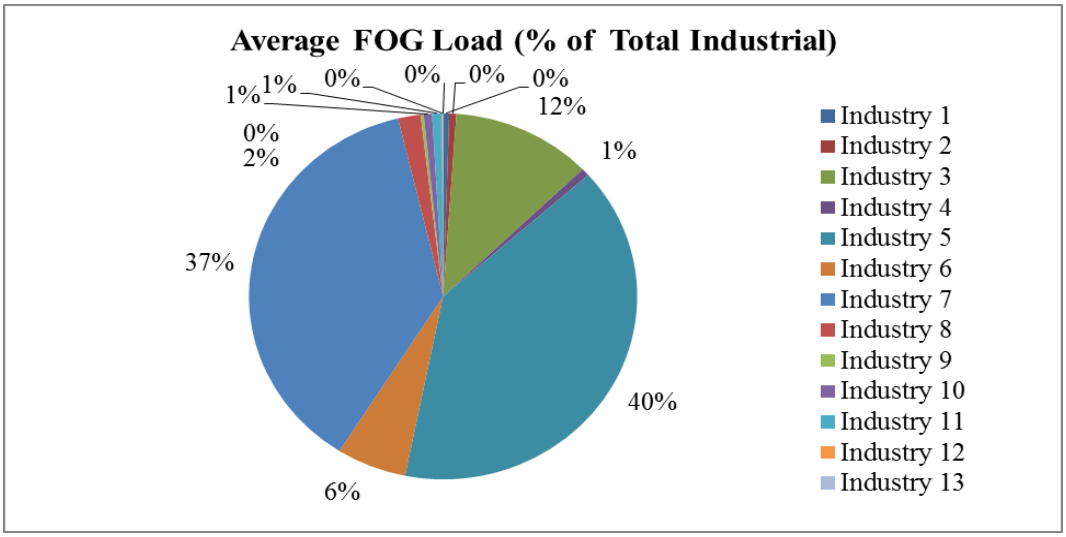

Figure 3-4- Average Daily FOG Discharge Load Proportions from the 13 Major Industries of Timaru

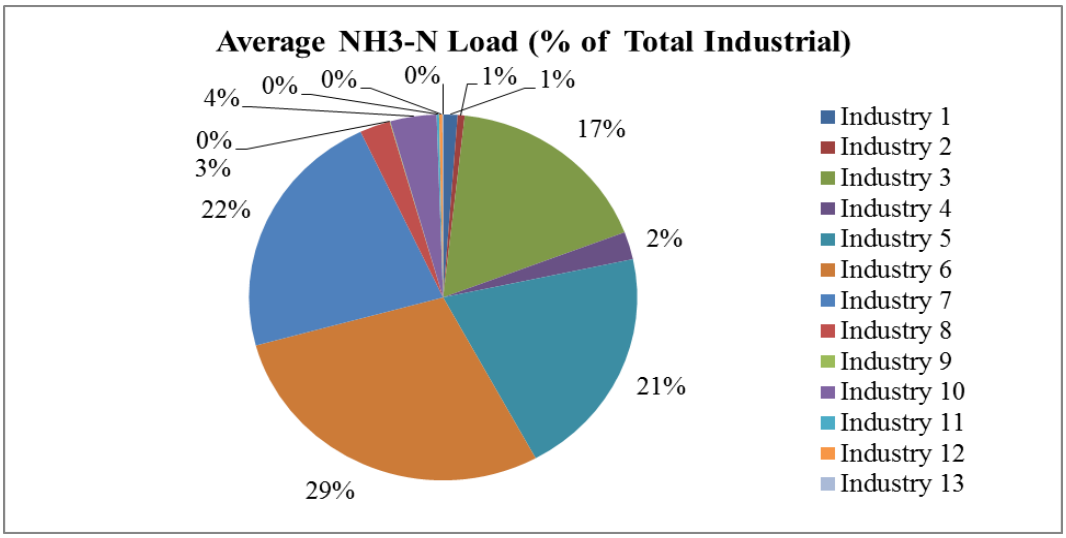

Figure 3-5 - Average Daily NH_3-N Discharge Load Proportions from the 13 Major Industries of Timaru

4 ALLOCATING TRADE WASTE CONSENTS CONTAMINANT LIMITS

4.1 MASS BALANCE MODEL DESCRIPTION

Cardno BTO developed a calculation model for TDC that provides a tool for assessing the impacts of applying various contaminant concentration limits to each of Timaru's major industries on overall compliance at the ocean outfall. This calculation is a mass and load balance model in Microsoft Excel. The model provides a method which uses TDC's existing trade waste and discharge monitoring data to predict future system compliance on a monthly basis against the allowable number of exceedences provided for in the Resource Consent.

The model is a mass/concentration balance formulation for the system that has been derived based on Figure 4-1. Wastewater from the domestic (X) and industrial sources (Y) will combine to form the final discharge stream (Z). The industrial stream will be 'diluted' by the treated domestic stream, thus the allowable concentrations in the combined industrial stream (Y) may be higher than the actual consent condition trigger concentrations (Z). The combined industrial stream (Y) is a blend of the trade wastes from each of the individual industries (y_n).

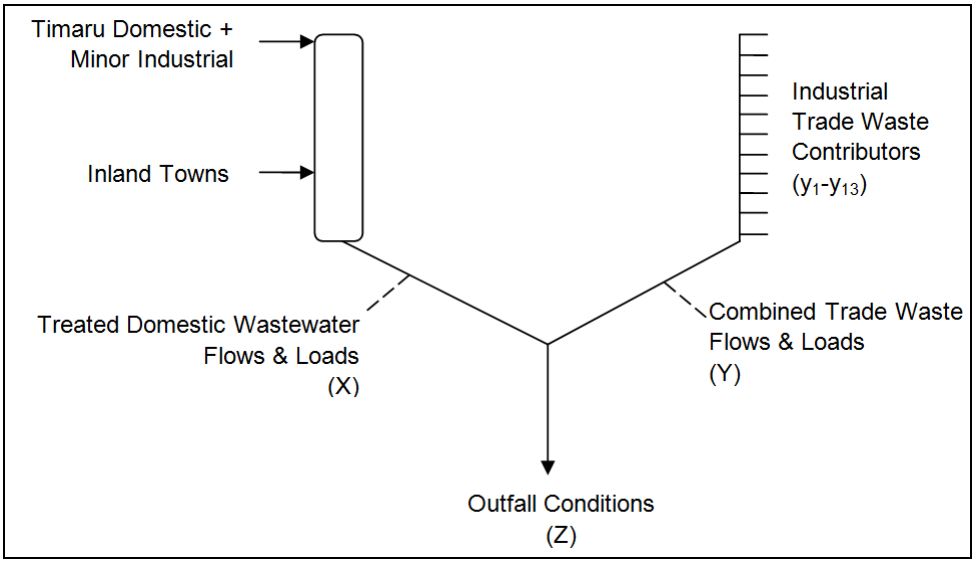

Figure 4-1 Wastewater System Representation

4.2 KEY MODEL INPUTS

In attempting to develop the most accurate prediction possible of future combined waste quality the following data was input to the model:

- Trade waste monitoring results from each of the 13 industries. For each industry composite samples are taken for around three consecutive days every two to three months. These samples are analysed at an accredited laboratory for relevant contaminants such as BOD, TSS, FOG and ammoniacal nitrogen plus sulfides and sulfates.
- Trade waste discharge volume was estimated from bi-monthly potable meter readings and other site water source meter readings.
- Domestic wastewater flow was back-calculated from the total discharge volume less the estimated combined trade waste volume.
- Domestic effluent concentrations after treatment were estimated based on likely performance of the pond with regard to the four key contaminants and seasonal variations.

4.3 SCENARIOS EVALUATED

4.3.1 THE STATUS QUO SCENARIO

The model was used to predict the effect of industries continuing to discharge at existing contaminant concentration limits once the new domestic treatment plant is operational and able to provide dilution. The 'status quo' modeling indicated that if industries continue to discharge at their current levels then TDC would be at risk of exceeding their allowable number of outfall failures both in terms of maximums and medians for most of the four key contaminants when the new conditions come into effect in December 2013.

4.3.2 INDIVIDUAL INDUSTRY LIMITS AND COMBINED MAXIMUMS SCENARIOS

A range of concentration limits for the individual industries have been assessed in the model to predict the likely outcomes on outfall compliance of allocating those limits. The proposed discharge consent limits that have been issued to industries are presented in Table 4.1.

Table 4.1 – Allocated Discharge Consent Limits for Major Industries

Limit Type	MAXIMUM LIMITS					MEDIAN LIMITS				
Industry	Flow (m^3/day)	CBOD (g/m^3)	TSS (g/m^3)	FOG (g/m^3)	NH3 (g/m^3)	Flow (m^3/day)	CBOD (g/m^3)	TSS (g/m^3)	FOG (g/m^3)	NH3 (g/m^3)
Industry 1	400	1000	600	400	40	300	600	400	200	20
Industries 2&8*	500	4000	2500	2000	120	350	2000	1500	1000	55
Industry 3	4000	1600	1400	1000	55	3500	1200	1000	420	42
Industry 4	400	2000	1200	800	55	300	1300	700	300	30
Industry 5	2300	7500	8000	3000	150	1600	4500	6000	2000	80
Industry 6	2600	3500	3500	800	100	1800	2800	2500	300	60
Industry 7	750	10000	2500	3000	200	600	5000	1500	1500	150
Industry 9	700	3500	1500	300	8	350	2000	500	100	1
Industry 10	900	1200	1200	420	100	400	800	700	300	55
Industry 11	1800	1300	1000	300	5	1100	900	500	50	1
Industry 12	200	2000	3000	250	20	150	1200	2000	100	15
Industry 13	200	100	2000	100	10	100	20	1500	60	2

* Industries 2&8 have been allocated a combined discharge consent

In summary, consent limits have been proposed that require reductions in contaminants to be made by most industries and require all industries to comply with both maximum and median contaminant concentration triggers. The model approach has allowed the dilution effect of the treated domestic effluent to be utilized. Most notably the model approach has also allowed different consent limits to be allocated to the different industries based on their existing discharge characteristics and their ability to deliver either high return process improvements or effective low cost (typically primary level) treatment technologies.

To make these assessments the combined effects of the limits occurring together have had to be assessed. This is because the resource consent conditions are based on an allowable number of exceedences per annum. Because any industry could discharge at their maximum limit in any given month, but not in all months due to the median limit provisions, this adds complexity to running scenarios and evaluating overall outfall compliance on an annual basis.

If all the industries discharge at their maximum consented limits in the same months of the year (i.e. a clustered maxima scenario) TDC's outfall waste would be highly concentrated for these few months. The 90%ile resource consent limits for TDC's outfall discharge are allowed to be failed only three out of 12 months per year. Therefore this clustered maximums scenario puts TDC at risk of exceeding the 90%ile outfall resource consent triggers. The maximum discharges could cluster into any month of the year so the possibility of the cluster occurring in any given month of the year was assessed.

Conversely, if industries discharge at their maximum consented limits in different months of the year to one another (i.e. a distributed maxima scenario) TDC's outfall waste will be less concentrated in any given month than if all the industries were discharging at their maximum limits in the same months. However, there will be more months per year when the outfall waste will be of a generally poorer quality. The 50%ile outfall resource consent limits for TDC's outfall waste discharge are allowed to be failed only eight out of 12 months per year. Therefore this distributed maximums scenario puts TDC at risk of exceeding the 50%ile outfall resource consent triggers.

4.4 TRADE WASTE CONSENT ALLOCATION OUTCOMES

After assessing a range of options for trade waste limits for each industry, the likely annual outcomes in the distributed and clustered scenarios for the proposed trade waste consents are presented in Table 4.2. More lenient limits would result in higher levels of non-compliance while stricter limits would result in lower levels of non-compliance, but would require more investment from industries to be achieved. The consent limits have been carefully chosen to balance TDC's risk profile with the ability of industries to cost-effectively comply. Due to the consultation process TDC has gained a clearer understanding of the ability of the industries to comply and the methods by which they propose to comply.

Table 4.2 – Comparison of Allowed and Estimated Outfall Non-Compliances (Months/Annum)

Conditions \ Compliance Scenario	Contaminant	Allowable no. 90%ile non-compliances annually	Allowable no. 50%ile non-compliances annually	Clustered scenario estimated no. of 90%ile non-compliances annually	Distributed scenario estimated no of 50%ile non-compliances annually
Proposed final trade waste consent conditions	BOD	3	8	2	3
	TSS	3	8	1	2
	FOG	3	8	0	6
	NH_3-N	3	8	0	5

5 TRADE WASTE COSTS AND CHARGES

5.1 REQUIREMENTS FOR A NEW CHARGING STRATEGY

TDC currently uses a charging formula which charges all industries a unit rate per measured cubic metre of trade waste discharged into the network (or a proportion of measured potable water used). The unit rate is reviewed annually within the annual plan process. There are two main difficulties with continuing to apply this strategy following the new outfall consent and the network upgrades as follows:

- The current strategy financially incentivizes industries to reduce the volumes of trade waste discharged without providing a financial incentive to reduce the load or the concentration of contaminants discharged. This encourages industries to produce more highly concentrated wastes, which increases the risk of outfall non-compliance and hence is not beneficial from TDC's perspective.
- The current strategy attempts to recover what are largely fixed costs on a variable basis. This creates a situation where there the recovery of fixed costs could be at risk. For example if the industries tried to reduce their costs by reducing their trade waste volumes there would be a cost recovery shortfall. The variable charge rate would have to increase in the following year to recover the fixed costs. This would result in industries having implemented potentially expensive waste reductions and gaining no long term financial benefit.

Because of the difficulties with the current strategy, TDC commissioned Cardno BTO to investigate alternative options for a new charging strategy. Aims for the new charging strategy include:

- To enable TDC to reliably recover the costs from providing trade waste users with their services
- To provide charging stability to industries so that charges do not change markedly from year to year
- To fairly apportion the cost of managing trade waste to the industries responsible for those costs.
- To acknowledge that many industries would need to invest in on-site treatment technologies to meet the requirements of their new trade waste consents.

5.2 COSTS FROM PROVIDING TRADE WASTE SERVICES

TDC has taken on debt to construct the new industrial trunk main. The portion of this capital cost that is due to servicing the industries must now be paid off by industries. The costs TDC has incurred from this investment are fixed in the sense that they will remain constant even if the number of industries discharging to the network varies or the volumes of wastes those industries discharge varies. The fixed costs are the bulk of the Timaru's trade waste related costs and are approximately $2.3M annually (around 92-95% of the total costs).

The other portion of costs are variable (i.e. there will be fewer costs if industries discharge less waste volume). These include trade waste pumping costs and the costs of disposing of solids collected at the milliscreening facility. Based on historic volumes of trade waste it is expected that the variable costs to TDC will be approximately $0.2M annually (around 5-8% of the total costs).

Figure 5.1 shows how TDC's costs can be categorized as either fixed or variable costs.

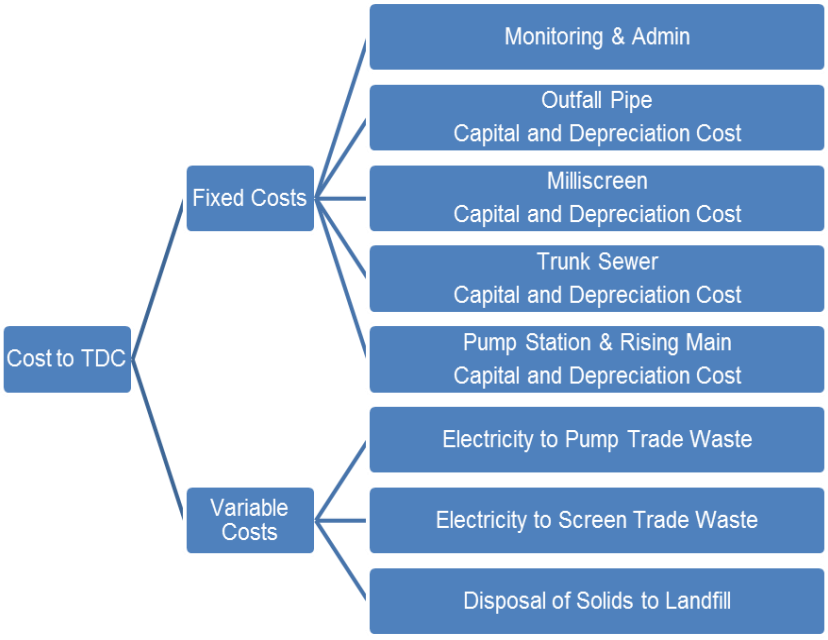

Figure 5-1 – TDC Trade Waste Costs Categories

5.3 COST RECOVERY STRATEGIES INVESTIGATED

Figure 5-2 presents a schematic of cost recovery mechanisms investigated by TDC. These are described further in Sections 5.3.1 – 5.3.3.

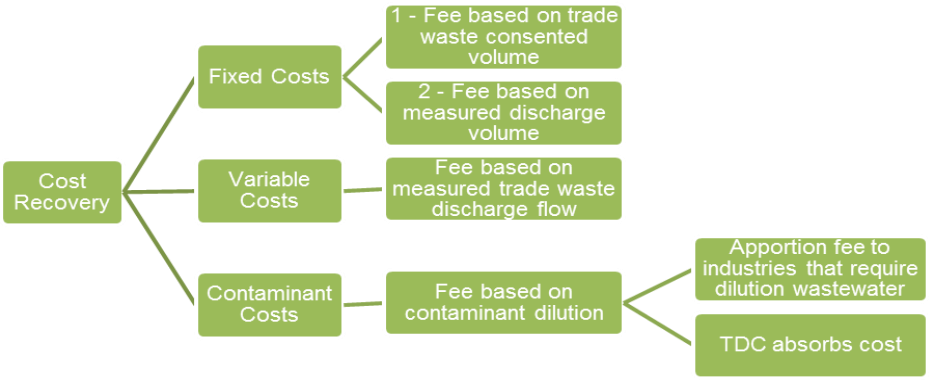

Figure 5-2 – Schematic of all mechanisms investigated

5.3.1 RECOVERY OF FIXED COSTS

Two mechanisms for the recovery of TDCs fixed trade waste costs were investigated. These were a) to recover the fixed costs by charging each industry at a unit rate based on the volume of trade waste they will be consented to discharge or b) to recover the fixed costs by charging each industry based on their measured discharge volumes.

To avoid the risks associated with recovering a fixed cost on a variable basis the option of recovering the fixed costs based on the consent median volume has been recommended.

5.3.2 RECOVERY OF VARIABLE COSTS

Only one mechanism was investigated and recommended to recover the variable costs and that is to charge industries at a unit rate based on the actual measured volumes of waste that they discharge.

5.3.3 RECOVERY OF CONTAMINANT COSTS

It is common practice among New Zealand District Councils to include a component of charging based on the contaminant loads discharged. This is usually applied to situations where there is a combined domestic and industrial wastewater treatment plant. This is an effective way of controlling the contaminant loads discharged by the industries and for recovering the costs of treating those loads.

The Local Government Act (LGA, 2002) restricts how Local Authorities can charge for their services. As per the LGA a Local Authority may prescribe fees or charges, however, the fees prescribed must not recover more than the reasonable costs incurred by the Local Authority *for the matter for which the fee is charged*. In the case of TDC the industrial wastewater is not treated other than milliscreening therefore a contaminant charge in terms of solids was not considered significant or in terms of other contaminant components as justifiable. The recommendation has therefore been that no contaminant charge will be made.

5.4 PROPOSED CHARGING FORMULA

The revised approach results in proposed new charging formula. The new charging formula will be divided into two components. One component of the charge will be aimed at recovering the fixed costs of TDC providing the trade waste infrastructure and the other component of the charge will be aimed at recovering the variable costs. This strategy will more accurately reflect the fact that the majority of TDC's costs are fixed.

The proposed charging formula is therefore as follows:

Total fee ($/annum) = Fixed Charge Rate ($/$m^3$) x Total Consented Median Discharge Volume (m^3/day) x 365 (days/annum) +

Variable Charge rate ($/m^3) x Total Measured Discharge Volume (m^3/annum)

Based on the median consented discharge volumes discussed with all industries at the meetings the proposed unit charges are of the order of:

Fixed Charge Rate ($/m^3) = $0.64 /m^3

Variable Charge rate ($/m^3) = $0.10 /m^3

Based on these estimated rates, the total proposed median consented discharge volumes, and all industries' 2012 measured discharge volumes, the total annual charge for the 2014/15 financial year would be of the order of $2,500,000 calculated as follows:

Total fee ($/annum) = 0.64 ($/m^3) x 9,900 (m^3/day) x 365 (days/annum) +

0.10 ($/m^3) x 2,240,000 (m^3/annum)

= $2,300,000 + $200,000

= $2,500,000

Through the consultation process the industries have generally been accepting of the proposed revised formula. Sensitivity testing of the formula in terms of unit rates, consented flow allocations, additions and/or deletion of connected industries and the frequency of reviews of allocations has all been part of the assessment.

6 CONCLUSIONS

Timaru District Council is in the final stages of concluding new trade waste consents for its major industries. This process has been necessary to ensure compliance with its new ocean outfall resource consent conditions that will come in to effect from December 2013; the new consent avoids the need to construct a costly centralized industrial WWTP. The trade waste consenting process has included extensive consultation over a period of five years with the industries to ensure their involvement in the changes that will need to occur for TDC to achieve compliance with the outfall consent.

The allocation of trade waste limits has been approached using a mass balance model based on trade waste quality data from up to 15 years. An outcome of the modeling is that some industries have been allocated consent limits which will allow them to spend less on trade waste treatments compared to the costs they would have incurred had they been granted TDC's outfall consent conditions as their own trade waste limits. A further successful outcome of the process is that a number of industries have recognized the value that is being lost in their waste streams and have taken steps to invest in loss reduction technologies to achieve a financial return at the same time as trade waste consent compliance.

With the construction of a new industrial wastewater interceptor, a new charging strategy has been proposed. This strategy attempts to recognize the high proportion of fixed to variable costs and provide certainty of cost recovery and charges to TDC and the industries respectively. The proposed charging strategy, formula and unit rates are currently under review by TDC for approval. It is intended that the change will be implemented from the 2014/15 financial year.

The industries have been generally accepting of this proposed change in the charging strategy. Key reasons for this are that:

- The increase in trade waste charges for each industry is of the order of what the industries have been led to expect throughout the infrastructure upgrade and consultation process.

- The costs have not been allocated significantly differently across the existing industries as they could have been with some other charging formulations investigated.

With the commissioning of the Timaru's domestic wastewater treatment plant scheduled for early 2014 the proving phase of this planning process will be realized over the next 12 months.

7 ACKNOWLEDGEMENTS

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8 NOMENCLATURE

TDC	Timaru District Council
WWTP	Wastewater treatment plant
BOD	Carbonaceous biochemical oxygen demand
TSS	Total suspended solids
FOG	Fats oils and grease
ECan	Environment Canterbury
TKN	Total kjeldhal nitrogen