AQUATAIN PRODUCTS PTY LTD

Aquatain

LIQUID ANTI-EVAPORATION FILM

INDEPENDENT

WATER QUALITY REPORT

May 2007

ASSESSMENT OF THE IMPACT OF AQUATAIN USE ON WATER QUALITY

for

Ultimate Agri-Products
522 Princes Highway
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by

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1. INTRODUCTION

At the request of Ultimate Agri-Products we assessed the impact of the use of Aquatain, a product based on a category of siloxanes that forms a mono-molecular layer on the surface of a water body to which it has been added, which minimizes the loss of water by evaporation.

Aquatain is a polydimethylsiloxane (PDMS), which is insoluble in water, the structure and degradation of which, and the resulting product, can be portrayed as follows:

$Me_3SiO(SiMe_2O)_{23}SiMe_3 \rightarrow Me_2Si(OH)_2$ (Dimethylsilanediol, DMSD)

In turn, DMSD degrades as follows to the end products:

$Me_2Si(OH)_2 \rightarrow CO_2$ + Inorganic Silicate + water

Where

Me stands for the methyl-group: CH_3-

As is shown above, in the long run, Aquatain degrades to carbon dioxide (CO_2), water (H_2O) and silica (SiO_2) and/or silicic acid ($Si(OH)_4$), all of which are common, ubiquitous and harmless constituents of the environment. The primary degradation is catalysed in the presence of soil and water, with the succeeding step being catalysed by microbes and light.

It is not the purpose of this study to estimate the impact of Aquatain on water loss by evaporation, but to determine if its use has a measurable impact on water quality, in particular with respect to drinking water quality in reservoirs used for potable supplies. Our approach to assessing the potential impact of Aquatain on water quality was as follows:

a) Select a suitable open water body such as a large dam. Ultimate Agricultural Products found the dam for this experiment.

b) Select suitable parameters of water quality for analysis: potable water and any potential degradation products of the Aquatain.

c) Take samples of the water in the dam to measure its chemical and microbiological quality before Aquatain is added. This took place on 4 April 2007.

d) Add Aquatain to the dam in a quantity that would be more than adequate to cover its entire surface with a mono-molecular layer of the product after the first samples have been removed. This also took place on April 4th, 2007.

e) Take samples of the water one day after Aquatain has been added and analyse for the same parameters. The second round sampling occurred on April 5, 2007.

f) Allow time for any degradation of Aquatain to occur.

g) Take the third set of samples and determine the same water quality parameters as before. These samples were taken on the 20th of April 2007.

h) Compare all sets of analytical results with one another and with the selected criteria for potable water.

Figures 1 and 2 show the dam that was selected, which is located on private property, in a fruit orchard, near Silvan.

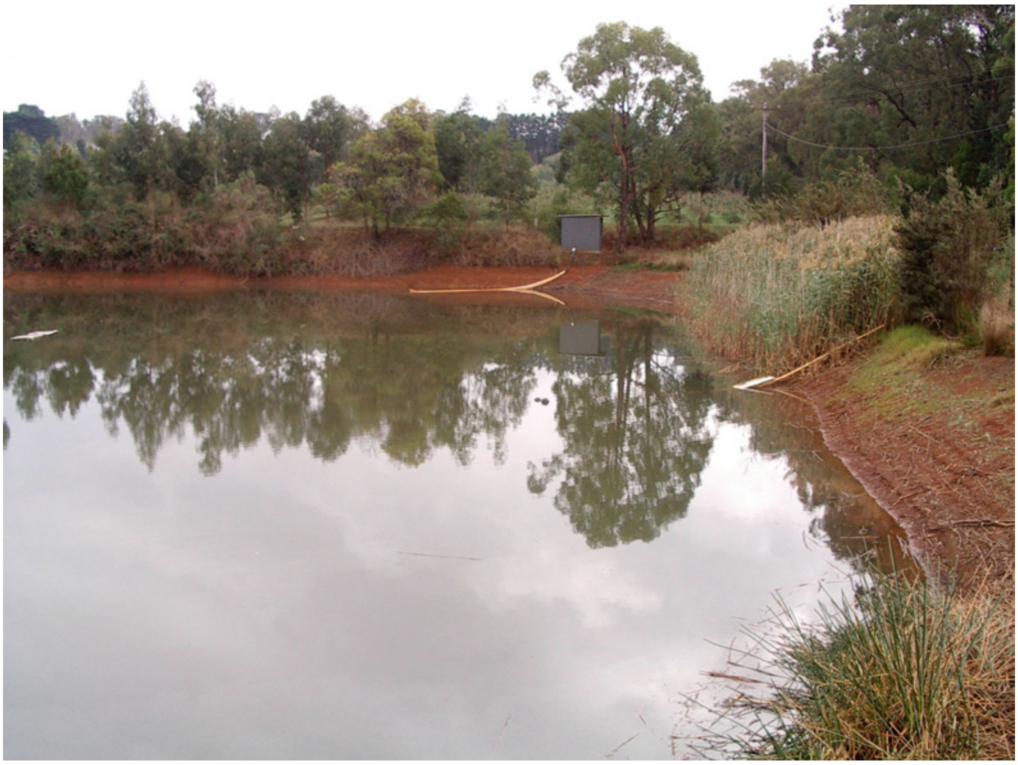

Figure 1 View in northerly direction, with sampling point #1 in the top right hand corner. Note the red basaltic soil. Taken before Aquatain was added.

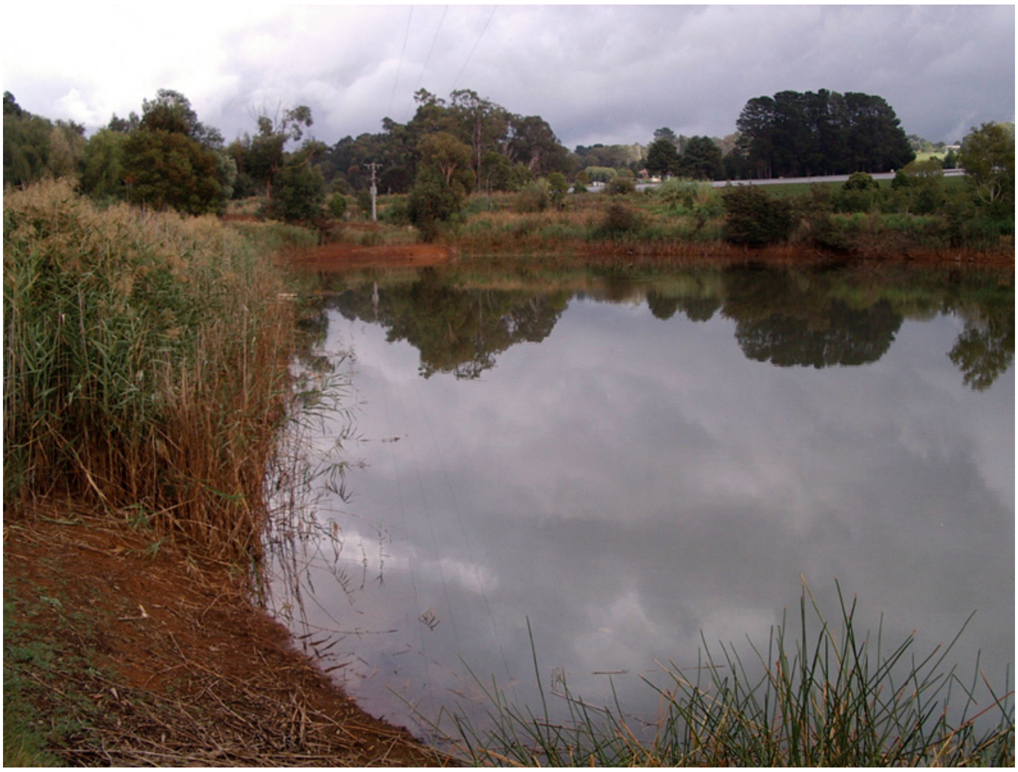

Figure 2 View taken in a south westerly direction. Sampling point #2 is located just a little to the right of the top left corner. Taken before Aquatain was added.

2. METHODOLOGY

Water samples were taken by throwing a clean plastic bucket several metres from the shore into the dam, letting it take water, and rapidly drawing it back, without stirring up any mud from the shallow areas along the edge of the dam.

The samples were immediately placed in appropriate sampling flasks, obtained earlier from AMDEL, by submerging the flasks in the bucket and allowing all air to escape before closing the lids or screw caps. All samples were kept on ice and transported by us the same day to AMDEL.

On the day after the Aquatain was added to the dam, we noticed an oily-looking film on the water surface, which also adhered to the plastic bucket used for sampling, and we could feel its slippery nature on the skin.

At sampling location #1 during the first sampling round on April 4th, we noticed a large number of small creatures in the water along the shore, which we believe to be a paramecium species. This was at the time a down wind part of the dam.

On April 5th, the paramecium organisms were seen in most parts of the dam near the shore. Paramecium organisms were also observed on April 20th at several locations around the dam. During that last sampling round, the Aquatain film was not as obvious as it was on April 5th.

The parameters selected for analysis included all potable water criteria, but also silicon and methanol as these are potential degradation products of the Aquatain. However, all natural waters in geological and soil media will also contain silicon in dissolved form, as virtually all rocks and certainly all soils contain silicon in their mineral constituents. Therefore, it is of interest to see if the silicon concentration of the dam water has increased as a result of the Aquatain.

It should be remembered that ducks and other water birds use the dam and were present on each sampling round.

3. RESULTS AND INTERPRETATION

Table 1 summarises all the data. All laboratory results and Chain-of-Command documents are in Appendix 1.

As can be see, the addition of Aquatain had no effect on silicon levels in the dam water, and methanol could not be found. Any methanol formed by degradation of Aquatain would be very rapidly oxidised by micro-organisms to water and carbon dioxide as it an extremely easily oxidisable compound.

Most of the water chemical parameters changed very little over the duration of the experiment. Slight changes in the pH could be due to the amount of CO_2 that is being generated by respiring aquatic organisms, which would form bicarbonate (HCO_3^-) and carbonic acid (CO_3^{-2}) by reacting with water, and the rate at which carbon dioxide can exchange with the atmosphere. Water is a poorly buffered liquid, so small changes in concentration of these constituents could affect the pH in measurable ways.

Orthosilicic (H_4SiO_4) acid exists only in solution. It is likely the silicon concentration that was measured represents this compound. It has a low solubility. Certain aquatic organisms, diatoms, use silicon from the water to build their exo-skeletons,

Table 1 Results of laboratory Analysis

Analyte	Sensitivity PQL	Unit	4 April 2007			5 April 2007			20 April 2007			Freshwater ecosystems Trigger Values	
			#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.	99% protection	95% protection
Customer Sample ID			**AQ1A**	**AQ1B**		**AQ2A**	**AQ2B**		**AQ3A**	**AQ3B**			
AMDEL sample #			418009	418010		418136	418237		432847	432848			
Methanol	-	mg/l	<2	<2	<2	<2	<2	<2	<1	<1	<1	-	-
Silicon	100	µg/L	3000	2920	2960	2800	3000	2900	2870	2920	2895	NT	NT
Total Hardness as $CaCO_3$	0.7	mg/L	35	35	35	35	35	35	33	32	32.5		
Antimony	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	ID	ID
Arsenic	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	As III: 1 As V: 0.8	As III: 24 As V: 13
Barium	5	µg/L	8.9	8.2	8.55	12	12	12	12	14	13	-	-
Boron	5	µg/L	<5	<5	<5	9.8	9.9	9.85	12	13	12.5	90	370
Cadmium	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	0.06	0.2
Chromium	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	ID	ID
Copper	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	1	1.4
Lead	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	1	3.4
Manganese	5	µg/L	20	20	20	<5	<5	<5	6.8	32	19.4	1200	1900
Molybdenum	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	ID	ID
Nickel	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	8	11
Selenium	5	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	5	11
Mercury	1	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.06	0.6
Calcium	100	µg/L	4010	3990	4000	3920	4040	3980	3800	3710	3755	No toxic limit	No toxic limit
Magnesium	100	µg/L	6080	6010	6045	6020	6030	6025	5660	5580	5620	No toxic limit	No toxic limit

NT = Dissolved silicon will be in the form of silicic acid at low concentrations and is not a known toxicant.
ID = Insufficient data.

Table 1 Continued

Analyte	Sensitivity PQL	Unit	4 April 2007			5 April 2007			20 April 2007			Freshwater ecosystems Trigger Values	
			#1	**#2**	**Ave.**	**#1**	**#2**	**Ave.**	**#1**	**#2**	**Ave.**	**99% protection**	**99% protection**
Customer Sample ID			**AQ1A**	**AQ1b**		**AQ2A**	**AQ2B**		**AQ3A**	**AQ3B**			
AMDEL sample #			418009	418010		418136	418237		432847	432848			
Total Cyanide	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	0.19	0.0925	<0.005	<0.005	<0.005	4	7
pH	0.1		8.4	8.3	8.35	8.3	8.2	8.25	7.4	7.5	7.45		
Total Dissolved Solids	5	mg/L	150	89	119.5	140	120	130	88	85	86.5	Note 1	Note 1
Fluoride	0.5	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Nitrate	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	17	700
Nitrite	0.2	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**)	**)
E. coli	-	MPN/100 ml	31	35	*)	35	47	*)	3.1	980	*)	NA	NA
Total coliforms	-	MPN/100 ml	>2400	>2400	>2400	>2400	>2400	>2400	610	>2400	*)	NA	NA
Heterotrophic Colony Count	-	CFU/ml	540	500	*)	570	750	*)	29	90	*)	NA	NA

*) As bacterial counts can vary enormously over short distances in water that is not being intimately mixed, it is pointless to calculate means.
**) Nitrite will not occur in well aerated waters.
NA = Not applicable.
Note 1: Any waters with less than 200 mg/L of TDS is considered low salinity water for irrigation purposes. With more than 200 mg/L of TDS, we cannot speak of "Fresh water".

The natural soils that contain the dam are derived from basalt by intense and long weathering from the Pliocene epoch. Basalts are naturally rich in calcium, magnesium, iron and manganese, and the latter two occur in the soil as various oxides and hydroxides, often mixed together.

The occurrence of a very low concentration of manganese in the water is to be expected. It is well within the limits that protect 99% of freshwater aquatic species.

Notwithstanding the presence of around 4000 µg/L of calcium and 6000 µg/L of magnesium, the water still has to be regarded as relatively soft, and of very low total salinity, with TDS levels fluctuating closely around 100 mg/L. For irrigation purposes it is "Low Salinity" water.

The Aquatain also has not affected the solubility and concentration of the other constituents, which it was never expected to do in any case.

5. CONCLUSIONS

Aquatain added to surface water bodies does not affect the chemistry of the water bodies it covers.

On the basis of incidental observations of the paramecium in the dam water, it is concluded that the film of Aquatain has not prevented the dam water from being oxygenated by gas exchange with the atmosphere, or from disposing of any excess carbon dioxide gas to the atmosphere. Aquatic life, apparently, continues without suffering a negative effect.

Water in an open dam in agricultural settings is not necessarily of potable quality. However, the experiment shows that the use of Aquatain does not produce any effects that would be deleterious for potable water quality if it were used in reservoirs for potable uses.

APPENDIX 1

LABORATORY DATA SHEETS AND CHAIN-OF-COMMAND DOCUMENTS

(NOT INCLUDED – AVAILABLE ON REQUEST)