Response to Neighbour's Concerns

Regarding a Proposed 6,000 Head Hog Finisher Barn for Verbruggen Farms SW 13-14-21W

Prepared by:

DGH Engineering Ltd.

12 Aviation Boulevard

St. Andrews, Manitoba R1A 3N5

Doug Small, P.Eng.

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DGH ENGINEERING LTD.

1. Responses to Neighbour's Concerns

A total of ten responses were received by the Technical Review Committee and forwarded to Verbruggen Farms for comment. As many neighbours shared common concerns, the following is a response to the concerns expressed.

2. The Verbruggen Family

The proposed hog operation will be owned by Wim and Marlies Verbruggen. This is a family farm. The Verbruggens have lived in the area for many years and want to provide diversified income for their grain farm so that their children can have a future in farming.

The Verbruggens have been involved in hog farming their whole life and have the skills to operate a successful, well-managed operation. The barn will be antibiotic and hormone free and will be operated with the highest standards of cleanliness and sanitation.

The feed for the hogs will be from the grain grown on the Verbruggen farm. After the hogs remove approximately 30 percent of the nutrients from the grain for body growth, the manure (grain) is simply recycled as organic fertilizer for further grain production. The farm will be a model of environmental sustainability.

The Verbruggens live less than one-quarter mile from the proposed operation. They are part of the community and wish to be good neighbours. The family is dedicated to be good stewards of the land and the environment.

3. Odour Control

Odour is one of the primary concerns regarding swine farms. Odourants in swine manure result primarily from the partial decomposition of organic matter by anaerobic microorganisms. Although not present at toxic concentrations, livestock odours present a nuisance potential.

There are three sources of odour from swine operations: the facilities that house the animals, the manure storage, and the manure spreading operation. At the present time, it is not economically feasible to raise swine without some odour production. However, odours can be maintained at acceptable levels through the propose design and management of barns and proper planning and operation of manure management systems.

With frequent manure removal and by keeping the animal and floor as clean and dry as possible, odours within the proposed barns will be kept to a practical minimum. Manure will be flushed out of the barns on a two-week interval to exterior long-term storage. This will keep the in-barn production of the most noxious and odorous gases to a minimum. Hydrogen sulphide, mercaptans, and the noxious organic acid gases are produced and released in greater quantities when manure is stored in the barn for longer periods. A state-of-the-art ventilation system will be installed, with computerized controls to ensure that the animals are always comfortable and healthy. This promotes improved barn cleanliness and reduced odour production. Further, the facility will be operated in an all-in all-out fashion by room; with complete wash-down and disinfection of every room between subsequent groups of pigs, improving barn sanitation and reducing odour production.

The Verbruggens are up-to-date on European technology and are reviewing the possibility of using air scrubbers to remove odour from the exhaust. Should this technology prove feasible under Western Canadian conditions, it would be incorporated into the design. These scrubber would virtually eliminate barn odours.

Odours from the earthen manure storage will be completely eliminated through the use of a plastic cover. This technology involves a geosynthetic membrane that covers the complete storage surface and eliminates almost all gas emissions from the storage. Since the majority of barn site odours originate from the storage, this feature of the project is expected to have a profound impact on odour reduction. In combination with the setbacks outlined earlier, neighbouring residences are expected to experience very little impact from the project.

Historically it was reported that about 40% of the public complaints on odour nuisance from swine operations was related to land application of manure when broadcasting was used as the method of spreading. In contrast, the use of injection as the method of land has application has virtually eliminated odour from land application.

In the proposed swine operation, manure will be injected into the topsoil using a cultivator. The liquids are not atomized; evaporation and exposure to the air is eliminated; nutrients in the manure are stabilized with respect to runoff; and odour release is negligible. Of the methods of manure applications available, injection results in the least odour during and after spreading. Due to the sparse population surrounding the spreading lands, the effect on area residents is predicted to be minimal.

Shelter belts around the hog facility will improve the aesthetic appearance of the area, and help to disperse odours. Windbreak buffers help decrease the effects of odours by creating greater lift and turbulence to better dissipate and diffuse odours.

The nearest weather station with wind data applicable to the project site is in Brandon. Weather patterns at the site are expected to be generally similar to those observed in Brandon (Figure 1). The annual prevailing winds in the area of the site are from the West.

The nearest neighbour to the proposed livestock operation is located northeast of the proposed site. This neighbour will potentially receive odour with winds originating from the southwest. According to meteorological data, for 96 percent of the time winds originate from a direction other than the southwest, carrying odour away from the neighbour.

The next closest neighbour is southeast of the proposed site. For 88 percent of the time winds originate from a direction other than northwest, carrying odour away from this neighbour.

The large separation distances from remaining neighbours provide adequate time and distance for any odours which may be produced from the facility to become dilute and thoroughly mix into the atmosphere, thereby reducing any impact on these residents.

Figure 1. Wind Direction, Brandon, MB

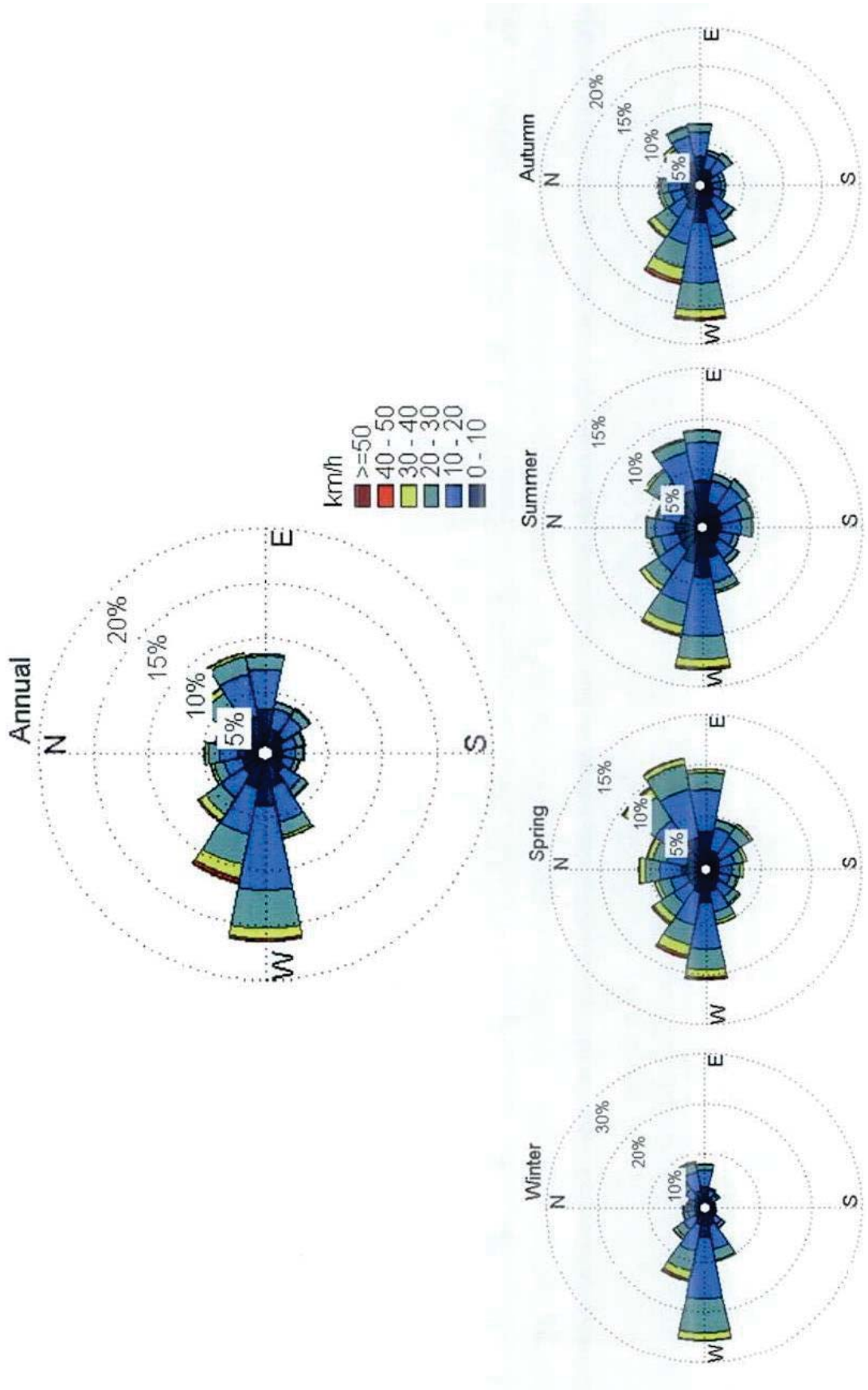

Figure 1 - Brandon Wind Roses for Hourly Wind Normals (1981-2010)

4. Land Base Required to Recycle Crop Nutrients

Nutrients contained in the manure will be utilized as organic fertilizer for crop production. The organic material contained in the manure will act as a soil conditioner improving soil tilth, fertility, and water retention. Over the long term, increased soil organic content also builds a better and more stable soil structure less prone to erosion.

The manure will be applied as a fertilizer at rates that will match crop phosphorus and nitrogen uptake. An annual manure management plan must be file with Manitoba Sustainable Development at least 60 days prior to application of manure to fields. This plan involves annual soil testing to ensure that there is no build-up of nutrients that could pose a risk to surface or groundwater. The manure application rate is calculated using target yield, crop nutrient uptake, and manure nutrient levels. Soil and manure nutrient contents are analysed annually.

As the manure management plans are filed with the Province annually, should a build-up of nutrients begin to occur, the Province would be alerted and require changes in the operation's manure management practices.

The land base required to sustainably support this proposed hog operation has been identified in the assessment filed with the Technical Review Committee (TRC). It is expected that TRC will verify that there is an adequate land base to recycle the nitrogen and phosphorous from this proposed operation.

Significant amounts of natural gas are used to manufacture chemical nitrogen fertilizer. The natural gas used to produce the chemical nitrogen to fertilize 70 acres of wheat producing 50 bushels per acre could heat a typical Manitoba home. The use of manure to fertilize crops conserves large amounts of natural gas.

No other manure fertilizers will be applied to the land base proposed for this operation.

All manure will be injected using a cultivator. Injection ensures the manure is immediately encapsulated by the soil, minimizing any potential runoff and virtually eliminating odours.

A three metre setback is recommended by Provincial Guidelines as a setback from watercourses when manure is injected. In addition to respecting this setback, Verbruggen Farms will maintain a vegetated buffer strip within this setback. Vegetated buffer strips have proven to be very effective in controlling nutrient runoff from cultivated crop land.

5. Manure Storage Safety

An earthen manure storage (EMS) is proposed to contain the manure from this operation.

Earthen manure storages have been regulated by the Province of Manitoba since 1995. A permit to construct an EMS requires a detailed geotechnical assessment of soils; a design prepared by a professional engineer; review of the design and all relevant information by Manitoba Sustainable Development prior to issuing the permit; site supervision of the construction by the responsible engineer; and finally certification of the storage by the engineer when the work is completed.

The above process is required for all manure storages constructed in Manitoba. Since the legislation was enacted in 1995 many hundreds of hog, poultry and dairy storages have been constructed. This program is among the strongest legislation in North America and has an excellent record of providing safe containment of livestock manures.
Verbruggen Farms has retained DGH Engineering Ltd. to conduct a preliminary geotechnical site assessment to determine the type of liner required. Design features of this specific proposed storage include:

- High quality clay soils are present. The proposed storage will have a one metre re-compacted clay liner;
- Thick earthen berms, a minimum of five feet above grade. This design provides extremely high structural integrity and ensures that surface waters will not be impacted, and that surface water will not impact the storage;
- The interior and exterior slopes are designed to prevent erosion from occurring. The exterior berms will be grassed to further ensure bank stability.

Setbacks from surface watercourses are the final defense that, in conjunction with the above measures, will ensure that surface water is protected. The proposed EMS meets all setback requirements.

The design and construction standards enforced by the Province of Manitoba ensure that there is no risk of groundwater contamination.

Since this program originated, the Province annually conducts audits of manure storages. Any storages found to have experienced damage or deterioration are required to implement remedial repairs to ensure environmental safety. To date, no permitted storage in Manitoba has experienced an incident that has resulted in any significant environmental impact.

6. Water Consumption

The proposed 6,000 head finisher barn will require 19,800 imperial gallons per day or 13.75 gallons per minute. Well records indicate that an existing well located in the vicinity of the operation produces 75 imperial gallons per minute. A new well will be drilled for the proposed barn.

Prior to any new development of a water supply that exceeds 5,500 gallons per day, a Water Rights License must be obtained through Manitoba Sustainable Development. The license process includes the assessment of the proposed use on the aquifer and other uses. Manitoba Sustainable Development establishes withdrawal rates that prevent problems for other users prior to issuing a license. The local aquifer is expected to sustain all current uses as well as the proposed development without any concern.

Should the Provincial review indicate concerns with the availability of groundwater, Verbruggen Farms will construct a dugout. The dugout will collect and store spring runoff water to reduce and supplement groundwater supplies.

The Technical Review Committee, through their review of the proposal, will also consider this issue. The TRC is expected to comment on the ability of the local aquifer to sustainably provide the quantity of water required for this operation.

7. Traffic

Verbruggen Farms will provide most of the feed for the proposed barn with grain grown on their own farm. This essentially eliminates the need to have feed delivered, other than one truckload per week of supplemental ingredients.

The barn will receive one truck per week of weanlings and ship two trucks per week of market hogs. The resulting four truck loads per week will have negligible impact on the municipal roads. All trucks will access the site from Highway 250 and will respect applicable weight restrictions.

8. Quality of Life and Land Values

The quality of life and land values of neighbours adjacent to hog farms were studies a few years ago by Alberta Pork Producers and Alberta Agriculture. In the study, completed by Serecon Management Consulting Inc., 73 neighbours to existing hog operations were surveyed for their view. The study concluded as follows:

"While most neighbours share public concerns about odour, water quality and the impact of the operations on their quality of life, the large majority haven't had any problems. They believe water quality, property impacts and aesthetics are important, but said that the existing operations did not significantly impact on these values."

An additional study undertaken by Serecon examined the impact of intensive swine operations on neighbouring property values. This study occurred in the Lacombe and Rimbey areas of Alberta and concluded the following:

"Our findings in the analysis and supported by our expertise in this area is that generally intensive livestock operations, more specifically hog enterprises, do not have a negative impact on area land values. In fact, most of the purchasers surveyed found that land prices have increased in the areas studied due primarily to the number and density of livestock enterprises. This was due to the increased number of buyers in the area".

The propose hog farm is not expected to have any negative impact on quality of life or land values.

9. Public Health Risks

Pathogens in human fecal waste have the greatest potential to cause infection in other humans. Failure to properly process and dispose of human sewage poses a much greater threat to public health than manure from intensive hog production. Indeed, there have been at least 150 different bacteria, viruses, parasites, yeasts, and fungi found in human feces that are capable of causing disease when transmitted to other humans. Although purification reduces the levels of these organisms, the remaining sewage sludge contains a significant amount of viable pathogens. In comparison, there is a relatively small number (10-15) of pathogens that have been identified in swine which are known to be transmissible to and cause disease in humans. Pathogens can be transmitted by direct contact with the animals or their feces, or by consuming food or water which has been contaminated with animal feces.

Table 1 compares the prevalence of most commonly found pathogenic organisms in pigs with that found in humans, cattle, and poultry. These organisms are either bacteria or parasites. Note that the

bacterium *E. coli 0157:H7* has a very low incidence in pigs. Only one virus (swine influenza virus) can be transmitted between pigs and people. This virus does not survive well outside the pig, particularly in a dry, cold climate, and is therefore considered to be of no risk to people not in direct contact with pigs.

Table 1. ***Prevalence of Enteric Pathogens in Humans, Pigs, Cattle, and Poultry***

Pathogen	***Percent Prevalence***			
	Human	Cattle	Pigs	Poultry
Salmonella spp.	1%	0 – 13%	0 – 38%	10 – 100%
E. coli 0157:H7	1%	16%	0.4%	1.3%
Campylobacter jejuni	1%	1%	2%	100%
Yersinia enterocolitica	0.002%	<1%	18%	0%
Giardia lamblia	1 – 5%	10 – 100%	1 – 20%	0%
Cryptosporidium spp.	1%	1 – 100%	0 – 10%	0%

The people at greatest risk of contracting infections from pigs are barn workers and packing house workers, since they are in daily direct contact with the animals and are exposed to fresh feces and urine. Some basic preventative and hygiene procedures are commonly employed by barn staff to minimize exposure. These include the use of protective masks to reduce inhalation of dust particles, disposable gloves to reduce direct contact when handling animals, strategically placed wash stations to encourage frequent hand washing, and in-barn showers and laundry facilities to promote personal cleanliness. Despite their close daily contact with live animals, reported infections of swine barn workers are very rare.

Modern hog production units are designed for total confinement of all breeding stock and their offspring. Therefore, neighbouring residents do not have direct contact with the animals or their manure. There is no direct evidence to suggest that any pathogen carried by pigs can be transmitted via air to humans. Air exhausted by barn fans may contain bacteria or viruses, which adhere to dust particles generated by the barn. Most of these particles, however, have been shown to travel only a short distance (10 m) from the barn.

Food-borne transmission of pathogens can occur of contaminated pork is prepared improperly and consumed. Proper handling and cooking of pork in the same manner as any other raw meat will ensure its safety when consumed. Food-borne transmission may also occur if foods such as fruits and vegetables are directly sprayed or irrigated with fresh manure and then consumed without proper washing. Most frequently, manure is applied after harvest to farmland growing small grains, grass, or oilseeds, and thus poses no risk of coming into direct contact with food.

In order for transmission of pathogens to occur through water, four steps must be completed. Elimination of any one of these steps will break the chain and prevent infection from occurring.

First, the pathogen must be present and excreted by the pigs. As shown in Table 1, prevalence rates are quite variable, ranging from a low of 0.4% for *E. coli 0157:H7* to a high of 38% for *salmonella spp*. Recent studies have shown that many swine herds are entirely free of roundworms, thus eliminating any

risk from this pathogen. As well, many herds of high health status are free of the harmful strains of *salmonella*.

Secondly, once excreted, the pathogen must reach a water supply. In modern swine units, feces and urine are collected in shallow gutters in the barn and then drained via a series of sewer pipes into a long term storage, where they are stored for an average of 150 – 200 days. There is no opportunity for animals to defecate directly into surface water. Properly designed and located earthen manure storages such as lined earthen lagoons serve to protect groundwater from potential seepage and contamination during storage. Once in storage, most organisms do not survive well. For example, an Alberta survey of 50 farms found roundworm and *cryptospordia* eggs in only 1% of lagoon samples, despite an overall prevalence in pigs on these farms of 8.5% and 2.8%, respectively. *Giardia* cysts, present in 8.5% of pigs, were degraded to a zero level in the lagoon. Table 2 shows the survival times of different bacterial pathogens in pig slurry, soil, and dry surfaces. Note that survival times for most organisms are relatively short, particularly once they are placed into warm soil or on a dry surface, as is typically done when hog manure is applied to fields.

Table 2. ***Survival of Bacterial Fecal Pathogens in Different Environments***

Environment	***Duration of Survival***			
	Salmonella	*Campylobacter jejuni*	*Yersinia entercolitica*	*E. coli 0157:H7*
Slurry	13 – 75 days	>112 days	12 – 28 days	10 – 100 days
Soil (warm)	4 weeks	1 week	10 days	2 days
Dry surfaces	1 – 7 days	1 day	1 day	1 day

Following long term storage, the slurry is applied to farmland using either direct injection or broadcasting followed by incorporation. Provincial guidelines discourage application of slurry immediately around surface watercourses or over potential aquifer recharge areas (gravel deposits, bedrock outcrops, sinkholes, etc.). This avoids the direct entry of slurry into surface and groundwater. The few remaining pathogens still alive in the slurry at the time of application must therefore continue to exist in the soil, where they are likely to become exposed to sunlight and dry conditions, both of which either cause the organism to quickly die or damage it so that it is unable to cause infection.

The final step that must occur in waterborne transmission is to have healthy, living organisms in sufficient numbers enter the water and then be consumed by humans. The minimum numbers of organisms needed to cause disease in humans varies between pathogens. *Campylobater* and *salmonella* bacteria, for example, need to be ingested by the thousands, whereas only a few *cryptospordia* may be necessary to cause illness. Injection or incorporation of slurry into the soil minimizes the risk of organisms entering the water by runoff and soil erosion. The elimination of the practice of spreading slurry on frozen ground prevents potential water contamination from spring snowmelt.

The fact that all four of the above outlined steps must occur in order to cause a waterborne infection means that there is a very low risk of such an event occurring. This is supported by the figures in Table 3, which list the number of reported waterborne-disease outbreaks in humans in the U.S. during the period of 1989 to 1996. Note that all of these organisms are present in many species including humans, so the source of the outbreaks is unknown in most cases. The role of livestock farms as a source has

been documented in very few cases. In these few cases, it is the water of the individual farms that has become contaminated by their own livestock. Very few waterborne disease outbreaks that affect more than the individual farmer have been directly linked with agriculture.

Table 3. ***Documented Waterborne Disease Outbreaks in the U.S., 1989 – 1996***

Organism Involved	***Number of Outbreaks***		
	Total Outbreaks	No. from Drinking Water	No. from Recreational Water
Giardia	27	18	9
Cryptosporidium	21	8	13
E. coli 0157:H7	11	3	8
Campylobacter	3	3	0
Salmonella	2	1	1

Finally, it is important to understand that the risk of water contamination from livestock manure is not related to the volume of manure produced, but the management practices in place to handle and dispose of the manure. A small operation allowing direct contamination of water by livestock manure poses a much greater risk to surface and groundwater than a large operation disposing of manure in accordance with the provincial requirements. Sound management practices that minimize the risk of contamination include:

- Total confinement of animals to avoid direct defecation into surface water supplies.
- Sound storage facilities constructed to avoid contamination from runoff into surface water or seepage into groundwater.
- Adequate volume of long-term storage to deactivate potential pathogens.
- Application of manure to farmland at agronomically sound rates to avoid soil saturation.
- Avoidance of potential groundwater recharge areas and margins of surface watercourses.
- Injection or application of manure to forages to avoid runoff.

The Verbruggen Farms will present a large negligible risk to neighbours and the surrounding community. Most activities, even the simple everyday task of driving a car, carry risks. It is hard to imagine any human activity that is entirely risk free. In spite of these inevitable risks to everyday activities, life must go on. As a society we institute reasonable safety measures to mitigate these risks, and act responsibly to allow these activities to go on. The risk of pathogens from Verbruggen Farms is no greater than the risks commonly accepted by our society. Under the manure management strategy outlined in this report the proposed operation will provide a high degree of safety.