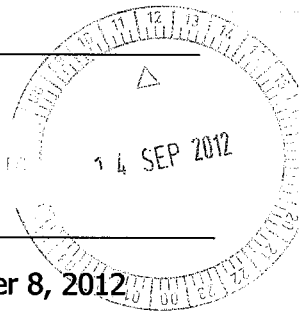



To the Committee on Environment and Public Affairs September 8, 2012

**RE: Petition No 166 – Immediate Cessation of the Chlorination of the Busselton Water Supply**

Dear Committee Members,

This Petition is the second from our community regarding the chlorination of our water supply. Please be advised that the 7232 adult and 969 children signatures supporting this petition were collected in 3 weeks and submitted as soon as parliament resumed because of the urgency of this matter. Busselton Water (BW) has 10,000 customers and supplies water to 17,000 full-time residents. On this critical matter I request that the committee grant me an opportunity to appear before it as a witness.

The following is my submission. The issues raised in the Petition:

1. ***Since the chlorination*** of our water supply there is ***significant distress, illness and injury to the community***. Our community has enjoyed ***106 years of chemical free water without ill effect*** and ***vehemently oppose*** Busselton Water (Board and Executive) ***imposing chlorine*** and other toxic chemicals on it ***under the guise of public health.***

Busselton residents have forwarded personal accounts of the significant distress, illness and injury they have and are enduring to the Tabling Member. As their appointed representative she is in the best position to comment on the ill effects of chlorination on her constituents. It is worth noting however that in addition to this harm there are reports from accommodation operator that tourists are cancelling their holidays in Busselton as a result of the water quality. Busselton derives the majority of its trade from Tourism. A decline in tourism will have a negative financial impact on the entire community.

2. Busselton Water's (BW) public comments that ***"This decision is too important for the community to decide"*** and its failure to involve the community in decisions related to the treatment of their water supply ***ignores the recommendations of the 2004 and subsequent 2011 Australian Drinking Water Guidelines.*** This stance: denies natural justice; withholds human rights; and contradicts the many international treaties enacted to protect individual's rights on matters impacting their health and wellbeing, treaties to which Australia is a signatory.

The statement above was made by BW's CEO Keith White at information forums held by BW and their appointed consultants Hunter Water Australia (HWA) conducted in March 2010. Attendees were told at the commencement of the forums that it was not a debate, the decision was final and the purpose for the forums was to give information on why the decision was made.

In addition to giving no opportunity for input attendees were given incorrect information on how they could voice their concerns. Attendees were told that if they were unhappy with the decision that they needed to address their complaints to the Ministers for Water and Health. This is not Busselton Water's complaints resolution procedure. This misinformation gave residents the run around, their complaints ignored, minimised or belittled. Their correspondence and calls referred back and forth between the Ministers' offices and BW. No one listened to or addressed their valid concerns.

Subsequent to this BW's CEO boasted at a Shire Council meeting in April 2010 that he had only received 43 complaints. A true account of the community's concerns is unknown. This practice continues today contrary to BW's complaints resolution procedure, outlined in their Customer Service Charter - link below. Residents with health concerns are being referred to the Minister for Health.
http://www.busseltonwater.wa.gov.au/Portals/0/Reports/CustomerCharterSummary.pdf

The community were silenced further when David Reid former Chairman of Busselton Water and Len Boyling Financial Controller of Busselton Water both Shire Councillors voted against a motion to acknowledge that there was significant community concern on the 28th of April 2010. On this occasion and again on the 23 rd of June 2010 the Councillors made a Declaration of Interest – Type of Interest – Interest Affecting Impartiality, then voted on motions to the detriment of the community.

3. Your petitioners respectfully request the Legislative Council ***call on the Minister for Water to direct BW to immediately cease chlorination, reinstate the UV disinfection systems and recommence the previous disinfection schedule.*** We ask that this be done ***pending a Parliamentary Inquiry*** because ***since the chlorination*** of our water supply ***hundreds of people have medical conditions*** from ***ingestion of or exposure to the chlorinated water.***

I have made the above request because the previous disinfection method and schedule caused no harm. In the 12 years that BW have used UV disinfection there have been no illness or ill effects from ingestion or exposure to the water. The effectiveness of the UV system was tested by Rockwater Pty Ltd. Tests conducted showed that the UV system eradicated N. lovaniensis, E. Coli and 2 other pathogens. The results are in the HWA Disinfection Investigation UV System Review 2009 pg 9. As BW and the Ministers for Water and Health continue to deny that there is a problem with the water I ask that action be taken immediately to ensure the community's safety and to stop the needless suffering.

This is essential as no adequate way of safe guarding the community exists. There is no alternate water supply. Those who have purchased filtration systems find them ineffective and maintenance expensive. Filter cartridges are lasting a quarter the time recommended by manufacturers and residents using identical systems and cartridges in Perth and other cities in Australia.

People are carting water from nearby properties that have rain or dam water. This is not sustainable and a large number of the community get no relief as they are prohibited by their financial or housing circumstances. Those renting, on low incomes and the elderly (in nursing homes) or without support can obtain no respite from drinking or bathing in the water. For these reasons I ask that the previous disinfection be resumed immediately because prolonging the suffering of this community is inhumane.

Below is a link to a Today Tonight program regarding Busselton community's distress with their water.
http://www.youtube.com/watch?v=ANWH_-NsJDY&feature=share

There are 5 Facebook sites that local people have created to gain support for their medical problems and those of their families. Where the harm is visible these residents have posted photographs of themselves, their children, pets or the ongoing black tea coloured water that Busselton Water insists is safe to drink and bath in. The Facebook sites and links are:

1. **Keep Busselton Water Pure Group Inc.** https://www.facebook.com/groups/213550208766913/
2. **Busselton Water- What are your thoughts?** https://www.facebook.com/groups/395406300491539/
3. **No Chlorine in Busselton water rally** https://www.facebook.com/groups/448626921831664/
4. **Keep Busselton's Water just the way it is. No Chlorine** https://www.facebook.com/groups/382016555218/?ref=ts
5. **Locals against chlorinating water** https://www.facebook.com/groups/187583961364408/?ref=ts

The following discussion shows that resuming the previous disinfection method is essential to the safety of the community and the premise/s underpinning the decision to chlorinate Busselton's water are faulty, thus exposing the community to immediate harm.

4. We ask that the Parliamentary Inquiry investigation include:

a. the validity of a case study that detected Naegleria Fowleri in cooling ponds and downstream from a nuclear power plant in France as an appropriate comparison to Busselton's ground water and closed reticulation system as the underpinning justification that there is a high risk of the pathogen entering the water supply;

The Hunter Water Australia Disinfection Investigation Background Paper May 2009, 3.2 Naegleria pg 10 states in relation to a study by French Scientists Michel Pelandakis and Pierre Pernin *"The results of the study focus on the success of the identification methods, however, they also report on the number of N. Fowleri identified from samples containing Naegleria (refer Table 3-2). (Pelandakis: 2002)."*

The table in the HWA report, Pg 10 is taken directly from the 2001 Pelandakis and Pernin paper (which can be down loaded at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC123847/pdf/1366.pdf) it states *"As shown in Table 3-2, the presence of Naegleria in warm waters of nuclear power plants indicates it is likely that N. Fowleri is also present."* The table shows results of readings at 5 sites in France.

HWA have suggested that if Naegleria Lovaniensis is present, in water from cooling ponds and downstream from nuclear power plants in France then it is likely that Naegleria Fowleri is present in Busselton's water. This claim has been accepted as fact and promoted by Busselton Water when in fact the alleged relationship has no validity. The 2002 Pelandakis and Pernin paper should not have been used to make any inference to Busselton's water supply. I make this claim because:

1. The last paragraph of the report states "The present work is a first step for fingerprinting Naegleria and its close relatives." The purpose of the report was to describe the first work conducted on new techniques for isolating and identifying different strains of amoebae, particularly Naegleria species. Only one of the 46 Naegleria species, N Fowleri is pathogenic. The scientist's objective was to develop a means of differentiating the species for environmental and clinical applications. The paper was a description of their first effort toward this objective.
2. No comparison can be made between contaminated surface water in France and water drawn from an artesian bore in Busselton. The water that is drawn from the Yarragadee in Busselton is pure. Busselton Water has stated that the integrity of the water is not in question. The water is supplied through a closed reticulation system. At no time is it exposed to the elements or held in an open dam or reservoir on the surface where contamination could occur.
3. The paper states that water samples were put on agar plates overlaid with a thin pellicle *Escherichia coli* as a food source and then incubated for 3 or 4 days at 44°C. The water in Busselton's underground reticulation system (pipes) is not 44°C nor is there E .Coli in the water as a food source. No similarity exists in the test conditions and Busselton's water supply.
4. 500 samples were analysed but it is not clear how many were taken. Remembering that the purpose of the analysis was to differentiate between the different Naegleria species one could construe that they only used samples that they identified Naegleria in. Of the 500 samples with Naegleria detected in them from the 5 French nuclear power plants (Table 3-2 HWA Report or Table 1 Pelandakis and Pernin2002) N. Fowleri was identified in 233 of these samples. In other words, where Naegleria species were detected, 46.6% (233/500) included N. Fowleri.

It is therefore accurate to say that French scientists tested water samples from nuclear power plants in France, after added E. Coli to agar plates to provide a food source prior to incubating samples at 44°C for 3 to 4 days. In 2001 they found that when Naegleria species were present 46.6% of the time N. Fowleri was present. It is however totally inappropriate to make any inference between the paper describing these scientists' work and Busselton's water supply.

It is unreasonable to suggest the presence of Naegleria Lovaniensis means that Naegleria Fowleri is present in Busselton's water and will be detected. Although this inference has no validity this assertion has been made by HWA and echoed repeatedly by Busselton Water. Busselton Water has been chlorinated for no valid reason. Other risk variables are discussed below.

b. the soundness of the risk assessment analysis, findings and reports of Consultants Hunter Water Australia;

A valid risk assessment of Busselton's water and reticulation system would consider the specific properties of the water and the reticulation system and from these properties and Busselton Water's history identify the risk/s to Public Health.

As indicated above there is no correlation between the properties of Busselton's water and its closed reticulation system and that of water collected in the Pelandakis and Pernin paper therefore the document used to cement an argument that there is a high risk of N. Fowleri in the water is invalid.

This perceived risk is based on the temperature of the water. The temperature of the water drawn from the artesian bore is constantly above 24°C. However the integrity of the water drawn from the aquifer is know not to be in question. The threat we are told is from the underground reticulation system which for three quarters of the year the water is less than 24°C.

In the formal complaint made to the Economic Regulation Authority (ERA) May 6, 2010 incorrect findings of the consultants were outlined **DETAILED INFORMATION OUTLINING BUSSELTON WATER BOARD'S NON COMPLIANCE WITH ITS LICENCE WITH THE ECONOMIC REGULATION AUTHORITY,** Written by D. Michaels, Research J. Foulds and D. Michaels, these include:

From pg 12 of the document, it states under "**(2) Assessment of water quality,** The risk factors:

1. ***Naegleria Fowleri entering reticulation system***
2. ***Cross-contamination could lead to organic matter in the water supply***

***1. Naegleria Fowleri entering reticulation system***
*The risk was considered high because of increased numbers of thermophalic indicator protozoa. This statement was found to be incorrect.*

*The Forum participants were told by Ms Laydon (HWA) that the increased incidence of Naegleria lovaniensis in the samples that have been taken by Rock Water (Sample Collection Company) had sparked concerns. Naegleria lovaniensis is a strain of harmless thermophalic (warm water) protozoa that has been found in the water supply. They present no immediate risk to public health.*

*The claim that the number has increased was found to be incorrect. When asked what data Ms Laydon was working from she revealed she was referring to the same data as residents at the Forum. Residents sourced these statistics from the Busselton Water Board website. The data was in the report by Rockwater Pty Ltd "Busselton Water Supply – Groundwater quality review for the Quarter of 2009". Ms Laydon confirmed that there have been no increases in the warm water protozoa found in samples.*
http://www.busseltonwater.wa.gov.au/LinkClick.aspx?link=Reports%2fWater+Quality+Report+QE+31+Dec+2009+for+Web.pdf&tabid=89&mid=475

*There had however been increases in sampling. It was pointed out to Ms Laydon by a Water Treatment Consultant that recording the same result more frequently is not an indicator of an increased incidence. Ms Laydon confirmed that the level recorded has remained the same. That in fact there has been no increase in the numbers. If the Consultants are making errors on fundamental points like this it does not inspire confidence. There have been numerous errors in the information at the Forums and in the HWA Report. As indicated in the data was in the report by Rockwater Pty Ltd "Busselton Water Supply – Groundwater quality review for the Quarter of 2009", there have been no increases and the protozoa has effectively been managed.*
*Ms Laydon of Hunter Water said that Naegleria lovaniensis was an indicator protozoa because both Naegleria lovaniensis and Naegleria Fowleri pathogens live in warm water environments.*

*Although both protozoa live in warm water conditions the presence of one does not indicate that the other protozoa will enter the system. The reticulation system is a closed system. Further to this Naegleria Lovaniensis does not mutate into Naegleria Fowleri (N. Fowleri).*

*Conditions need to be optimal for N. Fowleri to thrive, they are not. The risk is miniscule. It is* ***not*** *in* ***our water supply*** *and never has been. The World Health Organisation say 100 N. Fowleri per litre does not constitute a public health threat. We have none and there has* ***never been any detected in closed ground water systems anywhere in the world****. There are no reported cases from showering or private baths in Australia.*

*There are in total 330 recorded deaths from N. Fowleri worldwide, 18 in Australia. 3 were along the above ground Kalgoorlie pipe line. Our system is closed and below ground. All other cases of PAM in Australia were due to* ***incorrect chlorine levels*** *in South Australia.*

*The World Health Authority states that 100 Naegleria Fowleri in a litre of water constitutes a safe level in drinking water. We have none. Most cases of PAM are from pools and above ground water holes that people swim in. The risk to public health is miniscule because for the protozoa to cause harm in needs to get up the persons nose to have a chance of contracting PAM. Although it is not impossible for this water borne protozoa to enter the system as indicated above a related protozoa has been managed in the reticulation system.*

*If the BWB are genuinely concerned for public safety it is their duty of care to inform the public.*

***(1) Hazard identification and risk assessment***
*Component 5 of the Water Supply System – Contractors / businesses / householders damaging pipes*

***2. Cross-contamination could lead to organic matter in the water supply***
*Keith White claimed that there is a real threat of Naegleria Fowleri entering into the reticulation as a result of cross-contamination. He claimed that contractors breaking through fresh and sewer water pipes concurrently was one way that this could occur. The other way he stated was when businesses and residents connect to the reticulation system without permission.*

*Keith White stated that the system is constantly at risk from irresponsible contractors, business owners and householders who could break through sewer and water pipes concurrently or tap into the water supply system rendering it vulnerable to contamination.*

*He stated that the risk of this occurring was high and that Busselton Water could not control these irresponsible people. Statistics show that the 2009 leaks and bursts were at their lowest since 2007. (Audit results in BWB 2008 / 2009 Annual Report).*

*These are operational issues. Busselton Water has an ongoing responsibility to manage leaks and bursts and to educate the public.*
http://www.busseltonwater.wa.gov.au/LinkClick.aspx?link=Reports%2f2009+annual+report+Final.pdf&tabid=89&mid=475

***Misleading photograph and information given as to how cross-contamination can occur***
*At the first three Information Forums, Keith White showed a photograph of an open trench showing underground pipes. He stated that the water and sewer pipes at the same level as one another could be broken through concurrently and that this is how cross-contamination could occur.*

*At the first Information Forum it was pointed out to Mr White that the photograph that he selected and presented was incorrect. A recently retired Earth Moving Contractor who worked in the field for 50 years stated that the photograph was incorrect. He explained that according to legislative requirements that water and sewer pipes were not laid at the same height as one another.*

*This stipulation was put in place to avoid cross-contamination. In addition this resident stated that new fresh water pipe technology made pipes extremely resilient and breakages extremely unlikely.*

*Further to this on the 26th of March I returned home from work to find 3 Busselton Water vehicles two houses away from mine near the reserve at the end of Moore Street. I went to see what was happening and was told that a sewer pipe had been damaged by a tree root.*

*I asked the workers whether they would have to use chlorine to disinfect the area and they said there was no chance of cross-contamination because the fresh water pipe was on the other side of the road. I was told this is a practice which is used where ever possible.*

*My additional research has shown that if both pipes are laid in the same trench that the fresh water pipe is laid a metre and a half higher than the sewerage pipe.*

*Even in the extremely unlikely event that both a fresh and sewer water pipe is damaged at the same time gravity has to be reversed for cross contamination to occur. Further to this, fresh water pipes are usually high pressure and sewer pipes are low pressure. This further reduces the likelihood of the fresh water supply being contaminated by sewer water.*

*When the photograph and information in relation to the threat of cross contamination was found to be incorrect Keith White continued to present it for three out of the four sessions. Other parts of the PowerPoint presentation were changed but this inaccurate photograph was left in the presentation.*

*Although this image was shown to be inaccurate and misleading Busselton Water CEO Keith White continued to show the image. At the first session of the second day I insisted that it was inappropriate to continue to show the image that was proved not to reflect the risk that it was purporting to show. Both Jim Keary CEO Hunter Water and Keith White Busselton Water told me that I was out of order for insisting that it not be shown. Other residents at the Forum agreed that it should be removed.*

*It was removed from the Power Point presentation for the last Information Forum. It was shown at 3 out of 4 of the Information Sessions."*

On pg 12 of the same document it states, under ***Threat of contamination of reticulation system***

*"HWA and BWB said that the decision to implement full-time chlorination was due to a need to manage threats to the quality of water in the reticulation system. The threat of the pathogen Naegleria Fowleri entering the reticulation system was due to cross-contamination. The risk was considered very high? This is in contrast to the report by Rockwater Pty Ltd "Busselton Water Supply – Groundwater quality review for the Quarter of 2009."*
http://www.busseltonwater.wa.gov.au/LinkClick.aspx?link=Reports%2fWater+Quality+Report+QE+31+Dec+2009+for+Web.pdf&tabid=89&mid=475

*It stated the following:*

*Previous investigations by Busselton Water into the ongoing presence of non-harmful Naegleria species within the reticulation system traced the source back to the filters at Plant 2. Subsequently, Tank 1 at Plant 2 was isolated from the reticulation system and the filters were disinfected with chlorine during backwashing. Subsequent results show that this process had been successful in removing the Naegleria and, consequently, BW decided against chlorinating the entire reticulation system during the second quarter of 2009. The small number of occurrences of non-harmful Naegleria species during the third and fourth quarters of 2009 indicates that the treatment has apparently removed the previous major source of thermophilic amoeba in the reticulation system. However, this will continue to be closely monitored."*

HWA and BW have stated categorically that the threat of N. Fowleri entering the water is through cross contamination due to a reticulation system breach. However the presence of N. lovaniensis detected in Busselton's water supply was traced back to a filter at the Plant 2. The temperature of the water in the filter is consistent with the temperature at which this amoeba thrives, between 25°C and 40°C.

So what is the real risk? The risk of N. Fowleri is extremely unlikely by virtue of Busselton Water's 106 years as a water supplier. Further to this having a water temperature in the reticulation system of below 24°C would not aid this pathogens existence. According to the Queensland Health Fact Sheet last updated 19th April, 2010 pg 2, 3 "***How common are Naegleria infections?***

*Although N. Fowleri can be commonly found in the environment, infection is rare. Cases of Naegleria meningoencephalitis have been recorded in South Australia, Western Australia, Queensland and New South Wales, and in many countries throughout the world. There have been two documented cases in Queensland in the 10 years up to 2010. There have been no cases in South Australia since 1981. There have been three recorded cases in Western Australia, but none since 1985. In the USA, in the ten years from 1998 to 2007, 33 infections were reported.*

*Thirty-one had contact with recreational water and two had contact with water from a geothermal (naturally hot) water supply. It is estimated that the risk from recreational water activities (such as swimming/diving/waterskiing) in potentially contaminated freshwater in the USA, is five cases of N. Fowleri infection for every billion episodes of recreational water activity."*

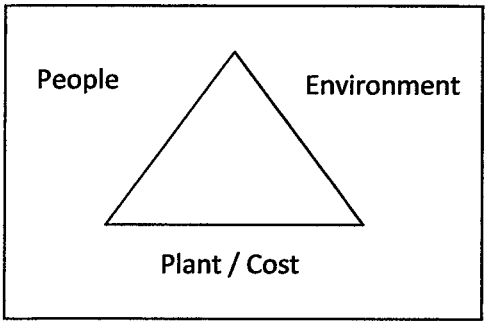
Another source speaking on the frequency of contraction of N. folweri, internationally Medscape states: *"The risk of infection has been estimated at one case per 2.6 million exposures to* N Fowleri." http://misc.medscape.com/pi/android/medscapeapp/html/A223910-business.html

As a comparison the National Asthma Council Australia state that in 2010, 416 people died in Australia of Asthma Attacks, the annual average is 500 deaths. The WHO estimates that drowning is responsible of 388,000 deaths annually worldwide. The number of N. Fowleri infections from water suppliers is a fraction of the 330 deaths worldwide because the majority are from recreational activities.

The reason that there is such concern with Naegleria is that all testing to differentiate which species of Naegleria is present is conducted in South Australia. The reason that it is not tested in Western Australia I was told by laboratories was that there is no business case for undergoing accreditation. There simply is not sufficient demand for it to be viable for laboratories.

In my submission as Principal Petitioner of Petition No 79 I stated "The real threats and risks to Public Health and implications for the community have not been evaluated. " These threats outlined in the submission are as relevant today as when I prepared it in 2010. It can be downloaded at: http://www.parliament.wa.gov.au/Parliament/petitionsdb.nsf/($all)/550EF11C1E3CA473482579DC001EE0EA/$file/ev.079.100812.sub.dm.pdf More information has come to light regarding the threats and risk to the public's health, some of this due to the obvious harm experienced by our community.

Most would agree that the best risk management decisions are made with consideration to 3 specific areas: people (health); environment (specific properties and impact) and plant /cost, as below:




The specific properties of Busselton's water comes under the consideration area – Environment – temperature, pH, naturally occurring minerals, turbidity. Clearly insufficient attention was given to these properties. No consideration appears to have been given to the environmental footprint associated with the use of chlorine as a disinfectant to our pristine natural habitat. Lack of consideration to any one of these areas produces and inferior outcome and necessitates harm and imbalance in the other sides of the triangle.

The following discussion relates to the absence of consideration of the properties associated with environment and relates to e. and c. below and their relevance to the risk assessment, point b above.

e. health risks of adding chlorine and other toxins to our specific water supply with its unique water chemistry;

The HWA Disinfection Investigation Background Paper May 2009, 2.1.1 Advantages and Disadvantages of Chlorine, 2.1 Chlorine under the heading, 2.Disinfection Types pgs 3 and 4 states as a disadvantage "Chlorine is less effective as a disinfectant at high pH." Was the pH of our water checked?

Busselton Water's most recent Water Quality Reports the following readings were recorded for pH:

| ADWG 2004 limit 6.5 – 8.5 | Raw Water | Treated Water | Distribution Water | Disinfection Method |
|---|---|---|---|---|
| January to March 2012 | 8 | 8.6 | 8.6 | UV Treatment |
| April to June 2012 | 7.7 | 8.4 | 8.4 | Chlorination |

Link to Water Quality Reports: http://www.busseltonwater.wa.gov.au/OurWater.aspx

Water with pH 8.4 or 8.6 (but not > pH9.5) is highly desirable as drinking alkaline water contributes to an alkaline body. As alkalinity decreases the blood becomes more acid and less able to fight off deterioration and disease because proper body function is impaired.

pH (Hydrogen Potential/Power) is the logarithm of the reciprocal of the hydrogen ion concentration. Simply pH is a number between 0 and 14, denoting degrees of acidity or alkalinity. A pH of 7 is neutral, water less than 7 is acidic and gets more acidic as it approaches zero. Water greater than 7 is alkaline and alkalinity increases as it approaches 14.

The pH readings above are relevant as water pH either improves or impairs chlorine's ability to be effective. AT pH 7 or below, chlorine acts primarily as a sanitizer and is very effective at killing bacteria. At 7.4, it acts equally as a sanitizer and oxidizer. Above 7.8, chlorine will act principally as an oxidizer.

Lenntech Water Solutions (link below) states: "*The effectivity of disinfection is determined by the pH of the water. Disinfection with chlorine will take place optimally when the pH is between 5,5 and 7,5.* http://www.lenntech.com/processes/disinfection/chemical/disinfectants-chlorine.htm The table below shows the converse relationship between pH and the disinfection benefit of Chlorine:

| pH level | pH results BW Water Quality Reports | Hypochlorite ions (OCl) lower OCl greater sanitation | Hypochlorous acid (HOCl) lower HOCl greater oxidation |
|---|---|---|---|
| 6.0 | | 20.00% high sanitization | 80.00% low oxidation |
| 7.0 neutral | | 27.50% high sanitization | 72.50% low oxidation |
| 7.5 | | 50.00% (OCl) Equal sanitization | 50.00% (HOCl) Equal oxidation |
| 7.7 Post chlorine | **BW 4/12 – 6/12** | Insignificant sanitation benefit | Principally oxidizing |
| 7.8 and above | | Insignificant sanitation benefit | Principally oxidizing |
| 8.0 Pre chlorine | **BW 1/12 – 3/12** | 80.00% ineffective sanitization | 20.00% high oxidation |
| **8.4** Post chlorine | **BW 4/12 – 6/12** | **ineffective sanitization** | **high oxidation** |
| 8.5 | | 90.00% ineffective sanitization | 10.00% high oxidation |
| 8.6 Pre chlorine | **BW 1/12 – 3/12** | ineffective sanitization | high oxidation |

Medline Plus a service of the U.S. National Library of Medicine states "*Chlorine, which reacts with water in and out of the body to form hydrochloric acid and hypochlorous acid. Both are extremely poisonous.*" http://www.nlm.nih.gov/medlineplus/ency/article/002772.htm

Exceeding the ADWG is only an issue here because chlorine is less effective in high pH water. The 8.4 pH reading is of treated and distribution water in Busselton since chlorination. As indicated in the table and references above the disinfection benefit is insignificant. The oxidation benefit however is very high which is of concern because corrosion of copper pipes can occur. Low levels of copper are toxic to aquatic life and can make people extremely unwell.

The pH of Busselton's water should have been considered to identify whether chlorine was an appropriate disinfectant or more to the point whether it would offer any disinfection benefit, clearly it was not. In addition to providing negligible disinfection benefit the oxidation effect is causing harm.

I believe that this is why residents are experiencing illness including: ear infections; breathing problems; digestive conditions; and skin conditions and chemical burns.

If the properties of the water - pH, iron and manganese were taken into consideration chlorine would have been found to be a poor choice. Why would anyone implement a form of disinfection that is being phased out abroad because it is harmful, unstable and ineffective to numerous pathogens including water borne pathogens, viruses, giardia, cryptosporidium and Naegleria in cyst form?

In Edition 207 Water Science & Technology an article by R. Trolio, A Bath, C. Gordon, R. Walker and A. Wyber, Operational management of Naegleria spp. in drinking supplies in Western Australia, under the topic, Maintaining Adequate Disinfection it describes the Water Corporations specific designs for chlorination units. It then states "*Despite this, detections of Naegleria occasionally occur in some chlorinated systems.*".....*"Furthermore, detections of Naegleria can occur in the presence of high residuals."* Link to document: http://www.iwaponline.com/ws/00802/ws008020207.htm

As shown, chlorine has been found to be ineffective against Naegleria. It is ineffective as a disinfectant with water pH 8.4. In addition to these facts three quarters of the year Busselton's water temperature is below 24°C, ideal for giardia and cryptosporidium to thrive. Therefore if as indicated by HWA there is a high risk of cross contamination there is a real risk of infection from giardia and cryptosporidium. These pathogens are chlorine resistant and unlike Naegleria that infects through the nasal passage these pathogens infect with ingestion, drinking the water, as with the Sydney 2000 incident.

UV in contrast is effective and so is the new form of chlorine dioxide – Clean Oxide which does not have the same properties, side effects or limitations as chlorine.

c. the merit of replacing the UV systems with chlorination plants when many pathogens are chlorine resistant;

As discussed above many microorganisms are chlorine resistant. Chlorine added to high pH water like that of Busselton is ineffective as a disinfectant. UV disinfectant is effective as Rockwater Pty Ltd demonstrated while testing to see the efficiency of the UV lamps toward the end of their life. Tests conducted showed that the UV system was effective at irradiating N. lovaniensis, E. Coli and 2 other pathogens. The results are in the HWA Disinfection Investigation UV System Review 2009 pg 9.

UV disinfection has been adopted by all first world countries and has been used since the early 1920's. It is used alone and as part of a multi barrier approach to disinfection drinking and waste water. Busselton is the first water authority in the world to ditch UV disinfection for the outdated and ineffective disinfectant chlorine. Even though it appears that there was no valid reason to do so.

Hanovia News states "*UV disinfection has many advantages over other alternative methods. Unlike chemical treatment, UV does not introduce toxins or residues into process water and does not alter the chemical composition, taste, odour or pH of the fluid being disinfected.*"
http://halmapr.com/news/hanovia/

Aquionics News http://halmapr.com/news/aquionics states the following *"Ultraviolet energy causes permanent inactivation of microorganisms by disrupting DNA (the reproductive material) so that it is no longer able to maintain metabolism or reproduce. UV kills all bacteria, fungi and moulds as well as spores and viruses. Research undertaken by Hanovia has demonstrated that Cryptosporidium oocysts are effectively de-activated using UV."*

UV disinfection is used in too many places to mention them all. http://www.environmental-expert.com/companies/trojanuv-1366 This UV disinfection manufacture states "*Our UV systems are installed in over 7,800 municipal disinfection facilities throughout the world, disinfecting over 44 billion gallons of water per day.*" Countries using UV include: those in Europe, the US, North American, Canada, the Netherlands, UAE, Germany, Greece, Kenya, Saudi Arabia, Slovakia, India, Congo, Nigeria,

Romania, Slovakia, the territories of Russia, the Republic of Belarus, Kazakhstan, and Ukraine, Switzerland, Sweden and countries in the Asia Pacific region including Australia, New Zealand, Thailand, Germany, Malaysia, China, Taiwan, Singapore, Japan, Brunei, Cambodia, Hong Kong, Macau, Indonesia, North and South Korea, Papua New Guinea, Philippines, Vietnam and Mongolia.

This link is to Scientific American August 31, 2012. It is to a story stating *"New York will be opening the world's largest ultraviolet, or UV, drinking-water disinfection plant in a couple of months.*

*The facility will have 56 enormous UV units that will neutralize waterborne pathogens in all the drinking water that comes from Delaware County and Catskill watersheds, the site said. The disinfection facility reportedly cost $1.6 billion to build. It is located in Greenburgh and Mount Pleasant in Westchester County.*

*Instead of adding more chlorine to the drinking water, UV lights will alter the DNA of cryptosporidium, giardia, and other waterborne pathogens so they can't reproduce, the site said. If people were to ingest such waterborne pathogens, they could suffer from nausea, diarrhea, cramps or other serious symptoms."* http://www.ibtimes.com/articles/379668/20120831/water-disinfection-plant-uv-ultra-violet-chlorine.htm

HWA raised the concern about BW managing a full scale outbreak. In the Disinfection Investigation Background Paper May 2009 referred to Hutt City in New Zealand who had a suspected outbreak of E.Coli in 1998. As Busselton's water supply is unique the Hutt Valley example may have been used because both suppliers draw water from deep aquifers and both had no residual disinfection. The similarity ends there because Naenae reservoir does not have UV disinfection. However they did successful manage the suspected outbreak of E. Coli and have continued to have chemical free water.

The suspected outbreak was the first for this Water Authority and they managed it using a standby chlorination plant and their emergency chlorination and system flushing plan for such a pathogenic microorganism contamination. Busselton Water has managed the N lovaniensis contamination within the reticulation system, traced back to the filters at Plant 2. It has not been detected since August 2011 but as we know BW have implemented full-time chlorination predisposing the community to greater harm than the harmless amoeba that occurred from BW's own operations.

In HWA Disinfection Investigations Options Analysis reports it refers to concerns about how BW would manage an outbreak. It questions the effectiveness of the use of portachlors - portable chlorination units. The capacity of the portachlors has been underestimated. A comment in the report regarding the backlash from the use of portachlors warrants further investigation. I say this because on July 16th this year I gave a presentation to BW Board outlining much of the content of this report. My presentation was supplemented by that of two consulting firms one of those was the supplier of the portachor units. The validity of statements made in the above named report were challenged by the firm who explained they made repeated offers to assist BW but that in spite of that the portachor units were never set-up to operate correctly at the commencement of each deployment, thus compromising their effectiveness. This was specifically related to maximising break-point chlorination which would contribute to residents receiving excessive amounts of chlorine in their water.

The other speaker, a spokesperson for Clean Oxide (new form of chlorine dioxide) explained that Clean Oxide has different properties to chlorine. He stated that the company had approached BW after hearing that they were having difficulty managing Naegleria in specific areas of the reticulation system.

The disinfectant has the capacity to penetrate through the cyst walls of amoeba where chlorine is ineffective when amoebas are in their protective stage. The amoeba's capacity to go into cysts makes them difficult to eradicate. UV also inactivates amoeba such as Naegleria when in cyst form.

These are two subtle technologies that could have been employed to manage a full-scale outbreak that were given no consideration or were reported as being ineffective in spite of their reputation.

The former chair of BW who headed the board when the UV units were commissioned said that the growth of the community was taken into consideration and they planned to install boaster systems to ensure continued disinfection effectiveness. He said BW worked closely with Rockwater Pty Ltd who to date conduct sampling / testing the integrity of Busselton's water to meet DoH reporting requirements.

d. the merit in using a disinfection remedy to rectify possible engineering hazards in the reticulation system;

BW stated the water is not the problem the pipes are, the risk of contamination is in the pipes. Although that is not where the contamination occurred problems with pipes are engineering hazards and such are operational issues. These issues exist for all water authority and are not exclusive to BW. BW has mechanisms in place to manage leaks in pipes including: meters fitted to every house; and Leaksearch detects water leaks electronically, reducing water wastage and identifying leaks.

BW closely monitors and replaces pipes on a needs basis, using disinfection is appropriate but not as substitute for proper management of the reticulation system. The reticulation system has been management for the past 106 years without a residual and the contamination was not in the pipes.

Regarding increases to the reticulation system between 2005 and 2010 the reticulation system was reported to have grown 25 %. This was a boom time for the region, 25 % equates to 5 kms of new pipe. Water authorities need to upgrade their facilities to keep up with growth. As mentioned earlier when the UV systems were commissioned the Board planned to add boaster stations as needed.

5. As with Petition 79 we ask that if an expansion of the UV system alone is ***proven*** to be inadequate that it be ***augmented by a health supportive alternative***. And your petitioners as in duty bound, will ever pray.

This statement requires no further explanation. However the incorrect and misleading misinformation in the consultants reports and subsequently provided to the community poses many questions. The main question I have is why was this NSW consulting firm used and why were the previous recommendation and concerns with the use of chlorine raised by local consultants Rockwater ignored? A Case Study "The Decision to Use UV for Municipal Water Disinfection in Busselton, Western Australia outlines important factors in the decision to use UV. http://halmapr.com/news/aquionics/the-decision-to-use-uv-for-municipal-water-disinfection-in-busselton-western-australia-%E2%80%93-a-case-study

In the immediate I ask along with the 8200 petitioners and on behalf of the remainder of the Busselton community (who did not have an opportunity to sign the petition) that the Legislative Council with the recommendation of the Committee ***call on the Minister for Water to direct BW to immediately cease chlorination, reinstate the UV disinfection systems and recommence the previous disinfection schedule.***

Please ensure the health and safety of the Busselton community! Please be advised that I have not taken this complaint to the Parliamentary Commissioner for Administrative Investigations.

Yours sincerely

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