IN THE HIGH COURT OF NEW ZEALAND
NEW PLYMOUTH REGISTRY — CIV 2013-443-107

UNDER	**the Judicature Amendment Act 1972 and the Declaratory Judgments Act 1908**
IN THE MATTER	**of an application for judicial review and an application for a declaration**
BETWEEN	**NEW HEALTH NEW ZEALAND INC**
	Plaintiff
AND	**SOUTH TARANAKI DISTRICT COUNCIL**
	Defendant

AFFIDAVIT OF GRAHAM MARK ATKIN

Dated 5 November 2013

Solicitor
Wynn Williams Lawyers
Homebase
Unit B 195 Marshland Road
Shirley
P O Box 4341
Christchurch
Ph: (03) 379 7622
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Level 8, Wakefield House
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PO Box 8045
Wellington 6143
Ph: 914 1052
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Email: l.hansen@barristerscomm.com

GMA

I, Graham Mark Atkin, company director of Lower Hutt affirm:

1. I am known as Mark Atkin.

2. I have a Bachelor's degree in Chemistry, conferred in 1980, and an Honours degree in Law, conferred in 2003, both from Victoria University of Wellington.

3. I completed my Masters level thesis for my Law degree on decisionmaking on fluoridation in New Zealand in 2002.

4. I have been involved in the fluoridation issue since the 1970s, and most intensively since 1999. I have read significant amounts of original research on this subject, both supporting and opposing fluoridation. I have conducted my own analyses of Government data on this issue.

5. I was a submitter to the South Taranaki District Council and my submission is contained at Volumes 3 and 4 of the Common Bundle.

6. I have read the affidavits of Stewart Jesamine, Gregory Simmons, John McMillan, Howard Wilkinson, Robyn Haisman-Welsh, Robin Wyman and Sandra Pryor.

7. I have been asked by the plaintiff to provide information to the court about the chemicals used in fluoridation in response to claims by the defendant's witnesses that fluoridation is safe.

Process of HFA production

8. The natural form of fluorine that occurs in NZ water and around the world is calcium fluoride. The natural level of calcium fluoride in NZ is typical 0.01ppm to 0.2ppm, but can be up to 0.3ppm. This is the common or typical level of calcium fluoride in water around the world. Some parts of the world have excessive levels of calcium fluoride (up to 35ppm). This causes crippling and sometimes fatal adverse health effects.

9. Fluoridation is defined by the US Heritage Dictionary as "The addition of a fluorine compound to a drinking water supply for the purpose of reducing tooth decay". It is the addition of fluorine compounds to achieve an elevated level of fluorine in the water supply.

10. In 2001 I made a request under the Local Government Official Information and Meetings Act of the Wellington Regional Council about the chemicals used in water fluoridation.

11. I received the documents attached and marked "A".

12. I refer specifically to the production of Hydrofluorosilicic Acid ("HFA"), and summarise that process.

    a. The HFA is derived from superphosphate manufacture. Toxic fluoride gases (Hydrofluoric Acid and Silicon Tetrafluoride) are produced in the manufacture of superphosphate. It is illegal to allow these gases to escape into the atmosphere due to their toxicity and environmental impact.

b. To meet emission limits, the gases are "scrubbed" from the effluent stacks by spraying water into the stacks. The gases chemically react with the water to produce HFA and fine particles of silica ("white sand"). This process is required whether or not the plant supplies HFA for water fluoridation purposes.

c. If the plant supplies HFA for water fluoridation purposes the scrubber system is modified to produce a more concentrated solution of HFA.

d. The HFA is filtered to remove the silica. It undergoes not other refinement or purification before being sold for use in water fluoridation.

13. The chemistry and toxicology of fluorosilicates and lack of adequate study of these compounds is discussed in Kathleen Thiessen's affidavit dated 29 October 2013 at paragraph [61].

14. The HFA contains heavy metal contaminants. These include, notably, arsenic, mercury, and lead.

15. The allowable levels of heavy metal contaminants in products used for water fluoridation is set in New Zealand by Water NZ (formerly the Water and Wastes Association of NZ), in its standard published in 1997. This is a private, industry-funded, organization; not a Government organization. The standard defines "water treatment grade".

16. Hirzy *et al*[1] describe the HFA meeting this standard as "Technical grade". That is consistent with my understanding of the range of chemical grades, from Analytical grade and "BP" (pharmaceutical) grade through to industrial or Technical grade.

17. *Fine Chemicals and Chemical Solutions* defines "technical grade" at http://www.reagents.com/products/reagents/grades.html as:

> A grade suitable for general industrial use.

18. *The Science Company* at http://www.sciencecompany.com/Chemical-Grade-Designations-W53C665.aspx defines "technical grade" as:

> A good quality chemical grade used for commercial or industrial purposes. Not pure enough to be offered for food drug or medicinal use of any kind.

19. The allowable heavy metal contaminant levels under the Water NZ standard are:

---

[1] Hirzy JW, Carton RJ, Bonanni CD, Montanero CM, Michael F, Nagle MF. 2013. Comparison of hydrofluorosilicic acid and pharmaceutical sodium fluoride as fluoridating agents—A cost–benefit analysis. *Environmental Science & Policy* 29: 81-86 (May)

Contaminant	mg/kg (mg per kg of fluorine)
Antimony	148
Arsenic	495
Cadmium	148
Lead	495
Mercury	99
Nickel	990
Selenium	495

20. I have written to Water NZ asking how these limits were derived. Water NZ has provided no information that meets that request.

21. Once the chemical is diluted one million times by the public water supply, the levels fall below the Maximum Allowable Values (MAVs) set in the NZ Water Standards. It is my understanding that the MAVs for these contaminants do not ensure absolute safety. They just recognise that it is impossible to remove naturally occurring levels of the substances. They are therefore set at a practical level that avoids an excessive health risk.

22. In 1983 Rebecca Hamner, Deputy Assistant Administrator For Water, U.S. EPA, stated in a letter to a Mr Leslie Russell dated 30 March 1983:

> In regard to the use of fluosilicic acid as the source of fluoride for fluoridation, this agency regards such use as an ideal solution to a long standing problem. By recovering by-product fluosilicic acid from fertilizer manufacturing, water and air pollution are

scm

minimized, and water authorities have a low-cost source of fluoride available to them.

23. This letter is attached and marked "B".

24. Of the contaminants there are two metals for which the US EPA's Maximum Contaminant Level Goal is zero: arsenic and lead.

25. Arsenic is a known human carcinogen for which there is no safe level.

26. It is my understanding that fluoridation chemical would typically add 0.43 ppb arsenic to the finished water. I attach the transcript of a letter marked "C" from Thomas Reeves (CDC) to Paul Connett dated January 2001 advising of 0.43 level. Analysis by Opflow found the level to be within the range of 0.248 to 0.306 ppb. A document entitled "Treatment Chemicals Contribute to Arsenic Levels" is attached and marked "D".

27. In the USA, fluoride levels are typically increased from an average of 0.2 ppm to the new standard of 0.7 ppm.[2] In NZ we typically increase levels from a typical 0.1 ppm to 0.85 ppm. Using the NSF data, the typical contribution of arsenic from HFA in NZ is therefore 0.645 ppb. This is based on the following calculations (using the NSF figure).

Amount used in USA = 0.7-.0.2.= 0.5/litre
Amount used in NZ = 0.85 - 0.1 = 0.75
Arsenic contributed by 0.5 = 0.43 ppb
Arsenic contributed by 0.75 = 0.43 x
0.75/0.5 = 0.645 ppb
Consumption used for fluoridation level is

---

[2] ibid

1.5 litres water per day
$0.645 \times 1.5 \times 3.5 \times 10^{-5} \times 4.4$ m people x
52% / 70 years = 1.107 deaths per year

28. Applying EPA's risk factor of 3.5×10^{-5} deaths per 70 year lifetime per microgram arsenic we would expect 1.1 cancer deaths per year with the present 52% of the population drinking fluoridated water, or 2.1 deaths per year if all NZ were fluoridated. This assumes people drink 1.5 litres of water per day, being the basis for current fluoridation levels. The calculation does not allow for the additional exposure from beverages and foods made with fluoridated water, or absorption through the skin during showering or bathing.

29. The unit risk of 3.5×10^{-5} was derived from data appearing in Table III D-2[a] in "Environmental Protection Agency. National primary Drinking Water Regulations; Arsenic and clarifications to compliance and new source contaminants monitoring; Final Rule: *Federal Register* **66** (14), 6975-7066 January 22, 2001. The referenced table appears at page 7008.

30. The Taranaki District Health Board has advised in response to an Official Information Act request by Imelda Hitchcock of Timaru that it did not hold a certificate of human health safety for HFA; nor has it ever sought one. A copy of that letter is attached and marked "E".

31. On 21 October 2013 I asked the Defendant if it holds a certificate of human health safety for HFA. The Defendant's response of 30 October

2013 advises that it does not have and has not sought such a certificate of safety. A copy of the letter is attached and marked "F".

AFFIRMED at Wellington this 5th)

day of November 2013

before me:

A Barrister ~~and Solicitor~~ of the High Court of New Zealand
Sandra Catherine McIver

'A'

THE REGIONAL COUNCIL

THIS is the Exhibit marked with the letter ....A.... referred to in the annexed affidavit of GRAHAM MARK ATKIN AFFIRMED ~~SWORN~~ at WELLINGTON this 5th day of November 2013 before me:

Barrister

A ~~Solicitor~~ of the High Court of New Zealand

caring about you & your environment

Office of the Chairperson

File: E/1/5/2
Ltr Mark Atkin re Fluoride from Chairman.doc

15 October 2001

Mr Mark Atkin
5 Tarras Grove
Kelson
Hutt City

Dear Mr Atkin

Fluoride

In your letter of 27 September, you requested information on five fluoride related issues The response to these particular issues are:

1. The Wellington Regional Council has corresponded with its supplier by email. A copy of the various emails are attached.
2. A copy of report 01.686 considered by the Council is attached.

With regards to issues 3, 4 and 5, the Council has asked Fernz Chemicals for a response. The request letter and the reply are attached. We do not have any further information about the fluoride production in Japan.

Yours faithfully

STUART MACASKILL
Chairman

Mark Atkin,
5 Tarras Grove,
Kelson,
Hutt City.

27 Septemeber 2001.

Stuart MacGaskill,
Wellington Regional Council.

Request under Local Government Official Information and Meetings Act 1987.

In light of the WRC's position that the fluoride-containing chemicals used in the water supply are not industrial waste products, please supply the following:

1) Copies of the correspondence between the WRC and suppliers of these chemicals relating to their production.
2) A copy of the WRC's report on this matter.

Please advise the following if not contained in the above:

3) What is the primary purpose of the industrial installations in question (in processes the rock phosphate); is it to produce fluorides or is it to produce superphosphate.
4) What products are produced from this processing and what are their relative proportions.
5) Where in the processing is the fluoride extracted, specifically is it or is it not from the scrubbers on the exhaust flues, and in the case of the New Zealand plant, would that plant be allowed under its resource consent/discharge permit to emit the hydrofluorosilicic acid into the environment (by decommissioning the scrubbers or otherwise).

Yours faithfully,

1266

3.17.1

Helga Perry

From: Cast, Nicola [Nicola.Cast@nz.nufarm.com]
Sent: Tuesday, 21 August 2001 08:13
To: 'Dan Roberts'
Subject: RE: Fluoride Manufacture

This is just a quick note to confirm I am still working on your request. I am just awaiting confirmation regarding the grade of HFA that is used in the product.

Regards

Nicola Cast

-----Original Message-----
From: Dan Roberts [mailto:Dan.Roberts@wrc.govt.nz]
Sent: Monday, 13 August 2001 11:35
To: 'Cast, Nicola'
Subject: RE: Fluoride Manufacture

Many thanks for your assistance however I wonder whether you can glean any information from your supplier of sodium silicofluoride .I understand that it is manufactured in Japan.
We have the MSDS but require if possible the actual process of manufacture.
there is a certain amount of discussion occurring as to whether it is deived from a waste product resulting from the production of fertilizer.
Sorry to hassle you .
Dan Roberts.

> -----Original Message-----
> From: Cast, Nicola [SMTP:Nicola.Cast@nz.nufarm.com]
> Sent: Monday, 13 August 2001 07:24
> To: 'Dan.Roberts@WRC.govt.nz'
> Subject: Fluoride Manufacture
>
> Dan,
>
> Hopefully this is the information you require. There is not great detail
> about Sodium Silicofluoride manufacture, this is all the information they
> provided. If you require more I will give it another go.
>
> Thank you.
>
>
> Nicola Cast
> Technical Rep
> Fernz Chemicals
>
> phone 025 248 1022
>
> <<Fluoride Manufacture.doc>>
>
>

Fernz Chemicals

Fernz Chemicals (NZ) Kiwitahi Road, PO Box 105, Morrinsville, New Zealand
Telephone 64-7-889 3400, Facsimile 64-7-889 7457
Nufarm Ltd Registered Office: Victoria, Australia. NZ Branch Office: Auckland, New Zealand
A Trading Division of Nufarm Ltd

B 4 6 1

M. Kennedy

Wellington Regional Council
PO Box 11-646
WELLINGTON

Attention: Mr M Kennedy

Dear Mr Kennedy,

Thank you for your questions regarding the production of fluoride chemicals for the addition to potable water treatment in New Zealand.

The three questions, which have been raised, are as follows:

3 The HFA plant is owned by an entirely separate company to the Super Phosphate manufacture. The actual HFA facility is located in a Super Phosphate manufacturing plant. The HFA plant is operated specifically to meet the requirement for fluoridation of New Zealand water supplies.

The HFA production unit is separate from the main scrubber systems but in order to operate, it draws fluoride compounds from the main scrubber system (the HFA plant was moved to this site in 1995, due to fertiliser industry restructuring. Up until this time the super phosphate manufacturing site in question had not been capable of making HFA for supply but had systems to deal with gas emissions and scrubber liquor).

4 The product produced in the HFA plant is solely for the purpose of supplying fluoride chemicals for potable water in New Zealand and is manufactured within the NZWWA supply managers' standards.

5 The main scrubber system for a super phosphate process is integral and allows for the handling of emissions in a manner that achieves resource consent and discharge consent. The HFA plant is not required to operate the super phosphate operations.

I trust these answers address your questions and reiterate that this product is made to nationally and internationally published standards.

Yours sincerely

Sean Eccles
Sales and Marketing Manager

73161

caring about you & your environment

Report 01.686
29 August 2001
File: B/4/6/1
Report 01.686.doc

Report to the Wellington Regional Council
from Murray Kennedy, Strategy and Asset Manager

Manufacture of Fluoridation Products

1. Purpose

To provide advice on the manufacture of fluoridation products.

2. Background

In July, the Council considered Report 01.524 – Water Fluoridation Petition. The petition claimed that sodium silicofluoride added to our drinking water is an industrial waste. Councillors requested information on the fluoride manufacturing processes.

Two different types of fluoride are added to raise the natural fluoride level in the drinking water;

- Sodium fluorosilicate, a powder which is added at Te Marua and Waterloo water treatment plants,
- Hyrdofluorosilicic acid, a liquid which is added at the Gear Island water treatment plant.

Advice has now been received from FERNZ Chemicals, the supplier of both products, as to how they are manufactured.

3. Manufacture of Sodium Silicofluoride

FERNZ Chemicals source this product from Mitsui Chemicals in Japan. Mitsui use the following process to manufacture it.

(i) React natural phosphoric ore (which contains a fluoride compound) with sulphuric acid. One of the products of this reaction is hydrofluosilicic acid.

(ii) Concentrate the hydrofluosilicic acid.

(iii) Add sodium hydroxide (caustic soda) to hydrofluosilicic acid to obtain sodium silicofluoride.

4. Manufacture of Hydrofluosilicic Acid

FERNZ Chemicals manufacture hydrofluosilicic acid at Mt Maunganui. The process is the same as 3(i) and 3 (ii) above.

5. Comment

The recent petition was organised under the banner of the Pure Water Association, as part of its campaign to have fluoridation stopped. The association has been persistent in the view that the fluoride additive was an industrial waste. Following Council consideration of the petition, three letters about fluoridation were published by the Evening Post on 28 July, Attachment 1. It is alleged the Council is using toxic industrial waste. This is incorrect. The two fluoridation products used by the Council are made through standard chemical processes. Both use naturally occurring phosphate rock.

6. Recommendations

(1) That the report is received and its contents noted.

(2) That the Pure Water Association is advised how the fluoride used by the Council is manufactured.

Report prepared by:

M D KENNEDY
Strategy and Asset Manager

Approved for submission:

DAVID BENHAM
Divisional Manager, Utility Services

Attachments

Attachment 1

Helga Perry

From:	Cast, Nicola [Nicola.Cast@nz.nufarm.com]
Sent:	Friday, 31 August 2001 15:58
To:	'Dan.Roberts@WRC.govt.nz'
Subject:	FW: Sodium Silicofluoride Manufacture

Dan,

I have finally had a reply from Shinwa (our Sodium Silicofluoride supplier. This is a copy of the last of many e-mails that were send to them and the reply. Hopefully this contains enough information. If not please get back to me and I will continue the saga.

Regards

Nicola Cast
Fernz Chemicals
phone 025 248 1022

-----Original Message-----
From: Shinwa Trading (Tatekawa) [mailto:hiro@shinwatrading.com]
Sent: Thursday, 30 August 2001 13:11
To: Cast, Nicola
Subject: Re: Sodium Silicofluoride Manufacture

Aug. 30, 2001

"Mitsui" advised as follows.

1) Raw materials for Hydrosillicofluoric Acid are:-

Phosphoric Ore and
Sulphuric Acid

2) Production process for Hydrosilicofluoric Acid are:-

a) React Phosphoric Ore and Sulphuric Acid

Phosphoric Ore include Fluoborate, Silicate, P, Ca etc and decompose by Sulphuric Acid ← and liquid of Hydrosilicofluoric Acid is obtained.

$$6HF + SiO2 = H2SiF6 + 2H2O$$

This is NOT the reaction. This is reverse of what happens when H_2SiF_6 is dissolved in water.

b) Heat and cool down above Hydrosilicofluoric Acid liquid to make concentrated liquid

c) Add Caustic Soda into concentrated liquid of Hydrosilicofluoric Acid and obtain Sodium Silicofluoride

Hope above information is OK but if you have further question, please do not hesitate to contact us again.

Regards

----- Original Message -----
From: Cast, Nicola <Nicola.Cast@nz.nufarm.com>
To: <hiro@shinwatrading.com>
Sent: Wednesday, August 29, 2001 9:18 AM
Subject: Sodium Silicofluoride Manufacture

> Hiro,
>
> I am just wondering how you are going regarding getting the information my
> customer requires regarding the quality of the Hydrofluorosilicic acid
used
> in Sodium Silicofluoride manufacture. This is becoming a very urgent
issue
> as local ratepayers require the information as they believe they are
getting
> a waste product. Verification would be most appreciated.
>
> Thank you.
>
> Nicola Cast
> Fernz Chemicals
> Fax +64 +4 568 3595
>
>
> **
> This email and any files transmitted with it are confidential and
> intended solely for the use of the individual or entity to whom they
> are addressed. If you have received this email in error please notify
> the sender.
>
> **

3|7|1

Helga Perry

From: Cast, Nicola [Nicola.Cast@nz.nufarm.com]
Sent: Monday, 13 August 2001 07:24
To: 'Dan.Roberts@WRC.govt.nz'
Subject: Fluoride Manufacture

Fluoride Manufacture.doc

Dan,

Hopefully this is the information you require. There is not great detail about Sodium Silicofluoride manufacture, this is all the information they provided. If you require more I will give it another go.

Thank you.

Nicola Cast
Technical Rep
Fernz Chemicals

phone 025 248 1022

<<Fluoride Manufacture.doc>>

> with new viruses.
>
> If you do not know or trust the sender of this message
> do not open the attachments. If it appears to contain
> work related material contact the IT help desk,
> otherwise delete it.
>
> For information on the WRC's policy regarding Email
> viruses look at the WRC Intranet page http://wrcweb/CouncilDocs/Email.doc
>
> ~~~~~~
> << File: Fluoride Manufacture.doc >>

Fluoride Manufacture

Hydrofluosilicic Acid

Fluosilicic acid is a by-product of superphosphate production.

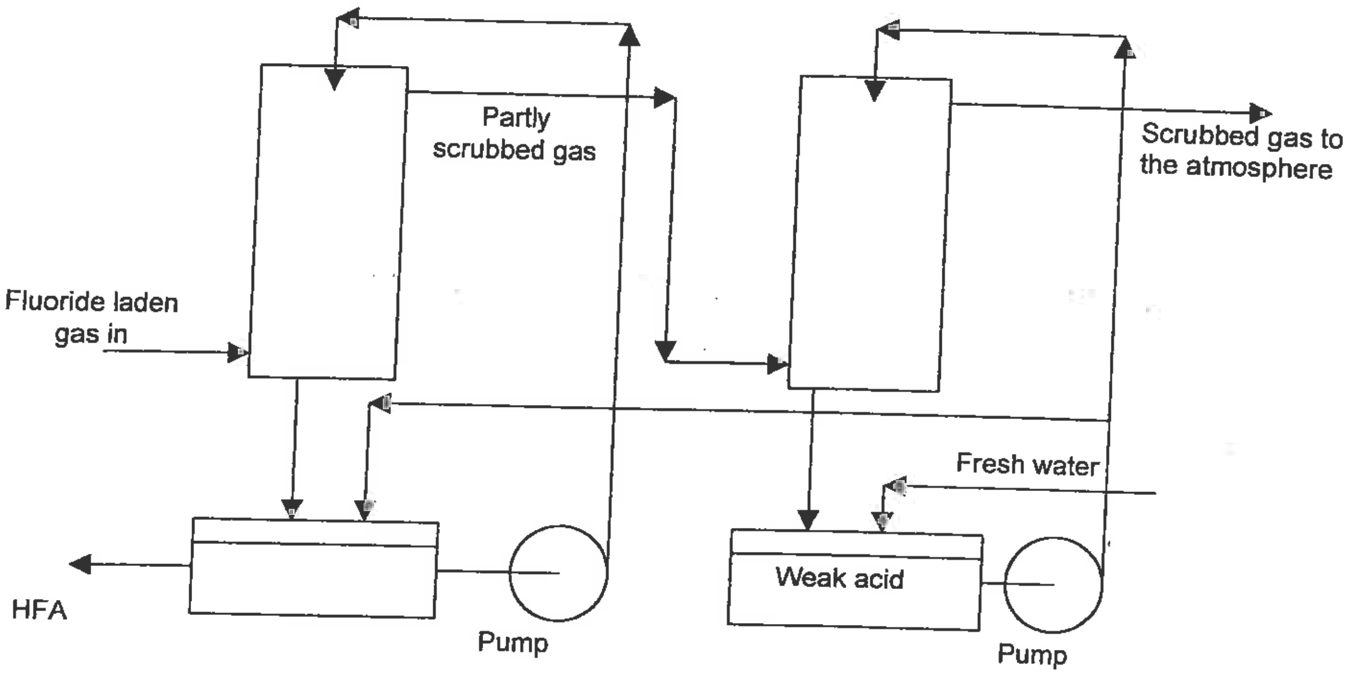
Superphosphate is manufactured by mixing together finely ground phosphate rock and Sulphuric Acid. A vigorous reaction occurs with considerable gas evolution. The gases given off are mainly steam and carbon dioxide, but there is also a small quantity of fluoride. This arises from fluoride and silica impurities in the phosphate rock and is principally silicon tetrafluoride. Every fertiliser works has a gas scrubber as an integral part of its manufacture plant because of the gas production. Silicon tetrafluoride reacts readily with water, so the gas scrubber is essentially a means of contacting the gas stream with small droplets of water. The reaction with water hydrolyses the silicon tetrafluoride according to the equation:

$$3SiF_4 + 2H_2O \leftrightarrow 2H_2SiF_6 + SiO_2$$

In this way 99% of the fluoride is removed from the gas stream, leaving only a very small quantity to be emitted to the atmosphere. The liquid from the scrubber is usually a dilute solution of fluosilicic acid, with solid silica suspended in it. To gain water treatment quality fluoride the scrubber is slightly modified to produce a higher quality product. The scrubbing process is divided into two or more stages with acid of different concentration in each. The yields an acid of approximately 16% H_2SiF_6, but can be variable. The following diagram shows a typical scrubber installation. Water and gas are made to flow "countercurrent" to each other so that gas rich in fluoride is contacted by strong acid and gas weak in fluoride meets very dilute acid. Strong acid is pumped away from the first scrubber and filtered to remove silica before being sold.

Sodium Silicofluoride

Sodium Silicofluoride is then made using fluorosilicic acid that undergoes a complex neutralising reaction using sodium carbonate.



Typical Fluoride Gas Scrubbing Plant

'B'

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 30 1983

OFFICE OF
WATER

Leslie A. Russell, D.M.D.
363 Walnut Street
Newtonville, Mass. 02160

Dear Dr. Russell:

Thank you for your letter of March 9, 1983, in regard to the fluoridation of drinking water.

The information available to the Environmental Protection Agency is that fluoridation is a safe and effective means for reducing the occurrence of dental caries. The fluoridation process has been endorsed by several Presidents of the United States and by several Surgeons General, including the current Surgeon General, Dr. C. Everett Koop. A copy of Dr. Koop's statement on fluoridation is enclosed.

Water treatment chemicals, including fluosilicic acid, have been evaluated for their potential for contributing to the contamination of drinking water. The Water Treatment Chemicals Codex, published by the National Academy of Sciences, prescribes the purity requirements for fluosilicic acid and other fluoridation chemicals.

In regard to the use of fluosilicic acid as a source of fluoride for fluoridation, this Agency regards such use as an ideal environmental solution to a long-standing problem. By recovering by-product fluosilicic acid from fertilizer manufacturing, water and air pollution are minimized, and water utilities have a low-cost source of fluoride available to them. I hope this information adequately responds to your concern.

Sincerely yours,

Rebecca Hanmer

Rebecca Hanmer
Deputy Assistant Administrator
for Water

Enclosure

THIS is the Exhibit marked with the letter B referred to in the annexed affidavit of GRAHAM MARK ATKIN
AFFIRMED ~~SWORN~~ at Wellington
this 5th day of November 2013 before me:

Barrister ~~Solicitor~~
A Barrister of the High Court of New Zealand

6 C 7

THIS is the Exhibit marked with the letter..C....
referred to in the annexed affidavit of
AFFIRMED ~~SWORN~~ at GRAHAM MARK ATKIN
this 5th day of November 2013 before me:
Barrister [signature]
A ~~Solicitor~~ of the High Court of New Zealand

Manufacture of Fluoride Chemicals

Letter from Thomas Reeves, CDC Fluoridation Engineeer to Paul Connett, Director Fluoride Action Network. (IFIN 2001)

"The Manufacture of Fluoride Chemicals

"A number of questions have been raised about the fluoride chemicals used in water fluoridation.

"This communication will attempt to respond to those concerns.

"All of the fluoride chemicals used in the U.S. for water fluoridation, sodium fluoride, sodium fluorosilicate, and fluorosilicic acid, are byproducts of the phosphate fertilizer industry. The manufacturing process produces two byproducts: (1) a solid, calcium sulfate (sheetrock, CaSo4); and (2) the gases, hydrofluoric acid (HF) and silicon terafluoride (SiF4). A simplified explanation of this manufacturing process follows: Apatite rock, a calcium mineral found in central Florida, is ground up and treated with sulfuric acid, producing phosphoric acid and the two byproducts, calcium sulfate and the two gas emissions. Those gases are captured by product recovery units (scrubbers) and condensed into 23% fluorosilicic acid. Sodium fluoride and sodium fluorosilicate are made from this acid.

"The question of toxicity, purity, and risk to humans from the addition of fluoride chemicals to the drinking water sometimes arises. Almost all of over 40 water treatment chemicals that may be used at the water plant are toxic to humans in their concentrated form, e.g., chlorine gas and the fluoride chemicals are no exception. Added to the drinking water in very small amounts, the fluoride chemicals dissociate virtually 100% into their various components (ions) and are very stable, safe, and non-toxic.

"Opponents of water fluoridation have argued that the silicofluorides do not completely dissociate under conditions of normal water treatment and thus may cause health problems. To counter these claims, the basic chemistry of this dissociation has been carefully reviewed. Scientists at the U.S.Environmental Protection Agency (EPA) and CDC epidemiologists have examined the research that opponents of water fluoridation cite. Both groups have concluded that these charges are not credible.

"The claim is sometimes made that no health studies exist on the silicofluoride chemicals used in water fluoridation. That is correct. We, the scientific community, do not study health effects of concentrated chemicals as put into water, we study the health effects of the treated water, i.e., what those chemicals become: fluoride ion, silicates and the hydrogen ion. The health effects of fluoride have been analyzed by literally thousands of studies over 50 years and have been found to be safe and effective in reducing tooth decay. The EPA has not set any Maximum Contaminant Level (MCL) for the silicates as there is no know health concerns for them at the low concentrations found in drinking water. Of course, the hydrogen ion is merely a measurement of the pH of the water.

“Concern has been raised about the impurities in the fluoride chemicals. The American Water Works Association (AWWA), a well-respected water supply industry association, sets standards for all chemicals used in the water treatment plant, including fluoride chemicals. The AWWA standards are ANSI/AWWA B701-99 (sodium fluoride), (ANSI/AWWA B702-99 (sodium fluorosilicate) and ANSI/AWWA B703-00 (fluorosilicic acid). Also, the National Sanitation Foundation (NSF) sets standards and does product certification for products used in the water industry, including fluoride chemicals. ANSI/NSF Standard 60 sets standards for purity and provides testing and certification for the fluoride chemicals. Standard 60 was developed by NSF and a consortium of associations, including AWWA and the American National Standards Institute (ANSI),. Standard 60 provides for product quality and safety assurance that aims to prevent the addition of harmful levels of contaminants from water treatment chemicals. More than 40 states have laws or regulations requiring product compliance with Standard 60. NSF tests the fluoride chemicals for the 11 regulated metal compounds that have an EPA MCL. In order for a product [for example, fluorosilicic acid] to meet certification standards, regulated metal contaminants must be present at the tap [in the home] at a concentration of less than the percent of the MCL when added to drinking water at the recommended maximum use level. EPA has not set any MCL for the silicates as there is no know health concerns, but Standard 60 has a Maximum Allowable Level (MAL) of 16 mg/L [for sodium silicates as corrosion control agents] primarily for turbidity reasons. NSF tests have shown the silicates in the water samples to be well below these levels.

“Arsenic, according to NSF tests, had an average of 0.43 ug/L (parts per billion) in the drinking water attributable to the fluoride chemical. Opflow, a monthly magazine from the AWWA, has found the arsenic levels in the finished water from the fluorosilicic acid to be 0.245ug/L [Opflow, Vol 26, No. 10, October, 2000]. The NSF Standard 60 has a Maximum Allowable Level (MAL) of 2.5 ug/L and EPA has a MCL of 50 ug/L, although they have proposed to lower their MCL to 5 ug/L. As you can see arsenic is less than 1/10th of even the proposed EPA MCL. Finally, tests by NSF and other independent testing laboratories have shown no detectable levels of radionuclides in product samples of fluoride chemicals. There is no evidence that any of the known impurities in the fluoride chemicals have failed to meet any of these standards.

“Opponents of water fluoridation have sometimes charged that "industrial grade fluoride" chemicals are used at the water plant instead of pharmaceutical grade chemicals. All the standards of AWWA, ANSI, and NSF apply to these industrial grade fluoride chemicals to ensure they are safe. Pharmaceutical grade fluoride compounds are not appropriate for water fluoridation, they are used in the formulation of prescription drugs.

“Finally, it is sometimes alleged that the fluoride from natural sources, like calcium fluoride, is better than fluorides added "artificially", such as from the fluoride chemicals presently used. There is no difference.

“There is no reason to change the opinion of CDC that water fluoridation is safe and effective.

“DOH”

(Written at bottom) Reference - Tom Reeves, water engineer, CDC Jan-2001

'D'

THIS is the Exhibit marked with the letter....D......
referred to in the annexed affidavit of GRAHAM MARK ATKIN
AFFIRMED ~~SWORN~~ at ....Wellington....
this ..5th.. day of ....November.....2013 before me:

A ~~Solicitor~~ Barrister of the High Court of New Zealand

Treatment Chemicals Contribute to Arsenic Levels

By Cheng-nan Weng, Darrell B. Smith, And Gary M. Huntley

Arsenic is an issue that water utilities no longer can avoid. The US Environmental Protection Agency is expected to propose a reduction in the federal drinking water standard on arsenic from 50 µg/L to 5 µg/L later this year, although USEPA is also considering setting the maximum contaminant level at 3 µg/L, 10 µg/L, and 20 µg/L The final arsenic rule is due by Jan. 1, 2001.

Utilities should test their sources of water for arsenic and compare them with the proposed levels of 3, 5, and 10 µg/L. However, testing source water alone may not be sufficient to determine the arsenic load in finished water. Some treatment chemicals may also contain trace amounts of arsenic. Utilities should review and estimate the maximum possible arsenic concentrations contributed by the chemicals they use in drinking water treatment. Even trace amounts add up and may contribute a substantial portion—possibly up to 10 percent—of a 3 or 5 µg/L maximum contaminant level.

Connecticut Experience

The South Central Connecticut Regional Water Authority has three surface water treatment plants (SWTPs) and five wellfields. Recently, SCCRWA calculated the arsenic burden derived from chemicals routinely used to treat surface and groundwater at these facilities. Those chemicals are listed in Table 1.

To estimate the trace arsenic levels in the bulk treatment chemicals, data from the suppliers' analysis report or product specifications were used. The resulting trace arsenic concentrations in the finished water that were contributed by the treatment chemicals were computed by one of the following two methods:

1. For those chemicals with dosages expressed as mg/L of product chemicals (such as polymer, sulfuric acid, bimetallic zinc metaphosphate, and potassium permanganate), the resulting trace arsenic concentration in the finished water was computed by multiplying the chemical dosage by the trace arsenic level in the bulk treatment chemical.

2. For other chemicals (such as alum, ferric chloride, caustic soda, and fluorosilicic acid), a dilution factor was determined by dividing the chemical concentration by the chemical dosage. The resulting trace arsenic concentration in the finished water was computed by dividing the trace arsenic level in the bulk treatment chemical by the dilution factor.

Information produced by several calculations is tabulated as follows:

- Table 2 shows the maximum possible arsenic concentrations contributed by treatment chemicals for one surface water treatment plant that uses alum (0.279 µg/L arsenic contributed).
- Table 3 shows the maximum possible arsenic concentrations contributed by treatment chemicals for the wellfield, which uses sodium hypochlorite for disinfection (0.249 µg/L arsenic contributed).

Treatment Chemical	# Surface Water Treatment Plants (3 total)	# Groundwater Treatment Facilities (5 total)
Sodium hydroxide	3	Not used
Sulfuric acid	1	Not used
Alum	2	Not used
Potassium permanganate	2	Not used
Ferric chloride	1	Not used
Synthetic polymer A	1	Not used
Synthetic polymer B	1	Not used
Chlorine	3	4
Sodium hypochlorite	Not used	1
Bimetallic zinc metaphosphate	3	5
Fluorosilicic acid	3	5

Table 1. Chemicals routinely used by the South Central Connecticut Regional Water Authority, and the number of facilities where they are used.

- Table 4 shows the range of maximum arsenic contribution by treatment chemicals for the SCCRWA (range of all compounds, 0.0002-0.245 µg/L).
- Table 5 compares in finished water the calculated amount of arsenic that is contributed by treatment chemicals with the analytical result (overall calculated range, 0.248—0.306 µg/L; analytical result <1µg/L in all cases).

These data show that in finished water the theoretical arsenic concentrations attributable to normal dosages of water treatment chemicals are extremely low (Tables 2, 3, and 4). This conclusion is supported by the analytical data (Table 5), which show arsenic concentrations to be below 1.0 µg/L in all of the SCCRWA's surface and groundwater treatment facility finished waters.

Conclusion

If the standard were set at 3 µg/L, about 10 percent of the MCL would come from the treatment chemicals, hardly a minimal amount. It is also interesting to note that about 90 percent of the arsenic that would be contributed by treatment chemicals is attributable to fluoride addition.

If your processes include the addition of chemicals, ask your manufacturer for the amount of arsenic in each. If necessary, obtain conversion charts for diluted products, as well. Then calculate how much arsenic those chemicals will add to your finished water. If the total is close to the MCLs proposed by USEPA, you have reason for concern.

To find out more about the proposed arsenic rule, go to the agency's Web site, <www.epa.gov/safewater/arsenic.html>, or call the Safe Drinking Water Hotline at (800) 426-2791.

Cheng-nan "Mike" Weng, PhD, DEE, is senior water quality engineer; Darrell B. Smith is vice president of water quality and research, and Gary M. Huntley is water treatment manager for South Central Connecticut Regional Water Authority, 90 Sargent Drive, New Haven, CT 06511; (203) 624-6671.

Table 2. Arsenic contributed by chemicals used to treat surface water at Lake Gaillard Water Treatment Plant

Treatment Chemical	Amount of Arsenic in Product	Dosage	Calculation of Contribution	Arsenic Contribution
50% alum	0.25 mg/L	10 mg/L*	Chemical concentration of 50% alum = 650 mg/mL Dilution factor = 650 x 1,000 ÷10 = 65,000 Arsenic contribution = 0.25 ÷ 65,000 mg/L	0.00385 µg/L
Polymer A	< 0.5 mg/L	2.0 mg/L	Arsenic contribution = 0.5 mg/L x 2 mg/L	0.001µg/L
50% Sodium hydroxide (NaOH)	1.5 mg/L (maximum)	12.5 mg/L* (maximum)	Chemical concentration of 50% NaOH = 770 mg/mL Dilution factor = (770 x 1,000)÷12.5 = 61,600 Arsenic contribution = 1.5 ÷ 61,600 mg/L	0.024 mg/L
Fluorosilicic acid (H_2SiF_6)	Maximum = 60 mg/L Normal = 28 mg/L	1.0 mg/L* as F	H_2SiF_6 solution contains 20% F or 244.8 mg/mL of F F dosage = 1.0 mg/L as F Dilution factor = 244.8 x 1,000 ÷1.0 = 244,800 Maximum arsenic contribution = 60 / 244,800 mg/L = 0.245 µg/L Normal arsenic contribution = 28 ÷ 244,800 mg/L=0.114 µg/L	0.114 µg/L (normal) 0.245 µg/L (maximum)
Bimetallic zinc metaphosphate	<2 mg/L	1.7 mg/L	Arsenic contribution = 2 mg/L x 1.7 mg/L	0.0034 µg/L
Potassium permanganate ($KMnO_4$)	4.8 mg/L	0.35 mg/L	Arsenic contribution = 4.8 mg/L x 0.35 mg/L	0.00168 µg/L
Chlorine	All manufacturer reports indicate that arsenic is not present in gaseous chlorine.			0
Total arsenic contributed by treatment chemicals				0.279 µg/L (maximum)

*Based on dry equivalents.

Table 3. Arsenic contributed by chemicals used to treat groundwater at North Cheshire Wellfield

Treatment Chemical	Amount of Arsenic in Product	Dosage	Calculation of Contribution	Arsenic Contribution
Sodium hypochlorite (NaOCl)	0.8 mg/L (maximum)	1.2 mg/L	1 lb of chlorine reacts with 1.128 lb of caustic soda to produce 1.05 lb of NaOCl. An excess of caustic soda is used as a stabilizer. Based on the arsenic concentration in the 50% caustic soda, the maximum arsenic concentration in the NaOCl is estimated to be 0.8 mg/L. Arsenic contribution = 0.8 mg/L x 1.2 mg/L	0.00096 µg/L
Fluorosilicic acid (H_2SiF_6)	60 mg/L (maximum)	1.0 mg/L as F	Dilution factor = 244.8 x 1,000 ÷1.0 = 244,800 Maximum arsenic contribution = 60 ÷ 244,800 mg/L	0.245 µg/L
Bimetallic zinc metaphosphate	<2 mg/L	1.7 mg/L	Arsenic contribution = 2 mg/L x 1.7 mg/L	0.0034 µg/L
Total arsenic contributed by treatment chemicals				0.249 µg/L (maximum)

Table 4. Maximum finished water arsenic concentrations based on chemical dosages applied in the treatment facilities

Treatment Chemical	Range of Chemical Dosage (mg/L)	Range of Maximum Arsenic Contribution (µg/L in finished water)
Sodium hydroxide	8.0–12.5	0.0156–0.024
Sulfuric acid	20	0.0002
Alum	10–80	0.00385–0.0308
Potassium permanganate	0.30–0.35	0.0014–0.00168
Ferric chloride	7	0.037
Synthetic polymer A	2.0	0.001
Synthetic polymer B	4.0	0.004
Chlorine	1.2–2.8	0.000
Sodium hypochlorite	1.2	0.00096
Bimetallic zinc metaphosphate	1.5–1.7	0.0030–0.0034
Fluorosilicic acid	1.0	0.245

Table 5. Maximum finished water arsenic concentrations based on chemical dosages applied in the treatment facilities

Treatment Facility	Trace Arsenic Concentration (µg/L) Calculated Maximum	Trace Arsenic Concentration (µg/L) Analytical Result
Lake Gaillard WTP*	0.279	<1
Lake Saltonstall WTP	0.299	<1
West River WTP	0.306	<1
North Cheshire Wellfield	0.249	<1
All other wellfields (N=4)	0.248	<1

*Water treatment plant

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TARANAKI DISTRICT HEALTH BOARD

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New Plymouth 4342
New Zealand
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Website www.tdhb.org.nz

28 March 2013

THIS is the Exhibit marked with the letter...E.....
referred to in the annexed affidavit of GRAHAM MARK ATKIN
AFFIRMED ~~SWORN~~ at ...Wellington...
this..5th...day of...November...2013 before me:
[signature]
A ~~Solicitor~~ of the High Court of New Zealand
Barrister

Imelda Hitchcock
6a Ranfurly Street
TIMARU

Response emailed to: imeldah@kinect.co.nz

Dear Ms Hitchcock

Thank you for your request for information under the Official Information Act dated 28 February 2013.

Responses to your requests are below:

Request 1
All certificates of human health safety showing water fluoridation chemicals at 0.07 to 1ppm is safe, provided by endorsing organisations.

Response
Taranaki District Health Board is not aware of any certificates under the name of "certificates of human health safety".

Request 2
All requests made by the Taranaki District Health Board to any person for a certificate of human health safety for water fluoridation chemicals at 0.07 to 1ppm.

Response
Taranaki District Health Board has not made any request for a "certificate of human health safety" for water fluoridation chemicals at 0.07 to 1ppm.

Request 3
All certificates of human health safety of water fluoridation chemicals at 0.07 to 1ppm held by the Taranaki District Health Board.

Response
Taranaki District Health Board does not hold any "certificates of human health safety".

Request 4
The citations for all the human health safety studies on which you rely in claiming water fluoridation with silicofluorides at 0.07 to 1ppm, is safe.

Response
The citations for human health safety studies on which we based our advice that fluoridation is safe at concentrations of fluoride ions at 0.07 to 1ppm are listed below:

Human Health Studies and Systematic Reviews

- 1999 National & Medical Research Council, Australia. Review of Water Fluoridation.
- 2000 York Report (UK – National Health Service) A Systematic Review of Public Water Fluoridation.
- 2002 Medical Research Council, United Kingdom Water Fluoridation and Health.
- 2002 World Health Organisation Fluorides – Environmental Health Criteria 227.
- 2003 World Health Organisation, Diet, Nutrition and the Prevention of Chronic Diseases.
- 2007 National & Medical Research Council, Australia. A Systematic Review of the Efficacy and Safety of Fluoridation.
- 2007 World Cancer Research Fund/ American Institute for Cancer Research, Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective.
- 2010 European Commission Scientific Committee on Health and Environmental Risks (SCHER). Critical Review of Any New Evidence on the Hazard Profile, Health Effects, and Human Exposure to Fluoride and the Fluoridating Agents of Drinking Water.
- Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis. Choi AL, Sun G, Zhang Y, Grandjean P. Environmental Health Perspectives 2012 Oct;120(10):1362-8.
- Do L, Levy S, Spencer A. Association Between Infant Formula Feeding and Dental Fluorosis and Caries in Australian Children. Journal of Public Health Dentistry 2012, 72 (2), 112-121.
- Fluoride Neurotoxicity: Review of Evidence from Drinking Water Studies. National Fluoride Information Service Advisory. June 2011.
- Fluoridation of Water Supplies – An Evaluation of the Recent Epidemiological Evidence (2000) Environmental Science and Research Ltd.

Regulatory Frameworks that Support Safety

- New Zealand Drinking Water Standards 2005 (Revised 2008).
- Food Standards Australia New Zealand
- Fluoride in Drinking Water. A Scientific Review of EPAs Standards. National Research Council (United States), 2006. Washing, NRC.

Yours sincerely

Becky Jenkins
SERVICE MANAGER — POPULATION HEALTH

'F'

South Taranaki District Council

30 October 2013

THIS is the Exhibit marked with the letter F referred to in the annexed affidavit of GRAHAM MARK ATKIN AFFIRMED ~~SWORN~~ at Wellington this 5th day of November 2013 before me:

A ~~Solicitor~~ Barrister of the High Court of New Zealand

Mr Mark Atkin
5 Tarras Grove
Lower Hutt 5010

Dear Mark

Official Information Request – Certificates of human health safety

We have received your request for official information dated 21 October 2013 in which you make two requests for information:

1. All certificates of human health safety held by the Council for the fluoridation chemicals hydrofluorosilicic acid and sodium hexafluorosilicate, showing these chemicals to be safe to humans when added to drinking water to provide a fluoride content of 0.7ppm to 1.0ppm. This includes certificates issued by suppliers or manufacturers of the chemicals, and certificates provided by fluoridation-endorsing agencies.

2. All requests made by the Council for a certificate of human health safety for the fluoridation chemicals hydrofluorosilicic acid and sodium hexafluorosilicate, showing these chemicals to be safe to humans when added to drinking water to provide a fluoride content of 0.7ppm to 1.0ppm.

The Council is unclear as to what you mean by *certificates of human health safety*, or as to the basis on which certificates can or should be held by the Council.

This aside, the Council has undertaken a search of its records and has no documents which are recorded as *certificates of human health safety* for hydrofluorosilicic acid and sodium hexafluorosilicate, nor does the Council have any record of making requests for such documents from other agencies.

Because the Council does not hold the information you are requesting and has no grounds for considering it exists or could be held by another organisation, the Council must refuse your request in accordance with Section 17 (g) of the Local Government Official Information Act 1987.

If you can provide further clarification about the information you are seeking, you can make a further request.

Yours faithfully

Craig Stevenson
Chief Executive

craig.stevenson@stdc.govt.nz