The Nature and the Containment or Confinement of GM Canola

A Report by Rene Van Acker Ph.D., P.Ag., in relation to the Supreme Court of Western Australia Proceeding no. CIV 1561/2012 Marsh vs. Baxter.

May 30, 2013.

Foreword

To produce this report I have relied upon my own expertise and experience relevant to the topic and gained in terms of formal training over the past 20 plus years and work, study and research experience over the past 16 plus years. I have also reviewed the statement of claim for this case and the consolidated statement of agreed and not agreed facts and materials provided related to the nature of the Marsh (Eagle Rest) and Baxter (Sevenoaks) properties including property maps and photos of the properties including photos of paddocks and photos of the Qualeup North Road on the northern boundary of the Sevenoaks property and also agronomic records for Mr. Baxter's farming operation and weather records for the area. In addition I have consulted published reports, studies and documents from around the world that are relevant to this topic and pertinent to the purposes of this report (see list of references cited at the end of this report). In these respects I consider that I have made all inquiries which I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld or not considered for the creation of this report within its intended scope.

Qualifications

My name is Dr. Rene Van Acker and I am Associate Dean of the Ontario Agricultural College, and Professor in the Department of Plant Agriculture at The University of Guelph (Since September 2009), Canada. I was previously (July 2006 - September 2009) Professor and Chair of the Department of Plant Agriculture and from1996 to 2006 was Professor of weed science and crop management at the University of Manitoba, Winnipeg, Canada. My research areas include weed seedling recruitment biology and ecology, robust cropping systems, and the coexistence of genetically modified (GM) and non-GM crops. I conduct field-based research, supervise graduate students and teach courses at the undergraduate and graduate levels. I have published over 100 peer-reviewed works to date and have made over 300 other non-peer reviewed contributions. My work on the coexistence of GM and non-GM crops and the movement of GM traits from crop to crop has lead to international collaborations, presentations, and consulting work with governments and organizations in Denmark, Australia, Austria, Switzerland, the United States (U.S.) and Canada, including membership on the scientific advisory committees for the International conferences on the coexistence of GM and non-GM crops in agricultural supply chains (GMCC) which has hosted conferences in Denmark (2003), Montpellier (2005), Seville (2007), Melbourne (2009) and Vancouver (2011), with the next conference scheduled for Lisbon in 2013. I have also conducted contained trials of regulated GM crops (from 1999 to 2003) while at The University of Manitoba. I have previously been retained and appeared on the stand as an expert witness on the topic of the movement and containment of GM material in Canada in the case of Monsanto v. Percy Schmeiser, in Canada (Federal Court of Canada 2001) and in the U.S. in the Genetically Modified Rice Litigation (United States District Court 2012). I grew up on a farm in southwest Ontario, Canada. I hold BSc and MSc degrees in crop science and weed management, respectively, from the University of Guelph, Canada and a PhD in crop-weed ecology from the University of Reading in the UK. I am a member in good standing of the Ontario Institute of Professional Agrologists (P.Ag.).

I have provided a complete CV along with this report and below are listed my peer reviewed publications relevant to the topic of this report (and two government commissioned reports; 1 U.S. and 1 Canadian). In addition, I have made over 45 invited presentations on this topic over the past decade.

Peer reviewed publications by Rene Van Acker related to the movement of GM material from crop to crop and the coexistence of GM and non-GM crops.

Bagavathiannan, M.V., G. S. Begg, R. H. Gulden, and R. C. Van Acker. 2012. Modelling the Dynamics of Feral Alfalfa Populations and Its Management Implications. PLoS ONE 7(6): e39440. doi:10.1371/journal.pone.0039440.

Van Acker, R.C. 2012. Understanding Agricultural Species Metapopulation Biology and Ecology and the Implications for Coexistence in Low Level of Presence Scenarios. AgBioForum 15:54-60.

Bagavathiannan, M.V., R. H. Gulden, and R.C. Van Acker. 2011. The ability of alfalfa (*Medicago sativa*) to establish in a semi-natural habitat under different seed dispersal times and disturbance. Weed Sci. 59:314-320.

Bagavathiannan, M.V., Gulden, R.H., and Van Acker, R.C. 2011. Occurrence of feral alfalfa (*Medicago sativa* L.) populations along roadside habitats in southern Manitoba, Canada and their role in intraspecific novel trait movement. Transgenic Research. 20:397-407.

Bagavathiannan M.V., Spok A, and Van Acker R.C. 2011. Commercialization of Perennial GE crops: Looming Challenges for Regulatory Frameworks. J. Agric. Environ. Ethics. 24: 227-242.

Van Acker, R.C. and M. Bagavathiannan. 2011. Volunteer and feral crop plants and latent seed populations play an important role in novel trait containment. Pages 83-98 in H. Beckie and L. Hall eds. New Crops and Crops with Second-Generation Traits: Weed Management Challenges. Topics in Canadian Weed Science, Volume 9. Sainte-Anne-de Bellevue, Québec: Canadian Weed Science Society – Société canadienne de malherbologie.

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Bagavathiannan, M.V., Julier, B., Barre, P. Gulden, R.H., and Van Acker, R.C. 2010. Genetic diversity of feral alfalfa (Medicago sativa L.) populations occurring in Manitoba, Canada and comparison with alfalfa cultivars: an analysis using SSR markers and phenotypic traits. Euphytica 171:419-432.

Willenborg, C.J., A. L. Brûlé-Babel, and R.C. Van Acker. 2010. Identification of a hybridization window that facilitates sizable reductions of pollen-mediated gene flow in spring wheat. Transgenic Research 19: 449-460.

Bagavanthiannan, M.V. and R. C. Van Acker. 2009. Transgenes and national boundaries – the need for international regulation. Environmental Biosafety Research 8:141-148.

Mauro I.J. S.M. McLachlan, and R. C. Van Acker. 2009. Farmer knowledge and *a priori* risk analysis: Pre-release evaluation of genetically modified Roundup Ready wheat across the Canadian prairies. Environ. Sci. Pollution Res. 16: 689-701.

Willenborg, C.J., A.L. Brûlé-Babel, and R.C. Van Acker. 2009. Low crop densities promote pollen-mediated gene flow in spring wheat (*Triticum aestivum* L.). Transgenic Research 18:841-854.

Willenborg, C.J., E.C. Luschei, A.L. Brûlé-Babel, and R.C. Van Acker. 2009. Crop genotype and plant population density impact flowering phenology and synchrony between cropped and volunteer spring wheat. Agron. J. 101:1311-1321.

Willenborg C. J., E. C. Luschei, A. L. Brûlé-Bable, and R. C. Van Acker. 2009. Flowering phenology and synchrony between volunteer and cropped spring wheat (Triticum aestivum L.): identification of a hybridization window and its implications for pollen-mediated gene flow. Crop Sci. 49:1029-1039.

Bagavathiannan, M. V. and Van Acker, R C. 2009. The Biology and Ecology of Feral Alfalfa (Medicago sativa L.) and Its Implications for Novel Trait Confinement in North America. Crit. Rev. Plant Sci. 28:69-87

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Knispel, A.L., S.M. McLachlan, R.C. Van Acker and L.F. Friesen. 2007. Multiple herbicide tolerance in escaped canola populations in Manitoba, Canada. In A.J. Stein and E. Rodriguez-Cerezo Eds. Proceedings of the Third International Conference on Coexistence between Genetically Modified (GM) and non-GM based Agricultural Supply Chains. Seville, Spain, Nov 20-21, 2007. Pp. 61-64.

Willenborg, C.J., and R.C. Van Acker. 2007. Intraspecific gene flow in bread wheat (*Triticum aestivum* L.). In A.J. Stein and E. Rodriguez-Cerezo Eds. Proceedings of the Third International Conference on Coexistence between Genetically Modified (GM) and non-GM based Agricultural Supply Chains. Seville, Spain, Nov 20-21, 2007. Pp. 71-74.

Bagavanthiannan, M.V., and R.C. Van Acker. 2007. Feral nature of alfalfa (*Medicago sativa* L.): potential barrier for the coexistence of genetically modified and conventional alfalfa in diverse production systems. In. A.J. Stein and E. Rodriguez-Cerezo Eds. Proceedings of the Third International Conference on Coexistence between Genetically Modified (GM) and non-GM based Agricultural Supply Chains. Seville, Spain, Nov 20-21, 2007. Pp. 225-226.

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Willenborg, C. J., and R. C. Van Acker. 2006. Comments on an empirical model for pollen mediated gene flow in wheat (Crop Sci. 45:1286-1294). Crop Sci. 46:1018-1019.

Harker, K. N., G. W. Clayton, R. E. Blackshaw, J. T. O'Donovan, E. N. Johnson, Y. Gan, F. A. Holm, K. Sapsford, R. B. Irvine, and R. C. Van Acker. 2006. Persistence of glyphosate-resistant canola in western Canadian cropping systems. Agron. J. 98:107-119.

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Van Acker, R.C., A.L. Brule-Babel and L.F. Friesen. 2004. Intraspecifc gene movement can create environmental risk: The example of Roundup Ready® wheat in western Canada. In: Breckling, B and R. Verhoeven (eds): Risk, Hazard, Damage – Specification of Criteria to Assess Environmental Impact of Genetically Modified Organisms. Bonn (Bundesamt fur Naturshutz) - Naturschutz und Biolische Viefalt 1:37-47.

Friesen, L.F, A. Nelson and R.C. Van Acker. 2003. Evidence of contamination of pedigreed canola (*Brassica napus*) seedlots in western Canada with genetically engineered herbicide resistance traits. Agron. J. 95: 1342-1347.

Van Acker, R.C. A.L. Brule-Babel, L.F. Friesen and M.H. Entz. 2003. Coexistence of GM and non-GM crops in Canada. Roundup Ready wheat as a case study. In B. Boelt Ed. Proceedings of the 1st European Conference on the Coexistence of Genetically Modified and Conventional and Organic Crops. Elsinore, Denmark, Nov 13-14, 2003. Pp. 60-68.

Government reports on GM and non-GM coexistence

Van Deynze, A.K. J. Bradford, J. DiTomaso, N. Kalaitzandonakes, C. Malory-Smith, R. Van Acker, N. Stewart, H. Daniel and S. Strauss. 2012. Gene Flow in Agriculture: Meeting Report. A report to the United States Department of Agriculture on the proceedings of the commissioned conference on "The Science of Gene Flow in Agriculture and its Role in Co-existence" held in Washington, DC, September 7-8, 2011.

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This report is structured as answers to questions (as follow) specified in instructions provided to me in a letter from Mr. Mark Walter at Slater and Gordon dated May 15, 2013.

1. Please provide some general background on the physical characteristic properties of canola.

Since the first genetically modified (GM) crops were commercialized in the mid 1990s, reports of GM material appearing where it was not intended, expected or wanted have steadily increased (Ellstrand 2012). This reflects both the challenges in containing GM crops but also the insufficiency of effort in some cases or lack of requirement in others, to contain them (Marvier and Van Acker 2005). GM canola has been grown commercially for more than 18 years and intraspecific gene flow in canola (*Brassica napus* L.) within and among arable fields is commonly recognized (Ellstrand, 2001; Légère, 2005; Smyth et al., 2002; Beckie and Hall 2008; Rieger et al. 2002; 2003; Demeke et al. 2006; Van Acker 2012). Escaped canola populations most likely arise from seed dispersed through agricultural activities and transport, including human error (Crawley and Brown, 1995; Marvier and Van Acker 2005), and have been found to contain multiple GM traits in areas where these GM varieties are widely grown (Yoshimura et al., 2006; Knispel et al. 2008). While localized escaped canola populations are believed to be transient (Crawley and Brown, 2004), such populations may contribute to the spread of GM traits through intraspecific gene flow within a single generation, and the nature of canola can facilitate GM trait movement.

Because of its primary colonizer nature (CFIA 1994), canola is a known weedy plant able to establish and grow in a wide range of habitats (Crawley and Brown, 1995; Pessel et al., 2001; Lawson et al. 2006), and escaped and volunteer canola populations are ubiquitous in areas where canola is commonly grown including Canada (Knispel et al. 2008), the United States (Shafer et al. 2011), Europe (Pessel et al. 2001), and Australia (OGTR 2008). Canola can effectively establish on its own from seed (inclduing in non-cultivated habitats) and it is a very common volunteer weed when it is grown in crop rotation (Crawley and Brown 2004; Lawson et al. 2006; Beckie et al. 2003; Hall et al. 2000).

Canola is an annual dicotyledonous crop (grown as a winter annual in Australia; OGTR 2008). Canola grows to a height of 70-170 cm depending on variety and conditions, and seeds develop in elongated capsules called siliques which when dry are susceptible to shattering which can result in seed (yield) loss (OGTR 2008; Beckie et al. 2003). Seed loss at harvest can range from 1% to as high as 30% of the crop in extreme cases (Gulden et al. 2003a). Canola seed can persist for a long time in the environment, even without new seed additions (Begg et al. 2006). Some studies have shown canola seedbank persistence at low levels of 10 years or more (D'Hertefeldt et al. 2008). The potential long term persistence of canola escapes makes eradication of escapes and clean up after escapes very challenging, requiring sustained and substantive effort (Marvier and Van Acker 2005).

What has been acknowledged generally in relation to seed mediated GM material movement is that it is often related to human involvement or human error in regard to handling or managing crops or seeds (Ellstrand 2012). In terms of seed movement, complete separation of operations (e.g. farming and grain handling) is acknowledged as the prudent and most effective approach for the confinement of GM crops (Van Acker 2012).

2. What is the potential for canola seeds (or plant material including seeds) to be dispersed , and by what mechanisms are they dispersed?:
(a) during sowing;

During sowing and in handling canola seed there are many opportunities for seeds to move. The handling of seed, especially small seed like canola, requires care in terms of preventing spills and inadvertent movement. Seed may move via animals, adherence to equipment or people, wind, in refuse (e.g. seed bag disposal), sharing of equipment, transport of seed on roads, inadequate tarping of seed loads, cleaning of equipment or seed transportation equipment in farm yards or along roadsides, via spills etc... The potential for canola seed movement is well known and has been reported on farms (Van Acker et al. 2007), on roadsides (Crawley and Brown 1995; Knispel et al. 2008) and along transportation routes and in grain handling ports (Crawley and Brown 1995; Yoshimura et al. 2006). Friesen et al. (2003) demonstrated that admixture of GM canola seed into non-GM canola seed lots, likely via insufficient handling oversight, has even occurred for canola breeder seed in plant breeding programs.

(b) after the plant has matured but before harvest

After the canola plant has matured (but before it has been harvested - assuming the canola is standing and has not been swathed) there is minimal opportunity for seed movement. Unless there were unusual weather including substantive wind (perhaps at the level of a minor twister), there would be minimal opportunity for seed to move from a standing canola crop.

(c) during harvest

During harvest there are two general opportunities for canola seed to move. The first is related to the nature of the harvest. If the canola is swathed and left in the swath to allow seed to mature before the swaths are combine harvested then there is a known opportunity for canola swaths to be moved by wind (OGTR 2008; MAFRI 2012). If swaths are not rolled into stubble to help reduce the chance of movement and/or if there are strong wind gusts or wind storms then canola swaths and canola plant material (carrying seeds) can be moved some distance (e.g. Western Producer 2012).

The second is in relation to grain handling. Any seed handling can result in movement of seed (Van Acker et al. 2007) and the escape of GM seed has been caused by insufficient care or oversight while handling seed (Marvier and Van Acker 2005). Canola seed is small and can end up being carried (either knowingly or unknowingly) in equipment, especially grain handling equipment including combine harvesters, seeders, seed wagons and trucks. Small amounts of seed can also be carried by humans (in clothing) or by animals as well as on the wheels of machinery when seed is embedded within moist soil. The large quantity of seed being handled during harvest operations (versus seeding) multiplies the risk of seed movement in this manner at this time.

3. Where do volunteer canola plants typically grow in relation to canola fields and how prevalent are they?

Volunteer canola is very common (Lawson et al. 2006; OGTR 2008), and is so common in Australia that it is considered a major weed (OGTR 2008). Volunteer canola plants are most commonly found within cultivated fields as the result of growing canola in rotation and subsequent seed loss at harvest as well as the ability of canola seed to persist in the soil and form a seedbank (Lawson et al. 2006; OGTR 2008). Volunteer (or escaped or feral) canola is less common in non-cultivated lands but it still regularly appears in non-cultivated and non-cropped areas, especially in agricultural areas where canola is grown as well as along grain transport routes and in grain handling areas (Knispel et al. 2008). It was previously thought that escaped canola populations had only a limited ability to persist (OGTR 2008) but a number of recent studies have shown that escaped canola populations (growing in non-cropped areas including roadsides) are robust enough to persist for multiple generations and for enough generations to facilitate GM trait stacking within these populations (Knispel et al. 2008; Shafer et al. 2011).

4. If the attached material and instructions permit, please provide your opinion as to the risk that canola seeds (or plant material including seeds) will be dispersed from Sevenoaks to Eagle Rest.

There are key facts provided to me that are relevant to this question including; Mr Baxter grew GM canola for the first time in 2010, including in paddocks closest to Mr Marsh's property (Eagle Rest). The 2010 GM canola was swathed as opposed to being direct combined as had been the previous practice of Mr. Baxter with his non-GM canola and as he did in that year (2010) with his non-GM canola elsewhere on his farm. Whole or parts of canola plants were found by Mr. Marsh on various paddocks on his farm in November 2010 and he personally witnessed canola plants being blown across his farm in that same month even though Mr. Marsh was not growing any canola on his farm. In 2010, canola confirmed to be GM was detected on Mr. Marsh's property at a distance of up to 1.4 km from Mr. Baxter's paddock on which he grew GM canola. The next closest farm to Eagle Rest on which GM canola was grown and harvested in that same year (2010) was at minimum 3 km away from Eagle Rest. Mr. Baxter did not grow any GM canola within 1.1. km of Eagle Rest in 2012 but has informed Mr Marsh that he will be growing GM canola in 2013 on paddocks that drain towards Eagle Rest. From the photos and the agronomy records provided to me for review in this case it is clear that the Baxter farm includes extensive canola production including extensive GM-canola production (e.g. 109 ha in 2010).

In general, the greater the extent to which Mr. Baxter reduces the physical segregation between the farming and related operations of Sevenoaks and Eagle Rest in relation to GM canola the greater the risk that canola seeds (or plant material including seeds) will be dispersed from Sevenoaks to Eagle Rest.

(a) during sowing;

Anytime seed is handled there is an opportunity for seed escape. this may occur during transport of the seed, as seeders are being filled, when seeding equipment is being cleaned (prior to or after seeding) and when equipment is being transported. This would be particularly true if transportation of seed or equipment occurred close to Mr. Marsh' property on for example, the Qualeup North Road which runs between the Baxter and Marsh properties. The relative risk of seed movement at this time (during sowing) is low unless Mr. Baxter, or people working for him or contracted by him (to deliver seed or equipment for example) inadvertently spill or trail seed near or onto Mr. Marsh's property.

(b) after the plant has matured but before harvest

After the canola plant has matured (but before it has been harvested - assuming the canola is standing and has not been swathed) there is minimal opportunity for seed movement. Unless there were unusual weather including substantive wind (perhaps at the level of a minor twister), there would be minimal opportunity for seed to move from a standing canola crop on Sevenoaks to Eagle rest.

(c) during harvest.

In particular if canola is swathed, there is an opportunity for canola plants and plant material to be blown onto Eagle rest from Sevenoaks. This would be true even for canola seeded into the Big Dam and Two Dams fields on Sevenoaks. Wind records for October and November 2010 for the region including Sevenoaks and Eagle Rest show that there are substantive winds and gust coming from a range of directions depending on the day but including from the southeast, south, southwest, west and northwest. This would create the possibility for canola plant material to be blown from a wide variety of paddocks on Sevenoaks to Eagle Rest. At harvest time, because relatively large quantities of grain (canola seed) are being handled, there is risk of seed escape which is substantively greater than at sowing time all other things being equal. If grain and or harvesting equipment is being transported there is also a risk of seed escape. The risk that this seed escape would end up on Eagle Rest is substantively greater if the transport occurs on routes next to Eagle rest.

5. What methods can be used to prevent the dispersal of canola seeds and plants that result in volunteer populations and which of these methods or combination of methods is most effective?
In general, the primary method for preventing plant or seed escape or incursion is segregation including spatial segregation. Ensuring that operations are well separated is key. In the case of the example of GM material and organic farms, this will require cooperation and agreement among GM and non-GM farmers (Van Acker et al. 2007). Segregation requires a system that includes many methods and no single method should be relied on for maintaining segregation (CSGA 2012).

Isolation distances are commonly used in seed production to meet regular seed (variety) purity standards (not necessarily absolute genetic purity standards) (CSGA 2012; Van Acker et al. 2004, 2007). Isolation distances in the case of seed production are maintained by the seed grower who is looking to prevent incursion of off types and the isolation distance is not the only measure taken to manage purity (CSGA 2012). Seed growers use a segregation system comprised of many methods including inspecting and roguing of seed fields to remove off types, using dedicated harvesting and seed cleaning and handling equipment, controlling volunteer and feral populations in and near seed fields, using long rotations, testing to maintain the varietal purity of seed, record keeping, and maintenance and inspection of field border areas (CSGA 2012). In this manner, seed growers take an active and systematic segregation approach to reduce the possibility of plant and seed escape or incursion.

It is important that there be an awareness of and a respect for the consequences of GM seed and/or plant material (containing seed) (DMFAF 2004). The signs that Mr. Marsh erected on his property (dated September 2010) would help in this regard. This awareness should extend not only to farmers and property owners but also to those providing services to farms including custom farming services (seeding and harvesting for example) and farm input delivery, especially seed, as well as grain transportation off farm.

Further details for methods to prevent the dispersal of canola seeds and plants that result in volunteer populations specific to this case are described in my answer to question 6.

6. What specific measures could be taken on Baxter's property (in the future) to mitigate the risk that GM canola plants will be blown or otherwise travel onto Eagle Rest?

In general, the greater the extent to which Mr. Baxter can segregate his GM canola farming (and associated operations) on Sevenoaks from Mr. Marsh's farm (Eagle Rest) the less risk there will be that GM canola will travel onto Eagle Rest from Sevenoaks.

From the photos and the agronomy records provided to me it is clear that the Baxter farm includes extensive canola production including extensive GM-canola production (e.g. 109 ha in 2010). An awareness by Mr. Baxter and those working for him or contracting by him in relation to his farming operations and in particular his farming of GM canola of the risks and the source of the risk of travel of GM canola from Sevenoaks to Eagle Rest would be an aid to reducing the risk of GM canola travelling from Sevenoaks to Eagle Rest. The sign (dated September 2010) posted on Mr Marsh's property stating clearly that it is a Certified Organic Farm and that it is considered GM-free is helpful in this regard. Also, the fact that Mr. Baxter has informed Mr Marsh that he will be growing GM canola in 2013 is positive in this regard. However, the fact that Mr. Baxter will be growing GM canola in 2013 on paddocks that drain towards Eagle Rest (the Baxter paddocks; Big Dam and Two Dams) and are closer (quite a lot closer in the case of Big Dam) to Mr Marsh's farm than the 1.1 km separation distance Mr. Baxter achieved in 2012 is not positive in this regard and it will increase the risk of movement of GM canola from Sevenoaks to Eagle Rest.

Relatively long distance physical separation of Mr. Baxter's GM canola production from Mr. Marsh's farm would reduce the risk of Mr. Baxter's GM canola showing up on Mr. Marsh's farm. For example, Mr. Baxter did not grow any GM canola within 1.1. km of Eagle Rest in 2012 and Mr. Marsh found no new GM canola on his farm in that year (2012). Long distance separation in this regard will make it less likely for canola plant material containing seeds to be blown onto Eagle rest from Sevenoaks.

Physical barriers may have some effect in reducing the risk of movement of canola plants or plant parts from Sevenoaks to Eagle Rest but the barriers would need to be substantive and dense so that even small pieces of canola plant would be captured. Some sort of fencing perhaps or a dense hedge or dense fence of tall plants could act as a barrier to the physical movement of canola plants or plant parts from one place to another. As far as I know, however, there have been no peer-reviewed studies of the use of physical barriers in fields to prevent the physical movement of GM plant material from farm to farm or field to field and so the extent of the effectiveness of this method is not known.

Whenever seed or grain is handled there is an opportunity for seed escape (Van Acker et al. 2007). Care in seed and grain handling as well as physical separation of seed and grain handling (including transport) away from Eagle Rest or any of its farming operations would reduce the risk of GM canola moving from Sevenoaks to Eagle Rest.

Direct harvesting versus swathing and then harvesting can make a significant difference in terms of reducing the risk of canola seed moving from Sevenoaks to Eagle Rest.

Although individual methods can help to reduce the risk of GM canola movement from Sevenoaks to Eagle Rest, no single method alone will necessarily prevent that movement. Given that Sevenoaks and Eagle Rest are neighboring farms, growing GM canola on Sevenoaks creates a risk of movement of GM canola from Sevenoaks to Eagle Rest. The level of this risk can be reduced to the greatest extent if a system is used comprised of multiple methods including for example;
- growing the GM canola on Sevenoaks as far away from Eagle Rest as possible
- making all relevant actors (including Mr. Baxter and any people working for him or contracted by him in regard to his farming operations) fully aware of the need and means to prevent the movement of GM canola from Sevenoaks to Eagle Rest,
- providing physical barriers on the boundaries of Sevenoaks which border Eagle rest to aid in trapping canola plant material that may be blown from Sevenoaks to Eagle Rest
- taking special care in seed and grain handling including transport and equipment transport to avoid spills and to keep the handling and transport as far away as possible from Eagle Rest.
- direct combine harvesting the GM canola instead of swathing and then combine harvesting.

7. Please comment in your answer to question 6, on the significance (if any, in your opinion), of: the location within Sevenoaks where GM canola may be grown, in terms of both distance and topography;

the use of buffers

Although buffers are typically not effective in preventing pollen mediated gene flow (Beckie and Hall 2008) buffers may be effective for helping to reduce the risk of movement of canola plants or plant parts. These buffers, however, would need to be substantive and dense so that even small pieces of canola plant would be captured. Some sort of fencing or permanent dense hedge could act as a barrier to an extent of the physical movement of canola plants or plant parts from one place to another. I am not aware of any peer-reviewed studies on the use or effectiveness of physical barriers in fields to prevent the movement of GM material via seed and no barrier (as with no individual containment method) may be sufficient to absolutely prevent movement of GM canola from Sevenoaks to Eagle Rest. Distance, especially substantive distance, however, is known to be important and effective as a buffer or barrier to GM incursion into farms or fields where it is not wanted (Beckie and Hall 2008).

methods of harvesting the GM canola.

Canola can be either swathed and then combine harvested or directly combine harvested (OGTR 2008). Canola is more typically swathed rather than direct combined because canola is prone to shattering which results in yield loss (OGTR 2008). In the case of containing GM canola, however, swathing facilitates the potential movement of GM canola to where it is not intended, expected or wanted. The movement of canola swaths by wind is common and known to occur (MAFRI 2012; Western Producer 2012). Growers wishing to prevent such movement will commonly roll their swaths as the canola is being cut. The roller, pulled behind a swather, pushes the swath into the canola stubble helping to hold it there in the wind. This does not guarantee that swaths won't move in the wind but it can help reduce the chance of swaths moving in the wind. In cases where GM canola needs to be strictly contained, direct combining of the canola would be considered a better and more responsible practice, but alone, it may not necessarily prevent movement of GM material from a given field. Grain and equipment handling at harvest are also important factors in terms of the risk GM canola movement. Keeping grain and equipment transport routes away from Eagle Rest during canola harvest would facilitate GM canola confinement and help to reduce the risk of GM canola moving from Sevenoaks to Eagle Rest.

If Mr. Baxter direct combine harvests the GM canola instead of swathing, it will substantively reduce the risk of GM canola moving from Sevenoaks to Eagle Rest. In addition, a change from swathing the GM canola to direct harvesting would greatly reduce the separation distance required between the GM canola fields on Sevenoaks and Eagle Rest in order to greatly reduce the risk of GM canola moving between the two farms. The difference in distance required in this regard could be an order of magnitude in scale, so that if a distance of around 1 km (e.g. 1.1 km as per the separation distance in 2012) is necessary to substantively reduce the risk of canola moving from Sevenoaks to Eagle Rest if the canola is swathed, then the separation distance required if the canola is direct combine harvested would only be approximately 100m. In my opinion and given the characteristics of the farms (e.g. that they share a long common border which consists of a relatively narrow road), and the weather (e.g. wind records for October and November 2010 for the region including Sevenoaks and Eagle Rest show that there are substantive winds and gust coming from a range of directions depending on the day but including from the southeast, south, southwest, west and northwest), if Mr. Baxter continues to grow GM canola, even at some considerable distance from Eagle rest (e.g. 500m to 1000m) and continues to harvest that canola by swathing first and then combine harvesting there is a good chance, that GM canola seed will again end up moving from Sevenoaks to Eagle Rest.

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Rene Van Acker

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