New Plymouth District Council Crematorium Monitoring Programme Triennial Report 2010-2013

Technical Report 2013-37

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Executive summary

The New Plymouth District Council (NPDC) operates a crematorium located on Junction Road, New Plymouth. Two gas-fired cremators are run. This report for the period July 2010-June 2013 describes the monitoring programme implemented by the Taranaki Regional Council to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities.

NPDC holds one resource consent relating to the crematorium which includes a total of 25 conditions setting out the requirements that the Company must satisfy.

The Council's monitoring programme for the period under review included 18 inspections focussing on process control and possible visible emissions and odours.

The monitoring showed that, generally, consent compliance has been good. In the 2010-2013 monitoring period, there were three incidents registered with regard to visible emissions being discharged from the crematorium site. No complaint about the crematorium was received from the public. Due to the nature of activities at a crematorium site, the discharge of visible smoke or odours from a cremator may be found to be offensive.

A major upgrade of the main Newton cremator was undertaken in November 2007, which improved its efficiency and is expected to extend its life until 2018.

A review of the consent condition controlling visible emissions was initiated in June 2006 to deal with differences in methods of measuring smoke intensity between the two cremators. The review was completed in October 2010 and changes were made to the consent conditions.

Overall, NPDC's performance in operating the crematorium was good.

In the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a **high** level of environmental performance and compliance with their consents, while another 59% demonstrated a **good** level of environmental performance and compliance with their consents.

This report includes recommendations for the 2013-2014 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report provides the combined Annual Reports for the period July 2010-June 2013 by the Taranaki Regional Council describing the results of the monitoring programme associated with an air discharge permit held by New Plymouth District Council (NPDC) to cover emissions to air from NPDC's crematorium on Junction Road (State Highway 3) at New Plymouth.

Since 1 October 1991, with the enactment of the Resource Management Act (1991), the Taranaki Regional Council has been the agency with primary responsibility for air quality management in the Taranaki region. Early in 1992, the Council initiated air quality monitoring programmes for industries holding air discharge permits, and has subsequently issued and monitored air discharge permits for a number of other industrial and trade premises.

The Council began monitoring the New Plymouth crematorium in 1998. This report is the fourteenth, fifteenth and sixteenth combined annual reports to be prepared by the Taranaki Regional Council to cover the crematorium air discharge and its effects.

1.1.2 Structure of this report

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

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

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

Section 4 presents recommendations to be implemented in the 2013-2014 monitoring year.

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

1.1.3 The Resource Management Act (1991) and monitoring

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

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

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

1.1.4 Evaluation of environmental performance

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

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

- **poor performance** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental impacts, or, there were adverse environmental effects arising from activities and there were grounds for prosecution or an infringement notice.

In the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a **high** level of environmental performance and compliance with their consents, while another 59% demonstrated a **good** level of environmental performance and compliance with their consents.

1.2 Process description

Figure 1 Location of New Plymouth crematorium

The New Plymouth crematorium has been operating at its site on Junction Road (**Error! Reference source not found.**), 5 km south of the city, since 1961. It was the only crematorium in the Taranaki region until March 2009, when the crematorium of W Abraham Limited commenced operation at Bell Block. Approximately 300 cremations are undertaken annually.

The propane gas-fired Newton Mark IV cremator was installed in 1997 to replace the original diesel-fired unit which, from then on, was used only as a back-up and for long coffins in about five cremations per year.

The diesel cremator failed in July 2003, and NPDC decided to replace it with a second gas-fired cremator. After investigation of various options and consultation with Taranaki Regional Council, a change of consent **5205** was granted to provide for

the (additional) operation of an Elecfurn HH2500 gas-fired cremator. The Elecfurn cremator was commissioned on 10 October 2005.

The number of cremations during 2010-2011, 2011-2012, and preceding years is presented in Figure 2.

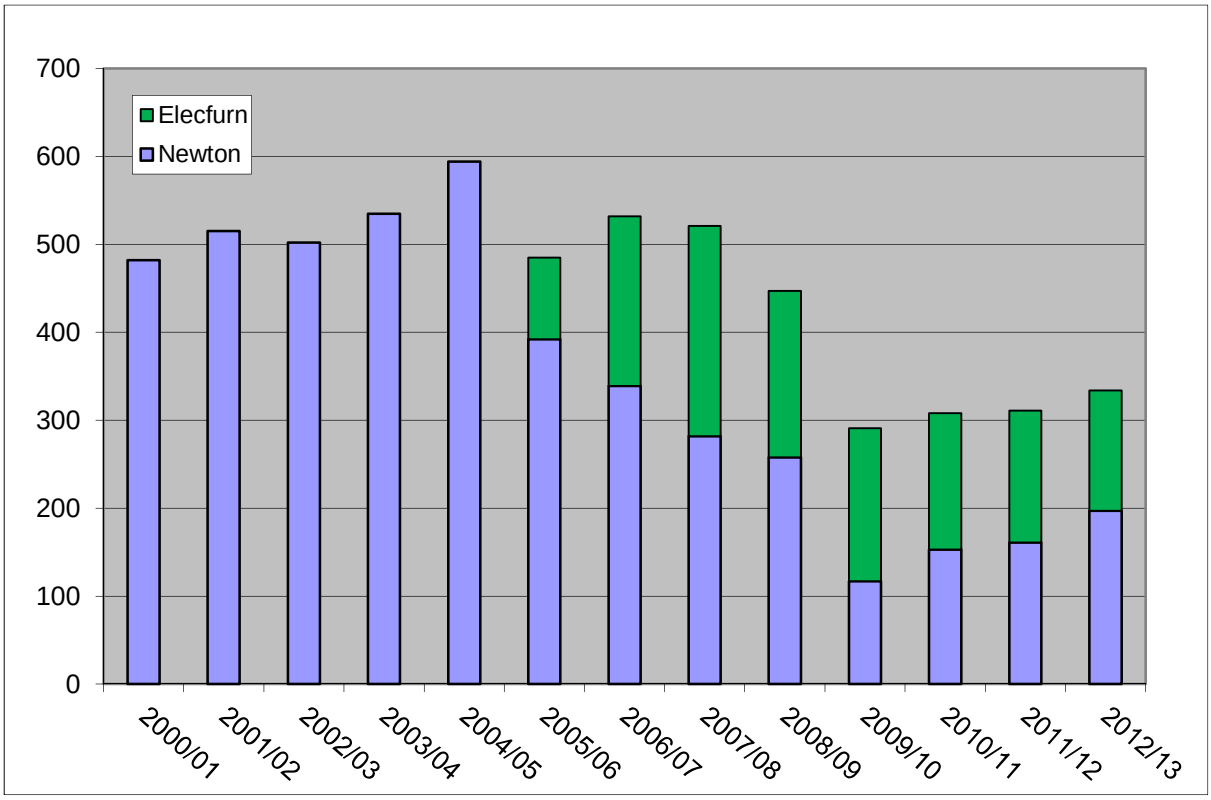

Figure 2 Annual number of cremations at New Plymouth crematorium, July 2000 - June 2013

The establishment of the crematorium of W Abraham Limited resulted in a substantial reduction in the number of cremations in 2009-2010, and numbers remained similar at just over 300 cremations during the 2010-2011, 2011-2012 and 2012-2013 periods.

1.2.1 Newton cremator

The Newton cremator is designed to comply with the criteria of the United Kingdom Environmental Protection Act (PG 5/2 95). It is a fully automatic unit that needs minimal operator involvement. It is pre-heated, charged and monitored until it is ready for removal of ash. Structurally, it consists of two combustion zones. A secondary chamber is wrapped around the primary combustion chamber. Some of the heat generated during the cremation process is transferred through the walls, arch and floor of the primary chamber to the secondary chamber by thermal conductivity. This increases fuel efficiency and increases the ability of the system to maintain consistent and high temperatures throughout both zones.

The primary and secondary chamber burners, and eight different air suppliers, are modulated by a microprocessor controller to achieve optimum conditions. Another (third) burner was installed in the second chamber in November 2007 to maintain more uniform temperature and allow more rapid heat-up.

The computer controller will not allow the cremator to be charged unless the temperature in the secondary chamber reaches 650°C and a two-second residence time is achieved. Data on residence time, emission levels, furnace pressure and rates of temperature change are used to continuously check and adjust controls to ensure maximum efficiency.

A feature of the Newton cremator is a water curtain charging system. This spray system retards the start of the cremation process until the charge door is closed, and allows higher operating temperatures to be maintained. Benefits include increased operator safety and a reduction of the smoking effect of heavily varnished coffins. Higher temperatures can also be controlled using the water curtain system.

The exhaust flue from the Newton cremator initially was connected to the old brick flue for the diesel cremator. A long connecting duct, which had two sharp bends, led to reduced combustion efficiency and occasional smoking. A new 8-metre high flue for the Newton, with a more efficient flow path, was installed in June 2004. The high discharge point of the flue ensures that all ground-level concentrations are well below the recommended guideline levels. Controlled dilution air is provided at two points in the exhaust ducting of the Newton cremator. Exhaust velocities are therefore high and flue temperatures are quite low.

The average cremation time for the Newton cremator is 70 minutes.

During the first few minutes after a highly polished coffin is introduced into the cremator, flammable coatings are ignited. This can lead to excessive cremation temperatures, which result in the products of combustion moving too quickly through the secondary combustion chamber to be consumed, causing transient visible and odorous emissions.

Odours emanating from a crematorium site may occur if inefficient combustion (especially at low temperature) or burner lockout occurs during the later stages of the cremation. Close monitoring of the cremation process is needed to avoid releases, as any odour emitted is likely to be found offensive.

Emissions of heavy metals from the cremation process are not likely to be significant due to the low numbers of cremations occurring at the site per year. The only probable source is mercury from dental amalgams.

1.2.2 Elecfurn cremator

The Elecfurn HH-2500 is a hot hearth medium volume machine that, like the Newton machine, operates a gas-fired two-chamber controlled pyrolysis combustion process. A difference from the Newton is that the initial heat-up time is faster, being about 40 minutes rather than two hours, but the cycle time is longer, having a cremation time of about 90 minutes and requiring a 25-minute cool down prior to the next cremation (45 minutes longer than the Newton). This makes the Elecfurn the more efficient when only one cremation is perfomed in a day, but less efficient when consecutive cremations are performed because of longer cycle time and its higher gas usage rate.

The Elecfurn is equipped with two fully modulating nozzle mixing gas burners, one each in the primary and secondary chambers, both controlled by a PLC.

Three other modulating valves control hearth air, secondary addition air and flue eductor air. Like the Newton, an opacity (smoke) sensor is fitted for control and monitoring of visible emissions. The position of the opacity sensor is different to that of the Newton, being at the outlet of the secondary chamber rather than after the dilution air eductor.

A separate stack is installed for the Elecfurn machine, 10.3 metres in height, with a dedicated sampling port.

1.3 Resource consent

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

NPDC holds air discharge permit **5205** to discharge emissions into the air from the operation of a crematorium including a Newton cremator and the supplementary operation of an Elecfurn HH2500 cremator. This permit was issued by the Taranaki Regional Council on 4 December 1997 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2014.

The consent was changed on 13 July 2005 to provide for replacement of the old back-up diesel-fired cremator with a supplementary gas-fired cremator.

Council initiated a review of the consent in June 2006 for the purpose of reviewing condition 15, as that condition did not adequately control visual impact of emissions from the crematorium on the environment. The review was completed in October 2010 with a new condition inserted specifically for control of the visible emissions from the Elecfurn cremator.

Condition 1 requires adoption of the best practicable option to prevent or minimise any actual or likely adverse effects on the environment.

Condition 2 requires that the procedures and requirements set out in the consent application be followed, except when there is a conflict between such matters and the resource consent. (In the case of conflict, the consent prevails).

Condition 3 requires that the consent holder consult with Council before carrying out any alterations which may change the nature, quantity or concentration of contaminants emitted from the site.

Condition 4 requires the cremators to be operated to minimise exhaust emissions and condition 5 addresses prevention of emissions during charging of cremators.

Condition 6 restricts the fuel to liquid petroleum gas or natural gas.

Conditions 7-9 relate to configuration of ducting and stacks.

Conditions 10-12 place controls on combustion conditions within the cremator. These conditions are specifically written to eliminate visible smoke and odours being

emitted from the premises. At temperatures above 850°C for two seconds with sufficient oxygen all odour and smoke-generating contaminants in the contents are destroyed.

Condition 13 requires that Council be notified at least 24 hours before any maintenance relevant to exercise of the consent.

Condition 14 addresses the reduction and minimisation of combustion of materials likely to generate unacceptable emissions, such as PVC.

Conditions 15 and 16 addresses visible emissions, allowing no more than two one-minute periods per cremation of smoke of opacity more than 20% (Elecfurn cremator) and 2% (Newton cremator) or Ringlemann Scale 1.

Condition 17 specifies that no discharge from the premises shall give rise to a ground level odour which is offensive or obnoxious or objectionable.

Condition 18 prohibits the discharge of any contaminants at a rate or quantity that is liable to be hazardous or toxic or noxious at or beyond the boundary of the site. Condition 19 places limits on emission rate of specified air pollutants.

Conditions 20 and 21 require continuous monitoring and recording of exhaust gas temperature and opacity.

Condition 22 requires and defines commissioning source emission testing for the Elecfurn cremator.

Condition 23 provides for emission testing to be undertaken, following consultation with the consent holder.

Condition 24 requires the provision on request of all monitoring, calibration and process control data regarding operation of the cremator.

Condition 25 is a review condition.

The permit is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the crematorium consisted of two primary components.

1.4.2 Programme liaison and management

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

1.4.3 Site inspections

The crematorium was visited 18 times during the 2010-2013 reporting period. The inspections focused on actual and potential emissions and characteristics, including potential odour, visible or offensive emissions. Sources of data being collected by the consent holder were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

2. Results

2.1 Inspections

The crematorium was inspected at approximately two-monthly intervals over the 2010-2013 review period. On most occasions, one or more cremations were observed. The performance of the cremators was discussed with the operator. Particular attention was given to detection and cause(s) of any visual or odorous emissions.

In general, both cremators were found to operate satisfactorily, with no significant visible emissions observed, with one exception.

The temperature of the exhaust gases at the outlet of the secondary chamber of both cremators was continuously monitored and recorded, in accordance with condition 19 on consent 5205. The (inlet and outlet) temperature readings for the secondary combustion chambers exceeded the minimum of 650°C at entry of the coffin, as required under special condition 11 on consent 5205.

Two of the inspections were arranged to coincide with cremations of new types of casket. On 11 March 2011, a casket made of "Paneltec board" composed of MDF dust and wood fibre, produced by Mt View Design of Okaiawa, was incinerated in the Newton machine, without incident. On 18 February 2013, a casket composed largely of cardboard provided by Custom Cartons of Tauranga and manufactured by Carrington Funeral Home was cremated in the Elecfurn machine, also without incident.

Cremator maintenance

In previous years, the Newton cremator was serviced and cleaned by the supplier, Austeng Engineering Solutions Pty Limited. NPDC notified the Regional Council of each impending service, in compliance with special condition 13 on consent 5205. Local contractors carried out major repairs at the time of service, and minor repairs at other times.

During 2010-2011 and 2011-12, Austeng was not brought in from Australia to service the Newton machine. Instead, both cremators were serviced by local contractors. Austeng serviced the Newton on (Saturday) 8 September 2012, and an inspection by Council was arranged to coincide – no major repair was required, only routine maintenance.

The Elecfurn machine was cleaned once annually, and serviced by The Electric Furnace Co. The service on 13 June 2012 occurred following failure of the machine, and was attended by an officer of the Council.

2.2 Emission assessment of Elecfurn cremator

Conditions 19 and 22 on consent 5205 state that:

19. *In addition to the generality of conditions 2, 4 and 5 the discharge of specified air pollutants from the cremator stack shall not exceed the corresponding emission rates set out hereto when averaged over a single cremation cycle.*

total particulate matter *80 mg/m³*
hydrogen chloride *200 mg/m³*

22. *The consent holder shall undertake commissioning source emission tests for the Elecfurn 2500 cremator. The tests*

a) shall be undertaken within 3 months of the consent being granted;
b) shall be conducted to determine compliance with conditions 18; and
c) shall comprise no less than three separate samples for each type of emission test undertaken.

Commission testing of the Elecfurn cremator in accordance with condition 22 for compliance with condition 19 on consent 5205 was carried out by independent IANZ-accredited stack testing specialists K2 Environmental Limited on 8 and 9 February 2006. An extension of one month to do the tests had been given by Council in relation to the availability of the tester.

In order to produce average results over a single cremation cycle, sampling was undertaken over different parts of three separate cremations, being (1) the burning of the coffin, (2) the cremation of the body, and (3) the calcification of remains. A summary of the test results is presented in Table 2. The full test report (K2 Environmental Ltd, 2006) is available from Council.

Table 1 Total particulate matter and hydrogen chloride emissions from Elecfurn cremator

sample	total particulate matter*		hydrogen chloride*	
	mg/m³	kg/h	mg/m³	kg/h
1	23	0.044	17	0.033
2	66	0.15	19	0.042
3	64	0.14	7.7	0.017
average	51	0.11	11	0.023
consent limit	**80**		**200**	

* all data corrected to 0°C, one atmosphere, 11% oxygen, and calculated as a dry gas

The results demonstrate compliance with condition 19 on consent 5205. The measured average total particulate matter concentration was 64% of the limit, and the average hydrogen chloride concentration was 5.5% of the limit.

2.3 Review of opacity condition

When consent 5205 was changed in July 2005 to provide for the Elecfurn cremator, it was recognised that the two cremators had different opacity, or smoke, monitoring systems. The meters were of different design, and the location of the meters within the exhaust ducting was different, the Elecfurn meter being adjacent to the outlet of the secondary chamber and the Newton meter being downstream of the dilution air eductors in the flue. The condition (15) addressing opacity on the original consent was tightened, by reducing the maximum allowable obscuration value from 30% to 20%, and the option to review the consent after a year was inserted to see if further change to the condition was necessary.

On 30 June 2006, Council notified (pursuant to condition 24a) its intent to review condition 15 on consent 5205 as the condition did not adequately control visual impact of emissions from the crematorium on the environment. Monitoring over the previous months had confirmed that separate limits were required for the two cremators.

The limit was obviously too high for the Newton, smoke being visible at 2% obscuration (as read on the meter), but there was difficulty in obtaining hard data from the Elecfurn computer. In August 2006, an abatement notice was served, requiring Elecfurn data to be produced.

The review was prolonged, mainly because of difficulties in relating observed smoke to obscuration readings. There were instances, for both cremators, when smoke was observed while there was no (positive) obscuration reading. In October 2010 the review was completed and a new condition was inserted relating to opacity readings from the Newton cremator.

2.4 PVC laminated caskets

Condition 14 on consent 5205 specifically requires that the quantity of materials such as PVC (poly vinyl chloride) combusted be minimised:

> *The consent holder shall take reasonable steps to reduce and minimise the quantity of materials [such as **PVC**, metals, and other materials listed in the guidelines published by the Australasian Cemeteries and Crematoria Association [May 2004]: contents of coffins delivered for Cremation] combusted within the cremator which are likely to generate unacceptable emissions.*

The purpose of this condition is to reduce the generation of persistent organic pollutants (POPs) such as dioxins and furans during incomplete combustion or by *de novo* synthesis (in the exhaust flue). The burning of PVC creates the potential for adverse effect on the environment through the emission of hydrogen chloride, an acidic gas; the release of toxic metals which PVC may contain, such as cadmium and lead; and the formation of dioxins and furans, which are highly toxic and bio-accumulative substances.

In August 2006, NPDC advised Council that a PVC laminated casket had been cremated and sought guidance as to whether this was acceptable. Council's initial response was to ask NPDC to make funeral directors and casket makers aware of the Australasian Cemeteries & Crematoria Association (2004) guidelines and of condition 14 on consent 5205 in respect of vinyl substances.

An increasing trend in use of PVC laminate caskets developed, apparently because of better "finish" in comparison to paper veneer and lacquer coated caskets, and low cost in comparison to natural wood. In response to Council's expressed concern, NPDC on 31 July 2007 wrote to the major supplier of PVC laminated caskets in Taranaki, advising that PVC laminated caskets would not be accepted for cremation after 1 October 2007. Funeral directors were informed. This date was eventually extended until 29 February 2008 to allow the casket maker time to develop, burn test and commence manufacture of an alternative laminate made of polyethylene terephthalate (PET), which does not contain chlorine.

A trial burn of the new laminate material was conducted at New Plymouth crematorium on 14 January 2008. The purpose of the trial was to determine, in a "worst case" scenario, whether the new laminate would cause unacceptable smoking. A series of three PET laminated caskets were cremated in the Elecfurn machine, followed by a"traditional" lacquered paper veneer coated casket. All the caskets were constructed of medium density fibreboard and were empty. Emissions from the flue during the cremations were monitored and recorded continuously by video camera. No testing was done for hydrogen chloride, as the PET did not contain a significant amount of chlorine (measured later as 0.020%). The cremator was pre-heated to 650°C in the secondary chamber and 360°C in the primary chamber before charging. Primary, afterburner and flue temperatures, oxygen concentration and opacity were recorded.

No smoking was observed during the first two cremations. An emission of thick black smoke of about one minute duration was observed about two minutes after commencement of both the third and fourth cremations. Average opacity readings over one minute were about 15% and 36%, respectively. This smoking was attributed to "flash-off" of casket coatings, both PET laminate and lacquered paper veneer, upon introduction to the heated cremator, and has been observed in other Elecfurn HH-2500 machines after the second cremation. Condition 15 on consent 5205 was complied with, owing to the short duration of the visible emissions.

The outcome of the trial was that Council considered the new material to replace PVC laminate acceptable for cremation.

2.5 Cemeteries and crematoria by-law

The NPDC bylaw contains a part on cemeteries and crematoria. The bylaw was revised during the 2007-2008 reporting period. An updated New Plymouth District Council Bylaw 2008, made under the Local Government Act 2002, came into force on 1 July 2008.

Part 3 of the bylaw deals with Cemeteries and Crematoria. Resource consent 5205 is attached as an appendix. Items that have particular relevance to the exercise of a resource consent to emit to air from crematoria are detailed below:

13 General conditions of cremation

13.1 (e) Any person may be cremated in a crematorium if the council has received a declaration from the funeral director or the person presenting the body that to the best of his or her knowledge the casket contains no substances prohibited under the part.

13.5 The authorised officer may require the removal of any casket furnishings prior to cremation and these shall be disposed of in such a manner as the council or an authorised officer decides.

14 Style, design and material of any casket in which a person is to be cremated

14.1 A casket for cremation:

b) shall be constructed from materials that will when combusted not exceed the crematorium's Taranaki Regional Council Air discharge permit (attached to this part as Appendix 2) or any subsequent amendment of the discharge permit or include any of the materials listed in Appendix 1 of this part;

f) shall not contain any bottle, can or other thing or object which may explode or release carcinogens into the atmosphere, cause the crematorium to exceed its air discharge permit from the Taranaki Regional Council, or cause harm or damage to persons or property during cremation

14.3 Materials that are unsuitable for combustion in the course of a cremation may be used on the exterior of a casket if they can be removed easily prior to cremation.

15 The council may make rules relating to cemeteries and cremation

15.1 The council may from time to time, by resolution, make rules relating to one or more cemeteries and crematoria on the following matters:

j) items prohibited from cremation.

Appendix I to the bylaw (which is for information only) contains a list of items prohibited from cremation. The list includes, among other things, die cast metals/aluminium/copper (large items only), mattresses, and PVC in all forms.

2.6 Investigations, interventions, and incidents

The monitoring programme for each year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During any year matters may arise which require additional activity by the Council eg provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

In the 2010-2013 period, it was necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the operation of New Plymouth crematorium on three occasions.

On two occasions the incident was self-notified by NPDC, and on the other Council officers passing by on State Highway 3 reported smoking.

No complaint about the crematorium was received from any member of the public.

On 19 October 2010, NPDC notified the Council in mid-afternoon that smoking of the Elecfurn cremator had started 10 minutes before, and shortly afterward reported that the machine had failed completely. Two officers of Council passing by separately also reported the event. The next day the cause was found (a failed air position switch), repair undertaken, and the cremation completed. The electronic operating log and a full explanation was received and accepted. No further action was taken.

On 17 October 2011, NPDC notified the Council in late afternoon that a general power failure had affected a cremation in progress, leading to smoking about 20 minutes before. When power was restored the cremation was completed. No further action was taken.

On 28 May 2012, the Council received two internal reports of smoking at the crematorium in late afternoon. Another internal report was received of a second event the next day. Blue-grey smoke could be seen from the road above, drifting to the east against the background of green trees. The cremator operator was contacted immediately upon the first event and could not see the smoke from below. The crematorium supervisor was on site at the time of second event, investigating the problem with the Elecfurn machine. The machine was assessed and repaired by its supplier on 13 June, and an explanation of the faults (failed PLC modules) given to the Council officer who attended. No further action was taken.

Another internal report of smoking, forming a blue vertical pall, was made by a Council officer passing by on 22 April 2013. Again the operator could not see the smoke from underneath. The electronic log of operating conditions and emission monitoring for the cremation could not be retrieved.

3. Discussion

3.1 Discussion of plant performance

Inspection by the Taranaki Regional Council over the period 2010-2013 found on-site management and operation of the cremation facility to be good. Conditions on consent 5205 in respect of site operations and management were complied with.

Maintenance of the cremators was carried out diligently, mainly using a local contractor. Some repairs to both machines were required during the review period.

There were three recorded instances when visible emissions of smoke occurred, all of short duration. Power failure was the cause of one incident, while mechanical failure was responsible for the other two incidents.

It is noted that a major upgrade of the Newton machine was undertaken in November 2007. Re-bricking of the furnace, addition of a third burner and reconfiguration of other burners, and installation of a new controller, computer and software was aimed at improving cremation efficiency and extending the life of the cremator a further 11 years.

It is also noted that a trend of increasing usage of PVC laminated caskets, in breach of consent 5205, and in contravention of New Zealand's obligations under the Stockholm Convention, was addressed in 2007-2008 when a local casket manufacturer that produced much of the caskets replaced the PVC covering with a polyethylene-based laminate. A burn test in January 2008 showed the new laminate to be acceptable.

3.2 Environmental effects of exercise of consents

The Taranaki Crematorium operated by the NPDC is located on Junction Road, 5 km south of the city of New Plymouth. The present site of the crematorium is regarded as a suitable site to fulfil the needs of the community and NPDC.

The crematorium site is surrounded primarily by Council land, the majority of which is in forestry. The site is isolated from the major residential areas and continues to be in respect to rural zone management. State Highway 3 passes by the crematorium. This is the only road in the immediate vicinity. There are a few dwellings in the vicinity of the site, the closest of which lie within the crematorium grounds and on the neighbouring water treatment plant site [both Council-owned] near the crematorium boundary.

3.2.1 Neighbourhood

The only adverse effects from previous monitoring that have been noted by any of the neighbours were the discharge of visible emissions and odours. During this 2010-2013 reporting period, no complaint was received regarding emissions from the crematorium.

3.2.2 Physical effects

The installation of gas-fired cremators has significantly enhanced the environmental performance of the facility. There are five potential issues surrounding the discharges to air from the Taranaki Crematorium.

(a) Visible emissions

Inefficient combustion has the potential to produce visible emissions from the exhaust stack. Under the worst circumstances there is potential for black/dark smoke to be discharged. Due to the nature of activities at a crematorium site, the visible discharge of smoke from the exhaust stack is likely to be found offensive and possibly emotionally disturbing. The discharge of smoke from the old cremator system was identified as an area of concern by at least one nearby resident.

The automated system allows control of the combustion process, and conditions can be altered instantaneously. The stoichiometric fuel/air ratio, greater heat, longer combustion zone and introduction of dilution air in the exhaust stream all contribute to the positive environmental performance of the cremator.

NPDC has experienced a number of technical problems with this facility and has worked closely with the manufacturer to meet its environmental goals. From time-to-time the crematorium has experienced difficulties meeting its *free from visible smoke* condition in its consent.

The installation of a new flue for the Newton machine in June 2004 improved this situation.

(b) Odour

Odours emanating from a crematorium site are also likely to be found offensive and possibly emotionally disturbing. Again, inefficient combustion (especially at low temperature) can lead to odour discharges. Improved combustion processes associated with the new, tightly controlled, cremator has led to minimal odour being produced.

(c) Toxic by-products

The production of toxic by-products, such as heavy metals and dioxins, is a concern with many combustion processes. The AEE provided by the NPDC clarifies this issue, stating that:

> *The cremation process is not considered a significant source for heavy metal by-products. The only probable source is mercury from teeth but this is produced in minimal amounts.*
>
> *Dioxins are removed due to the complete combustion process and particularly the secondary chamber system that ensures full and controllable combustion.*

(d) Particulate deposition

The reported low opacity of the smoke discharge from the two gas-fired cremators indicates low levels of particulates. The controlling computer monitors particulate levels and displays these on the screen at all times. The cremators are controlled so that they operate below the consent limit of 80 ppm. At this level it

is not expected that there will be any adverse effects, such as the visible deposition of particulate either off or on the crematorium site.

(e) Nitrogen and sulphur oxides

Nitrogen and sulphur oxides are often by-products of the combustion process.

Monitoring conducted by the Taranaki Regional Council in February and March 1999 has shown that the crematorium does not have any significant impact on nitrogen oxides levels in the vicinity.

The adverse effects from the NPDC's crematorium have potential to be marked given the sensitive nature of crematorium activities and social attitudes. The requirement for an efficient combustion system is emphasised with regard to minimising these effects. Maintenance of an efficient combustion process is therefore a paramount consideration of crematorium management.

3.3 Evaluation of performance

A tabular summary of the NPDC's compliance record for the period under review is set out in Table 2.

Table 2 Summary of performance for Consent 5205 Discharge to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to minimise adverse effects	Inspection and liaison with consent holder	Yes
2. Exercise in accordance with application	Inspection and liaison with consent holder	Yes
3. Approval prior to alterations to plant or processes	Inspection and liaison with consent holder	Yes
4. Control processes to minimise emissions	Inspection and liaison with consent holder	Yes
5. Cremator designed/operated to prevent smoke, fumes during charging	Inspection	Yes
6. LPG or natural gas fuel only	Inspection	Yes
7. Duct work leak proofed	Inspection	Yes
8. Minimum stack height	Inspection	Yes
9. Stack and duct insulation	Inspection	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Limit on minimum temperature and time in secondary chamber	Continuous monitoring by consent holder	Yes
11. Limit on minimum temperature in secondary chamber at charging	Continuous monitoring by consent holder	Yes
12. Limit on minimum oxygen in secondary chamber outlet	Continuous monitoring by consent holder	Yes
13. Notification prior to maintenance	Record of maintenance received	Yes
14. Steps to reduce and minimise combustion of certain materials	Liaison with consent holder	Yes
15. Limit on opacity Elecfurn cremator	Monitoring by consent holder and inspection by Council	Moslty
16. Limit on opacity Newton cremator	Monitoring by consent holder and inspection by Council	Moslty
17. No offensive odour beyond boundary	Inspection	Yes
18. No contaminants at hazardous levels beyond boundary	Inspection	Yes
19. Limits on emission components	Continuous opacity measurement. (Stack testing by independent consultant in previous monitoring period).	Yes
20. Limit on cremator outlet temperature	Continuous monitoring by consent holder	Yes
21. Method of opacity monitoring	Liaison with consent holder	Yes
22. Commissioning source emission tests on Elecfurn	Elecfurn commissioned prior to monitoring period (and stack testing done by independent consultant).	N/A
23. Additional emission testing		N/A
24. Provision of monitoring results	Liaison with consent holder	Yes
25. Optional review provision		N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Good**

N/A = not applicable

During 2010-2013, generally New Plymouth District Council demonstrated a good level of environmental performance and compliance with the resource consent. There were three reported incidents during the period which produced visible emissions.

3.4 Recommendations from the 2009-2010 Report

In the 2009-2010 Annual Report, it was recommended:

1. THAT monitoring of air emissions from New Plymouth crematorium in the 2009-2010 year continue at the same level as in 2008-2009.

2. THAT the Council notes the option for review of resource consent 5205 was invoked in 30 June 2006 for the purpose of amending special condition 15 as it does not adequately control visual impact of emissions from the crematorium on the environment.

The recommendation on monitoring was implemented in full in 2010-2011, 2011-2012 and 2012-2013. The review was completed and changes to the consent conditions have been discussed above in sections 1.3 and 2.3.

3.5 Alterations to monitoring programmes for 2013-2014

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

In the case of New Plymouth crematorium, the programmes for 2010-2011, 2011-2012 and 2012-2013 were essentially unchanged from that for 2009-2010. Similarly, it is now proposed that for 2013-2014, the monitoring programme, being two-monthly inspections, continue at the same level. A recommendation to this effect is attached to this report.

3.6 Exercise of optional review of consent

Resource consent 5205, as amended on 13 July 2005, provides for an optional review of the consent in June 2006 and June 2008. Condition 24 allows Council to review the consent, for the purpose of:

a) adding, amending or deleting any limit on discharge or ambient concentrations or any contaminant or contaminants; and/or

b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to the environment; and/or

c) requiring the consent holder to install, calibrate and/or maintain any monitoring and/or recording device to monitor combustion conditions or environmental performance of the cremators; and/or

d) ensuring that the conditions are adequate to deal with any significant advers effects of the discharge on the environment arising from the exercise of this consent which were not foreseen at the time the application was considered.

Council invoked condition 24a) on 30 June 2006 for the purpose of reviewing condition 15, as that condition did not adequately control visual impact of emissions from the crematorium on the environment. The review was completed in October 2010.

4. Recommendation

1. THAT monitoring of air emissions from New Plymouth crematorium in the 2013-2014 year continue at the same level as in 2012-2013.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

g/m^3	grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures
Incident	an event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred
Intervention	action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring
Investigation	action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
UI	Unauthorised Incident
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan

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Stockholm Convention on Persistent Organic Pollutants 2001: http://chm.pops.int/; http://chm.pops.int/Portals/0/Repository/batbep_guideline08/UNEP-POPS-BATBEP-GUIDE-08-12.English.PDF

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Taranaki Regional Council (1999): New Plymouth District Council Crematorium Monitoring Programme Annual Report 1998-1999. Technical Report 99-03

Taranaki Regional Council (1997): Regional Air Quality Plan for Taranaki

United Kingdom Department of Environment (1991): Environmental Protection Act 1990, Part 1 – Secretary of State's Guidance – Crematoria – PG5/2(91) February 1991

Appendix I

Resource consent held by New Plymouth District Council

Consent 5205-1

TARANAKI REGIONAL COUNCIL
CHIEF EXECUTIVE
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47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Decision Date [Review]:	11 October 2010
Commencement Date [Review]:	11 October 2010 [Granted: 4 December 1997]

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the operation of a crematorium including a Newton Cremator and the supplementary operation of an Elecfurn HH2500 Cremator at or about (NZTM) 1696418E-5669150N
Expiry Date:	1 June 2014
Site Location:	Taranaki Crematorium, 629 Junction Road, New Plymouth
Legal Description:	Pt Lot 1 DP 8125 Blk X Paritutu SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

Best practicable option

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effects on the environment arising from discharges to air from the site.

2. The consent holder shall adhere to and comply with the procedures, requirements, obligations, and all other matters stipulated within applications 140 and 3840 including supporting documentation, inasmuch as related to the exercise of this resource consent. In the case of any contradiction between the documentation submitted in support of applications 140 and 3840, the conditions of this consent, the conditions of this consent shall prevail.

3. Prior to undertaking any alterations to the plant, process, or operations, as specified in applications 140 and 3840 including accompanying documentation, which may significantly change the nature or quantity or concentration of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.

Operation of the cremators

4. The consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at a practicable minimum.

5. The cremators shall be designed and operated in order to prevent the discharge of smoke, fumes or other contaminants to air during the charging of the cremators.

6. The cremators shall only be fired on either liquid petroleum gas [LPG] or natural gas.

7. The cremators and all duct work shall be constructed and maintained leak proof and gas tight to prevent the discharge of gases from the duct work or cremator, other than through the stack.

8. The minimum stack height for the discharge of exhaust emissions from the cremators shall be eight metres above ground level.

9. The stack flue and duct work leading to the stack shall be adequately insulated to avoid or minimise the condensation of liquids or the formation of soot smuts.

10. The incineration of the waste gases in the secondary chamber shall be undertaken such that waste gases are held at a minimum temperature of 850°C for a minimum period of 2 seconds referenced to a standard oxygen content of 6% by volume on a wet gas basis.

11. The cremator shall be interlocked so as to prevent the introduction of a coffin to the primary chamber unless the temperature in the secondary combustion zone exceeds 650°C.

12. The concentration of oxygen at the outlet from the secondary combustion chamber shall exceed 6% by volume on a wet gas basis at all times.

13. The Chief Executive, Taranaki Regional Council, shall be notified at least 24 hours prior to any visit to the site by any agent of the supplier of the cremators or of the consent holder for the purpose of any maintenance that may affect or include the calibration, monitoring, or process control of the cremators.

14. The consent holder shall take reasonable steps to reduce and minimise the quantity of materials [such as PVC, metals, and other materials listed in the guidelines published by the Australasian Cemeteries and Crematoria Association [May 2004]: *Contents of Coffins Delivered for Cremation*] combusted within the cremator which are likely to generate unacceptable emissions.

Emission limits

15. In any one cremation cycle of the Elecfurn cremator, not more than two one-minute averages of the opacity readings shall exceed 20% obscuration or Ringelmann Scale 1.

16. In any one cremation cycle of the Newton cremator, not more than two one-minute averages of the opacity readings shall exceed 2% obscuration or Ringelmann Scale 1.

17. No discharge from the premises shall give rise to an odour at ground level that in the opinion of at least one officer of the Taranaki Regional Council is offensive or obnoxious or objectionable.

18. The consent holder shall not discharge any contaminant to air from the site at a rate or a quantity such that the contaminant, whether alone or in combination with other contaminants, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the site.

19. In addition to the generality of conditions 2, 4, and 5 the discharge of specified air pollutants from the cremator stack shall not exceed the corresponding emission rates set out hereto when averaged over a single cremation cycle.

total particulate matter	80 mg/m^3
hydrogen chloride	200 mg/m^3

All emission concentrations shall be corrected to 0 [zero] degrees Celsius, 1 [one] atmosphere pressure, 11 [eleven] percent oxygen and dry gas basis.

Monitoring

20. The temperature of gases within or at the outlet of the secondary chamber shall be continuously monitored and recorded.

21. The opacity of the exhaust gases shall be continuously monitored and recorded using an appropriately calibrated photo-electric instrument sited in the flue prior to discharge. The output of this device shall be corrected for path length and temperature as set out in 'Addendum No.1 [1972] to BS2742:1969'.

22. The consent holder shall undertake commissioning source emission tests for the Elecfurn 2500 cremator. The tests:

    a) shall be undertaken within 3 months of the consent being granted;

    b) shall be conducted to determine compliance with condition 19; and

    c) shall comprise no less than three separate samples for each type of emission test undertaken.

23. At the written request of the Chief Executive, Taranaki Regional Council, the consent holder shall undertake emission tests on discharges from each of the cremators. This emission testing:

    a) shall be undertaken for all pollutants that are requested to be tested in writing by the Chief Executive, Taranaki Regional Council, for the volumetric flow of combustion gases, and for the oxygen concentration at the exit of the secondary chambers and at the test ports;

    b) shall, for each sample, be conducted over a complete cremation cycle, commencing as soon as typical operating conditions have been achieved, ending once calcining is complete, and over a period of at least one hour; and

    c) shall comprise not less than three separate samples for each type of emission test undertaken, and shall have the concentration results corrected to 0 [zero] degrees Celsius, 1 [one] atmosphere pressure and on a dry gas basis.

    Note: this condition will not be initiated without prior consultation with the consent holder.

24. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, upon request, all monitoring [including results of all tests, relevant operating parameters, raw data, all calculations, assumptions and an interpretation of the results], and calibration and process control data whether generated and held by an operator, any automated process control systems or any agent of the consent holder.

Review

25. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2002 and/or June 2006 and/or June 2008, for the purpose of:

    a) adding, amending or deleting any limit on discharge or ambient concentrations or any contaminant or contaminants; and/or

    b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to the environment; and/or

    c) requiring the consent holder to install, calibrate an/or maintain any monitoring and/or recording device to monitor combustion conditions or environmental performance of the cremators; and/or

    d) ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent which were not foreseen at the time the application was considered.

Signed at Stratford on 11 October 2010

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5205-1

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH
Change To Conditions Date:	13 July 2005 [Granted: 4 December 1997]

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the operation of a crematorium including a Newton Cremator and the supplementary operation of an Elecfurn HH2500 Cremator at or about GR: P19:065-309
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2006, June 2008
Site Location:	Taranaki Crematorium, 629 Junction Road, New Plymouth
Legal Description:	Pt 1 DP 8125 Hua & Waiwhakaiho Hundred Blk X Paritutu SD
Catchment:	Waiwhakaiho
Tributary:	Mangorei

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

Best practicable option

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effects on the environment arising from discharges to air from the site.

2. The consent holder shall adhere to and comply with the procedures, requirements, obligations, and all other matters stipulated within applications 140 and 3840 including supporting documentation, inasmuch as related to the exercise of this resource consent. In the case of any contradiction between the documentation submitted in support of applications 140 and 3840, the conditions of this consent, the conditions of this consent shall prevail.

3. Prior to undertaking any alterations to the plant, process, or operations, as specified in applications 140 and 3840 including accompanying documentation, which may significantly change the nature or quantity or concentration of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.

Operation of the cremators

4. The consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at a practicable minimum.

5. The cremators shall be designed and operated in order to prevent the discharge of smoke, fumes or other contaminants to air during the charging of the cremators.

6. The cremators shall only be fired on either liquid petroleum gas [LPG] or natural gas.

7. The cremators and all duct work shall be constructed and maintained leak proof and gas tight to prevent the discharge of gases from the duct work or cremator, other than through the stack.

8. The minimum stack height for the discharge of exhaust emissions from the cremators shall be eight metres above ground level.

9. The stack flue and duct work leading to the stack shall be adequately insulated to avoid or minimise the condensation of liquids or the formation of soot smuts.

10. The incineration of the waste gases in the secondary chamber shall be undertaken such that waste gases are held at a minimum temperature of 850°C for a minimum period of 2 seconds referenced to a standard oxygen content of 6% by volume on a wet gas basis.

11. The cremator shall be interlocked so as to prevent the introduction of a coffin to the primary chamber unless the temperature in the secondary combustion zone exceeds 650°C.

12. The concentration of oxygen at the outlet from the secondary combustion chamber shall exceed 6% by volume on a wet gas basis at all times.

13. The Chief Executive, Taranaki Regional Council, shall be notified at least 24 hours prior to any visit to the site by any agent of the supplier of the cremators or of the consent holder for the purpose of any maintenance that may affect or include the calibration, monitoring, or process control of the cremators.

14. The consent holder shall take reasonable steps to reduce and minimise the quantity of materials [such as PVC, metals, and other materials listed in the guidelines published by the Australasian Cemeteries and Crematoria Association [May 2004]: *Contents of Coffins Delivered for Cremation*] combusted within the cremator which are likely to generate unacceptable emissions.

Emission limits

15. In any one cremation cycle, not more than two one-minute averages of the opacity readings shall exceed 20% obscuration or Ringelmann Scale 1.

16. No discharge from the premises shall give rise to an odour at ground level that in the opinion of at least one officer of the Taranaki Regional Council is offensive or obnoxious or objectionable.

17. The consent holder shall not discharge any contaminant to air from the site at a rate or a quantity such that the contaminant, whether alone or in combination with other contaminants, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the site.

18. In addition to the generality of conditions 2, 4, and 5 the discharge of specified air pollutants from the cremator stack shall not exceed the corresponding emission rates set out hereto when averaged over a single cremation cycle.

total particulate matter	80 mg/m^3
hydrogen chloride	200 mg/m^3

All emission concentrations shall be corrected to 0 (zero) degrees Celsius, 1 (one) atmosphere pressure, 11 (eleven) percent oxygen and dry gas basis.

Monitoring

19. The temperature of gases within or at the outlet of the secondary chamber shall be continuously monitored and recorded.

20. The opacity of the exhaust gases shall be continuously monitored and recorded using an appropriately calibrated photo-electric instrument sited in the flue prior to discharge. The output of this device shall be corrected for path length and temperature as set out in Addendum No.1 (1972) to BS2742:1969'.

21. The consent holder shall undertake commissioning source emission tests for the Elecfurn 2500 cremator. The tests:

    a) shall be undertaken within 3 months of the consent being granted;

    b) shall be conducted to determine compliance with condition 18; and

    c) shall comprise no less than three separate samples for each type of emission test undertaken.

22. At the written request of the Chief Executive, Taranaki Regional Council, the consent holder shall undertake emission tests on discharges from each of the cremators. This emission testing:

    a) shall be undertaken for all pollutants that are requested to be tested in writing by the Chief Executive, Taranaki Regional Council, for the volumetric flow of combustion gases, and for the oxygen concentration at the exit of the secondary chambers and at the test ports;

    b) shall, for each sample, be conducted over a complete cremation cycle, commencing as soon as typical operating conditions have been achieved, ending once calcining is complete, and over a period of at least one hour; and

    c) shall comprise not less than three separate samples for each type of emission test undertaken, and shall have the concentration results corrected to 0 (zero) degrees Celsius, 1 (one) atmosphere pressure and on a dry gas basis.

    Note: this condition will not be initiated without prior consultation with the consent holder.

23. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, upon request, all monitoring [including results of all tests, relevant operating parameters, raw data, all calculations, assumptions and an interpretation of the results], and calibration and process control data whether generated and held by an operator, any automated process control systems or any agent of the consent holder.

Review

24. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2002 and/or June 2006 and/or June 2008, for the purpose of:

    a) adding, amending or deleting any limit on discharge or ambient concentrations or any contaminant or contaminants; and/or

    b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to the environment; and/or

    c) requiring the consent holder to install, calibrate an/or maintain any monitoring and/or recording device to monitor combustion conditions or environmental performance of the cremators; and/or

    d) ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent which were not foreseen at the time the application was considered.

Signed at Stratford on 13 July 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management