

Dear Ed and West Side Neighborhood Association,

First of all, thank you for thinking of *TERA* and utilizing our State Hazard Evaluation Lending Program (StateHELP) to help address your public health concerns. We realize that the science of toxicology and risk assessment can sometimes be abstruse and unapproachable to the very communities they are intended to protect. *TERA* established the StateHELP program to try break down these barriers, so we are glad to see you using our assistance for a complicated project such as this.

From our conversations with Ed Newman, and review of the *Wellhead Protection Facility Evaluation of the University Estates/ Ohio Club Golf Course* prepared by Eagon & Associates, Inc.,¹ it is our understanding that a golf course is intended to be developed above your community's wellhead, which serves as the primary source of drinking water for the community.

According to plans, a series of fungicides, pesticides, and herbicides are scheduled to be applied, for which Mr. Newman has asked us to provide toxicity data and assess the risk that may be involved. These chemicals include:

Fungicides

Iprodione
Vinclozolin
Mancozeb
Chlorothalonil
Propiconazole

Pesticides

Carbaryl

Herbicides

Clopyralid
Fenoxaprop

Evaluating the health risk of chemicals consists primarily of two separate considerations:

- 1) *Exposure*: Will there be exposure to the chemical? What is the route of exposure; inhalation, oral, dermal? What is the level of exposure (dose or concentration)? For how long might the exposure occur?
- 2) *Toxicity* of the chemical: With an understanding of how much of the chemical is entering the body and how it is getting in, what are the health consequences?

At *TERA*, our expertise is in this second area; evaluating toxicity. We study the health consequences of exposure, rather than the likelihood of exposure. We work to establish a "safe dose," or a level of exposure that a human being can experience without the likelihood of adverse health effects.

In the United States, all pesticides must be registered by the Environmental Protection Agency (EPA) prior to use. Registration requires that a pesticide "when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment." EPA's evaluation includes consideration of sensitive groups (for example, children, elderly, women of childbearing age, immune-suppressed individuals, etc.), aggregate risk of exposure from multiple sources (for example, food, water, and residential uses), and cumulative risk of exposure to multiple chemicals with

¹ *Wellhead Protection Facility Evaluation of the University Estates/ Ohio Club Golf Course* prepared by Eagon & Associates, Inc

similar health effects. EPA also considers potential for ground water contamination.² To the best of our knowledge, EPA has approved the use these chemicals on golf courses based on a thorough evaluation of the toxicity and potential risk that can result from their uses.

Eagon & Associates have also evaluated the potential for each of the named pesticides to leach through the soil and reach the ground water. Acknowledging that the exposure modeling used is outside our expertise, and without confirming the legitimacy of the model parameters and assumptions used, the assessment by Eagon & Associates appears to be well thought out and thorough.

As part of our review, we spoke with Matt Beal of the Ohio Department of Agriculture. Mr. Beal explained his group is responsible for registering and labeling all pesticides in the State of Ohio. His group has conducted groundwater monitoring across the state, with particular focus on Atrazine, an agricultural pesticide. His group did not detect atrazine in groundwater despite the fact that atrazine is heavily used on cornfields throughout Ohio, and has a greater leaching potential index (56) than any of the pesticides scheduled for use at the Ohio Club³.

From our correspondence, we gather that you aware there is always some degree of health risk when using chemicals. In an ideal world, we would have a zero-risk policy, but in reality we all use and interact with chemicals in our daily lives. Each time we start our car, or shampoo our hair, or have a coffee, we are deciding that the benefits of these chemicals we are using outweigh the risks. *TERA's* goal is to provide scientific data to help risk managers (such as communities and local regulators) make informed choices about chemical risk.

As mentioned, EPA conducts a thorough assessment of chemical toxicity before permitting its use as a pesticide. We have reviewed and provided the registration documents for each of the chemicals (with the exception of chlopyralid, for which there is only a Pesticide Tolerance document available). Additionally, we have extracted and compiled acute and chronic reference dose (RfD) values for each of the chemicals (see Table 1). A reference dose, which is also known as an acceptable daily intake (ADI) is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects⁴. A chronic reference dose applies to a lifetime of exposure, while an acute reference dose applies to exposure lasting up to 24 hours. We have also provided EPA's cancer classification for each chemical.

Unfortunately, without conducting our own exposure assessment, we are not able to estimate whether concentrations equal to the reference doses are likely to occur. Assuming the accuracy of the report by Eagon & Associates, the physical-chemical properties of these pesticides indicate that it is unlikely they will reach the wellhead in concentrations equal to the reference doses. Groundwater monitoring at well sites, and rapid reporting of and response to accidental spills, as recommended by Eagon & Associates provide an additional level of protection.

² <http://www.epa.gov/pesticides/about/aboutus.htm>

³ <http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-31/>

⁴ Teuschler, L.K., M.L. Dourson, W.M. Stiteler, P. McClure and H. Tully. 1999. Health risk above the reference dose for multiple chemicals. *Reg. Toxicol. And Pharmacol.*, 30: S19-S26.

In conclusion, the pesticides scheduled for use on the Ohio Club Golf Course- if used as prescribed by U.S. EPA's Office of Pesticide Programs- do not appear likely to impact the health of the community residents. However, it should be noted that this statement is not intended as an endorsement of the development or the use of the discussed pesticides. If you have additional clarifying questions, please do not hesitate to contact us.

Sincerely,

Oliver Kroner

Bernard Gadagbui, PhD, DABT

Tabel 1. Acute and Chronic References Doses

Chemical	CAS	*Chronic Oral Reference Dose (RfD) (mg/kg-day)	Critical Effect	Species	Study	Year	*Acute Oral RfD (mg/kg-day)	Critical Effect	Study	Cancer Classification
Fungicides										
Iprodione	36734-19-7	2.00E-02	histopathological lesions in the male reproductive system	rat	MRID 42637801; MRID 42787001		6.00E-02	developmental toxicity	MRID 44365001	probable human carcinogen
Vinclozolin	50471-44-8	1.20E-02	Histopathological lesions in the lungs (males), liver (males), ovaries (females) and eyes (both sexes)	dog	MRID 43254701 -702, - 703		6.00E-02	Decreased ventral prostate weights in offspring	MRID 44395701; 44395702	possible human carcinogen
Mancozeb	8018-01-7	5.00E-02	Thyroid	rat	U.S. EPA	2005	1.30E+00	Developmental Toxicity	U.S. EPA 2005	a probable human carcinogen
Chlorothalonil	1897-45-6	2.00E-02	increased kidney weights	rat	MRID 41250502		**			probable human carcinogen
Propiconazole	60207-90-1	1.00E-01	Liver toxicity	rat	U.S. EPA	2006	3.00E-01	Neurotoxicity	U.S. EPA 2006	possible human carcinogen
Pesticides										
Carbaryl	63-25-2	NA	Due to the rapid recovery of ChE activity, the acute exposure from carbaryl is the main duration of concern and therefore a chronic assessment is not appropriate for carbaryl.	rat	Carpenter et al.	1961	1.00E-02	brain ChE inhibition	MRID 47143001	possible human carcinogen
Herbicides										
Clopyralid	1702-17-6	0.15	epithelial hyperplasia and thickening of the limiting ridge of the stomach	rat	U.S. EPA	2001	7.50E-01	Developmental Toxicity	U.S. EPA 2001	not likely to be a human carcinogen
Fenoxaprop	95617-09-7	2.50E-03	decreased total blood lipids/cholesterol	rat	MRID 00263030		3.20E-01	developmental toxicity	MRID 00152156	not classified

*Reference Dose (RfD) is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

**MOEs for drinking water risk for chlorothalonil are in excess of 110,000 for children, the most highly exposed population subgroup, and in excess of 380,000 for adults. Since an MOE of 300 is thought to be protective, the Agency does not have acute dietary (drinking water) risk concerns for chlorothalonil.

Acute dietary risk is calculated considering what is eaten in one day, in this instance, the full range of consumption values as well as the range of residue values in food.