

OSHAB Transport Biosecurity Gap Analysis

Summary

Ontario markets approximately 4.8 million market hogs per year. If pig trucks rolled every day that would be 65 pot loads per day 365 days a year. If we take into account transport of culls, movement of different age groups such as weaned pigs and feeder pigs as well as the delivery of gilts and boars, the number of pig transport events that happen on any given day, the number is substantially higher – estimated at over 150 loads per day.

Many diseases can be transmitted by bodily secretions (manure, urine, saliva) and Porcine Reproductive and Respiratory Syndrome (PRRS) falls into this category. PRRS costs the Canadian pork industry an estimated \$130,000,000 per year (George Morris Centre, 2011) and is considered the most significant endemic disease in Ontario. This project was developed and executed in response to the importance of excellent pig transport biosecurity and its' impact on PRRS transmission, control and elimination. The primary goals of the project were to:

1. Assess the capacity of the Ontario industry to wash swine transport trucks and trailers and the current range of practices being used. Identify the gaps and provide recommendations to address these gaps.
2. Identify the best practices and protocols already used in the North American swine industry and modify and or improve on them for use in the Ontario industry. This included a literature review to assess current scientific knowledge (Appendix 1) and assessment of practices at a truck wash facility considered to be a gold standard in the industry (personal communications) (Appendix 2, Steve's Livestock Transport Visit Report). Training materials, reference materials and a standardized truck wash facility audit as well as a standardized truck and trailer audit were developed.
3. Engage the industry and make it truly a consultative project. It was our goal to develop materials with long term value because this was an inclusive project.

A wide range of gaps were identified through the process of surveys and industry consultation and are itemized in the body of this report. The most significant gaps and recommendations will be dealt with here.

One of the most significant gaps identified was the need for practical, educational best practices information. There was some excellent information already developed but for the most part it tried to incorporate both rationale and steps required for a protocol. After consultation with transporters it became clear that they wanted simple, visual steps to the best management practices and the rationale separate as a reference handbook. If one reviews the gaps identified from the transporter surveys it becomes clear that many of the very important best management practices are not being followed by many transporters. Less than half had a written protocol for washers. Significantly more than 50% used nothing more than water for washing. 60% of

respondents indicated solids accumulated in the wash bay. Only 75% of washed trailers were disinfected and only 66% calibrated their equipment. Less than 50% of facilities can dry trailers in the winter. 46% of facilities had pigs on site.

In response to this gap, a poster was developed outlining the steps required to properly scrape, wash, disinfect and dry a pig transport truck and trailer. A best management practices handbook was developed using Canadian Swine Health Board materials as a template which provides rationale and reference to the poster. After consultation with transporters and producers, a video as a training and educational tool was requested by the majority. As a result, two videos were developed: one focusing on how to properly wash a truck and trailer and the other depicting a trailer audit. Many producers request an outside audit of the washed trailer they plan to use. The trailer audit video specifically addresses the request from transporters that “it would be great to know exactly what they are looking for”.

The development of these materials is only filling the gap if they are made available to their target audience and become used. To support this, OSHAB has developed a project package that will be provided to transporters and will be made available to producers. The project materials will also be showcased at our annual OSHAB Big Bug Day meeting in December 2012. The standardized audit of a truck wash facility and a trailer audit will be made available to Ontario swine veterinarians through the Ontario Association of Swine Veterinarians.

Truck and trailer wash capacity is another substantial gap within our Ontario swine industry. It is very difficult to accurately assess the need and the capacity for truck and trailer wash. The industry uses commercial transport and farm owned “internal transport”. However, wash disinfect and dry capacity is important for all transport events. After taking into account the estimated amount of internal transport as well as understanding the range of knowledge within the industry with regards to best management practices, it is our belief that the Ontario Industry is lacking at least 33% of the wash capacity that would be required for a major disease control initiative.

Part of the bottle neck is the length of time it takes to follow the best management practices. This time is significantly extended when trailers have frozen or baked on manure and bedding. In the United States there are more commercial wash bays available for transporters so this problem is reduced. However, contamination at the wash bay is a real concern. We propose that if scrape out and high volume facilities were available in Ontario then the wash could become a two-step process. Ideally the scrape out and high volume wash facilities would be in close proximity to packing plants and located in pig dense Southern Ontario. Manure and bedding could then be removed before it could freeze or get baked on. The high pressure wash, disinfect and dry could occur at the transporters facility, reducing time requirements and improving the efficiency and efficacy of the process. A source of funding would need to be identified in order to implement this recommendation.

With respect to producer owned internal transport, clearly farm level facilities fall into two categories. The small minority have well-appointed wash bays. The majority have inadequate facilities and protocols. Funding and education are very much needed to help correct this gap. The recent National Biosecurity Program initiative through the Canadian Swine Health Board provides a good foundation with respect to biosecurity best management practices. However, future funding that would provide recommendations and incentives to assist producers to upgrade wash facilities would be beneficial to producers.

To attain the goal of reduced transmission and therefore better control and ultimate elimination of PRRSV, knowing pig site's PRRSV status in real time is one of the critical elements. Knowing PRRSV health status is also key to reducing the risks associated with pig transport. Transporters, producers and veterinarians all agreed that knowing PRRSV status is currently a major gap and one that we must find solutions to. Immunity to PRRSV is strain specific so even if a site is PRRS positive it does not reduce the risk of it becoming infected with a new strain. However, if the pigs loaded on a truck are known to be negative the risks to the next load of pigs on that truck are significantly reduced.

When asked, transporters indicated that they would use PRRSV status information to influence wash procedures and route planning. We were very impressed with the overall desires of transporters to do whatever they can to reduce the risk of disease transmission for their customers. An associated gap is a sociological one. Producers need to be willing to be transparent about their pigs' health status. We strongly recommend that funding and industry focus continues to support the development and validation of diagnostics to update PRRSV site status in real time. Sample collection needs to be producer friendly and testing costs need to be identified as a cost benefit for the producer. It is also extremely important that transparent communication of PRRSV status is encouraged and rewarded. If we can effectively update PRRSV site status in real time, not only will transport risks be reduced but PRRS Area Regional Control and Elimination projects will be enhanced. Whenever a recommendation can impact multiple disease control initiatives, it must receive priority support.

Do we need more scientific investigation with regards to risk reduction of the transmission of PRRSV during pig transport? The answer is yes. The first important question is related to transmission from a washed and disinfected trailer (without drying). If specific disinfectants prevent PRRSV transmission and therefore reduce or eliminate the requirement of drying, significant cost savings and significantly more trailers can meet the requirement of reduced risk. We strongly recommend further investigation of this question. Can the risk of transport be controlled for, in a cost effective way, at the level of the pig site? Again more work is needed here. More options for load in, load out protocols and facilities are needed. The use of one way pig flow and positive ventilation of load out areas must be evaluated.

If the materials included in this project prevent one farm from enduring a PRRS outbreak then we have succeeded. We encourage the reader to review the entire document and by working together we will reduce swine disease transmission.

Ontario Swine Industry Overview

Ontario is Canada's most populous province and the fourth largest in total area (approximately 1,076,395 square kilometers). The provincial agricultural base is concentrated in the Southern region of the province. The Ontario Swine industry is made up of 1,730 producers registered with Ontario Pork that marketed 4.8 million hogs in 2011. (2011 statistics) Ontario pork estimates that there are 2.9 million pigs in Ontario including the breeding herd of 341,900 sows and bred gilts.

It is important to understand the geography of pork production in Ontario because disease transmission risk is highly correlated to proximity to other pig farms and therefore risks associated with events like pig transport become even more significant. To understand this concept one needs to simply consider a person with a cold. If that individual is isolated then the risk that they will transmit the cold is low. If that individual is a child in school contacting hundreds of other children, then the risk that they will transmit the cold is high. Ontario has 49 counties, 26 counties have one or more producers registered with Ontario Pork. The following 13 counties account for 91.5% of producers: Perth, Huron, Wellington/Dufferin, Oxford, Waterloo, Grey/Bruce, Middlesex, Lambton, Kent, Haldimand-Norfolk and Elgin. These producers market 94% of the hogs in Ontario. The density of pig farms throughout Ontario is illustrated in Figure 1.

High pig farm density makes control of swine diseases challenging. Diseases such as PRRS are transmitted in a number of ways. If one farm is infected because pigs were contaminated in transit, it can then become a source of transmission through aerosol spread to other farms.

It is impossible to describe the "typical" pig farm in Ontario. There is a huge range in type and size of pig farms. There are also a number of different ownership structures. One way that farms are described is based on the pigs that are found on the site: breeding herd (sows, gilts, boars and suckling piglets), weaned pigs (piglets from approximately 5 to 25 kg body weight), finisher pigs (approximately 25 kg to market weight). This description results in a barn designation by the pigs on site i.e. sow barn, nursery barn, and finisher barn. Pigs that are moved from one site to another also have industry labels: breeding stock, weanlings, (weaned from the sow) feeder pigs, (pigs leaving the nursery stage usually at approximately 25 kg body weight) market hogs, and culls.

Farms are then categorized by production stages: farrow to finish, farrow to wean, farrow to feeder pig, wean to feeder pig (nursery), wean to finish, finisher (25 kg to market). In addition to the listed categories there are still sites that have other functions and names that have pigs on site: isolation/acclimatization barns, assembly yards, auction barns and slaughter facilities.

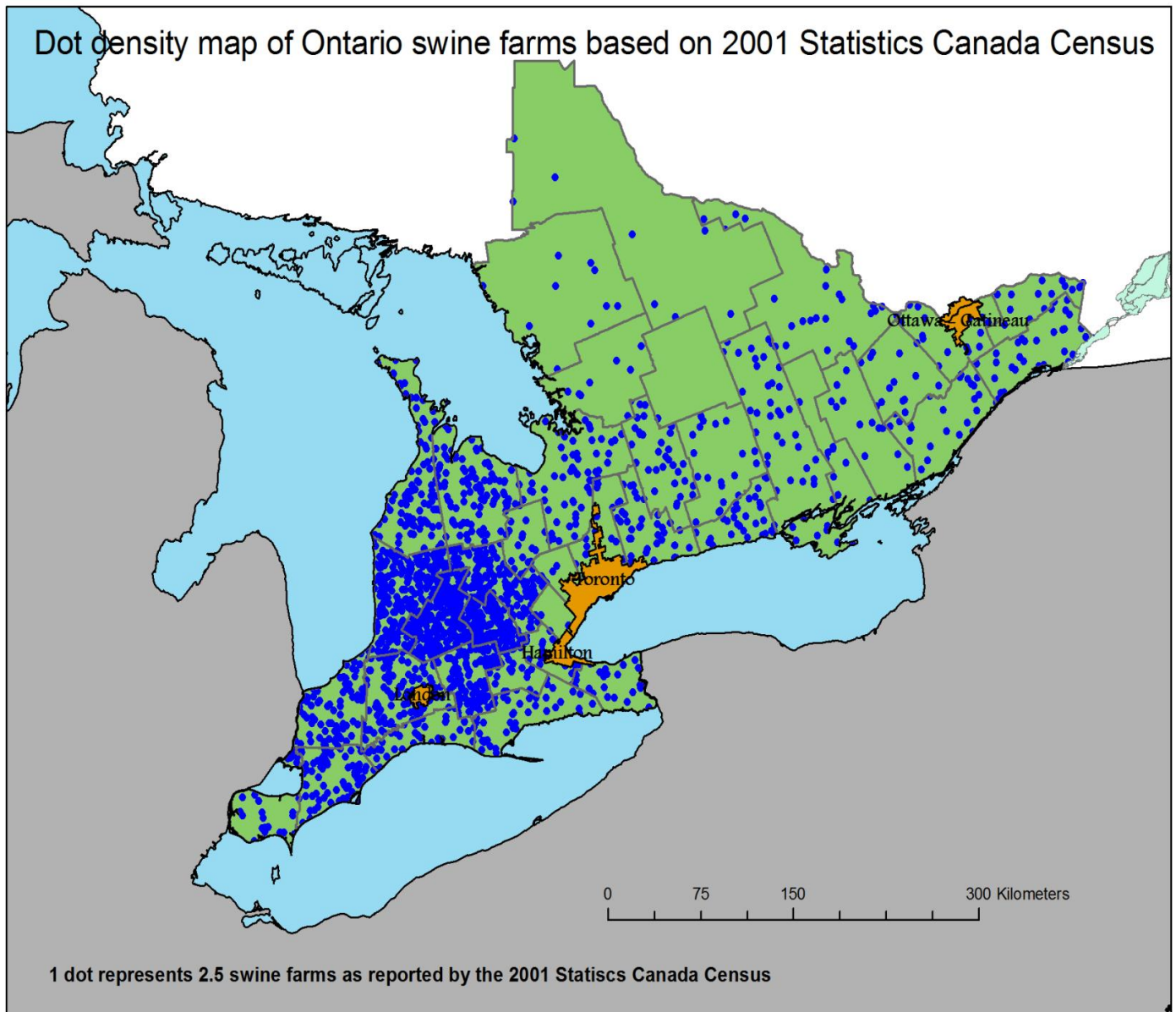


Figure 1: Depicting the pig farm concentration in Southwestern Ontario.
Each blue dot represents 2.5 pig farms.

Pig Transport Events

Ontario markets approximately 4.8 million market hogs per year. If pig trucks rolled every day that would be 65 pot loads per day 365 days a year. If we take into account pig transport of culls, movement of different age groups such as weaned pigs and feeder pigs as well as the delivery of gilts and boars the number of pig transport events involving commercial transporters is estimated to be 151 loads/day. If you add in the transport events that are done with farm owned trucks and trailers, the number is substantially higher. Table 1 describes the pig transport events that commonly occur in the Ontario swine industry.

Table 1. Pig Transport Events

Load Site	Internal Unload Site	External Unload Site
Genetic Supplier: Gilt and or boar finisher, weaned pigs or nursery pigs.	Breeding herd site Nursery site Finisher site Isolation barn	Customer farm (Sow barn, Finisher barn, nursery Barn, isolation barn) Slaughter facility Assembly yard Livestock auction
Sow barn	Another sow barn Nursery site Finisher site	Assembly yard Livestock auction Sow barn Acclimatization barn Slaughter facility Nursery Finisher
Isolation /Acclimatization Facility	Sow barn	Slaughter facility Assembly yard
Nursery	Finishing barn	Finishing barn Assembly yard Slaughter facility Livestock auction
Finishing barn	Sow barn	Slaughter facility Assembly yard
Assembly yard		Slaughter facility Nursery Finishing barn
Livestock auction		Finishing barn Sow barn Assembly yard Slaughter facility

Pig transport events can occur within Ontario and can also occur outside of Ontario. Pig movements may result in pigs coming into the province from other provinces and many pigs from Ontario are shipped to other Canadian provinces. Export of live pigs is also common. Ontario exported approximately 700,000 pigs weighing less than 50kg to the United States in 2011. (Ontario Pork Statistics 2011) Breeding stock also travel between Ontario and the United States.

Another way to understand the Ontario swine industry is to summarize the pig movements that occur in a real life system over a one week time period.

Pig Transport in a Moderate Size, Complex Ontario Farrow to Finish System with Multiple Sites

This example includes 4 sow herds of similar health status co-mingling weaned pigs into a series of nurseries and finishers in Ontario and the mid-west United States, delivering market hogs to slaughter plants in Ontario, Quebec and USA. Weekly output for this system: 2000 weanlings, 30 cull sows, 1900 pigs to slaughter.

The following is a description of the pigs transport events that occur in this system in a one week period.

Monday

Three of the four sow herds wean. These weaned pigs are picked up over three trips with three different internal trailers that are Cleaned, Washed, Disinfected and Dried (CWDD) internally prior to use. Cull sows may be picked up at the same time if the number of weanlings permits. Weanlings are delivered to either one or two nurseries depending on pig flow, cull sows are delivered to an assembly yard. The movement of weanlings and cull sows involves transport within the following counties: Perth, Wellington, Waterloo, Huron, and Grey. After use the internal trailers return to a system-dedicated yard for CWDD.

Feeder pigs may be moved from nursery sites to finisher sites within the system or sold to other customers. Feeder movements are done with external transport equipment that has had CWDD. Feeders may originate at nursery sites in the counties already mentioned and delivered to finishing sites in any of Perth, Huron, Wellington, Waterloo, Grey, Niagara and Oxford counties, or in several US states.

Market hogs will be picked up at finishing sites and delivered to two slaughter facilities in Ontario and occasionally slaughter sites in Quebec or USA. Movement of fattened hogs to slaughter is done with external livestock haulers using trucks that are not CWDD prior to use.

Tuesday and Wednesday

There are no weanings on Tuesday and Wednesday. An internal trailer with CWDD may be used to make one or two trips from one or two sow herds to an assembly yard with cull sows, if necessary.

Feeder pigs may be moved from nursery sites to finisher sites within the system or sold to other customers. Feeder movements are done with external transport equipment that has had CWDD. Feeders may originate at

nursery sites in the counties already mentioned and delivered to finishing sites in any of Perth, Huron, Wellington, Waterloo, Grey, Niagara and Oxford counties, or in several US states.

Market hogs will be picked up at finishing sites and delivered to two slaughter facilities in Ontario and occasionally slaughter sites in Quebec or USA. Movement of fattened hogs to slaughter is done with external livestock haulers using trucks that are not CWDD prior to use.

Thursday

Thursday is weaning day for all four of the sow herds. Cull sows are not typically handled Thursday due to larger volume of weanlings. Movements same as Monday

Friday

Similar to Tuesday and Wednesday except fewer market hogs typically are shipped Friday compared to the other days of the week.

In addition to the movements already mentioned there are monthly movements of replacement gilts into the system. These gilts are hauled by the genetics company's own internal transport. Gilts originate in Waterloo or Huron counties and are delivered to one or more of the four sow sites per month.

In this system greater than 24 transport events happen each and every week. The potential to spread disease during the transport of pigs is a real concern because of the high risk of transmission of diseases such as PRRSV known to occur with dirty trucks.

Porcine Reproductive and Respiratory Syndrome Virus (PRRSV)

It is common knowledge that many infectious diseases including PRRSV are excreted in bodily secretions such as feces, urine and saliva. When pigs are transported the trailer and all materials that have had contact with the pigs can become contaminated with infectious diseases if the pigs are excreting these pathogens in their bodily fluids. Inert materials that can carry and transmit disease are known as omits.

In the North American Swine industry PRRSV is one of the biggest disease challenges we face. We have 130 million reasons to worry about PRRS transmission on pig transport trucks because it is estimated that PRRS costs our Canadian swine industry 130 million dollars per year. (A Risk, Benefit, Strength, Weakness, Opportunity and Threat Analysis for the Control and Possible Eradication of PRRSV within the Canadian Swine Herd, George Morris Centre 2011) Approximately 55% of our Ontario sow herds are PRRS positive according to benchmarking data collected by OSHAB from a base of 125,000 sows and 300 sites in 2010. The financial impact of this disease compounded by the animal welfare concerns and the human emotional trauma of a PRRS outbreak, make efforts to prevent its transmission essential.

Due to the known impact on the industry and current efforts to control and eliminate PRRSV, for the scope of this project, PRRSV has been chosen as the disease model with regards to the contamination of pig trucks and the associated fomites that are used in the transport of live pigs. The following sections will provide some insight into PRRS, the disease and explain why it is used as a model for disease transmission. A targeted literature review of PRRSV and pig transport is included in Appendix # 1.

Porcine Reproductive and Respiratory Syndrome presented as an unknown agent causing severe reproductive losses and pneumonia in piglets and growing pigs in North American pig herds in the late 1980's. (Diseases of Swine 9th ed.). Until 1991 the clinical syndrome was commonly called "Mystery Swine Disease". The causative agent was identified in 1991 at the Central Veterinary Institute (Lelystad, Netherlands) and was found to be an unrecognized RNA virus. (Diseases of Swine 9th ed.). Porcine Arterivirus became commonly referred to as PRRSV.

PRRSV is highly host specific, meaning it only replicates in pigs and therefore the disease manifestations are only seen in swine. There are literally hundreds of genetically different PRRSV strains and viral recombination is likely an important genetic mechanism contributing to PRRSV evolution. (Diseases of Swine 9th ed.). The fact that there are many different PRRSV strains is very important with regards to controlling this disease. When a pig is infected with PRRSV it will mount a strong immune response to the specific strain of PRRSV that caused the infection. Unfortunately cross protection against other strains, particularly reproductive disease protection, is poor. The genetic diversity of PRRSV and the lack of good cross protection between strains have been significant road blocks in the development of a fully efficacious vaccine.

Without a fully efficacious vaccine the focus for better control of this disease has been on reducing exposure of pigs to new PRRSV strains. To reduce the risk of exposure one must have some understanding of the way the virus is shed and the route of transmission.

Infected animals shed virus in all body fluids for a variable degree of time post exposure. Nasal secretions, urine, feces, saliva, semen and mammary secretions may all contain infective virus. (Diseases of Swine 9th Ed.). Transmission of PRRSV can occur when susceptible pigs come into contact with infectious virus. The virus outside the host is very sensitive to heat, drying and changes in pH. However in solution, PRRSV infectivity persists for 1 to 6 days at 20 to 21 degrees Celsius. The virus is infective for much longer time periods at low temperatures. (Diseases of Swine 9th ed.). PRRSV is killed in a time and temperature dependent fashion by most detergents and disinfectants.

If a susceptible sow herd is exposed to PRRSV the clinical outbreak can be totally subclinical (no clinical signs) or it can be a devastating epidemic. The highest abortion losses recorded in an Ontario 2004 outbreak were 65% of pregnant inventory. (Clinical record, Dr. Martin Misener). Outbreaks with high sow, piglet mortality and abortions are not uncommon. In weaned pig populations, infection with PRRSV can cause mild to severe pneumonia that results in variable levels of mortality and reduced growth performance.

PRRSV is the number one disease concern in the Ontario swine industry. It is secreted in bodily fluids and therefore easily contaminates livestock trailers and the fomites that come in contact with the virus during the process of transporting pigs. It is therefore the logical model for disease transmission risk as it pertains to the transportation of live pigs.

Ontario Pork Industry Transport Gap Analysis

The gap analysis included assessment of the Ontario industry capacity and practices through use of a survey delivered in person in an interview format. As well, practices were compared to the best management practices outlined in the training materials developed throughout this project.

Approach and Methodology

The only way that facilitated positive change can occur is if one has a good understanding of what is currently being done, identify the gaps and then work to provide good solutions and recommendations. To achieve the first objective, of understanding what is being currently done as it pertains to pig transport in Ontario, a goal of interviewing greater than 75% of Ontario hog transporters about their capacity, facility design and procedures was set.

To aid in conducting these interviews and to capture analyzable data a detailed questionnaire was developed. (Hog Transporter Truck Wash Questionnaire see Appendix 3). This questionnaire is made up of five sections as well as the location information and an area to record additional comments.

Not all of the originally listed transporters (registered with Ontario Pork) were commercial transporters of pigs. Only commercial transporters of pigs or those facilities doing commercial washes were used in the analysis of the questionnaires.

A survey of commercial transporters and commercial wash stations was carried out. Each participant was visited and interviewed in person by an individual with a good working knowledge of the industry. The decision to conduct on site interviews was made to help facilitate as much direct industry participation in this project as possible. The goal was to collect statistical information but also to give the people that have to carry out the day to day work of transporting pigs an opportunity to express their opinions and provide their input.

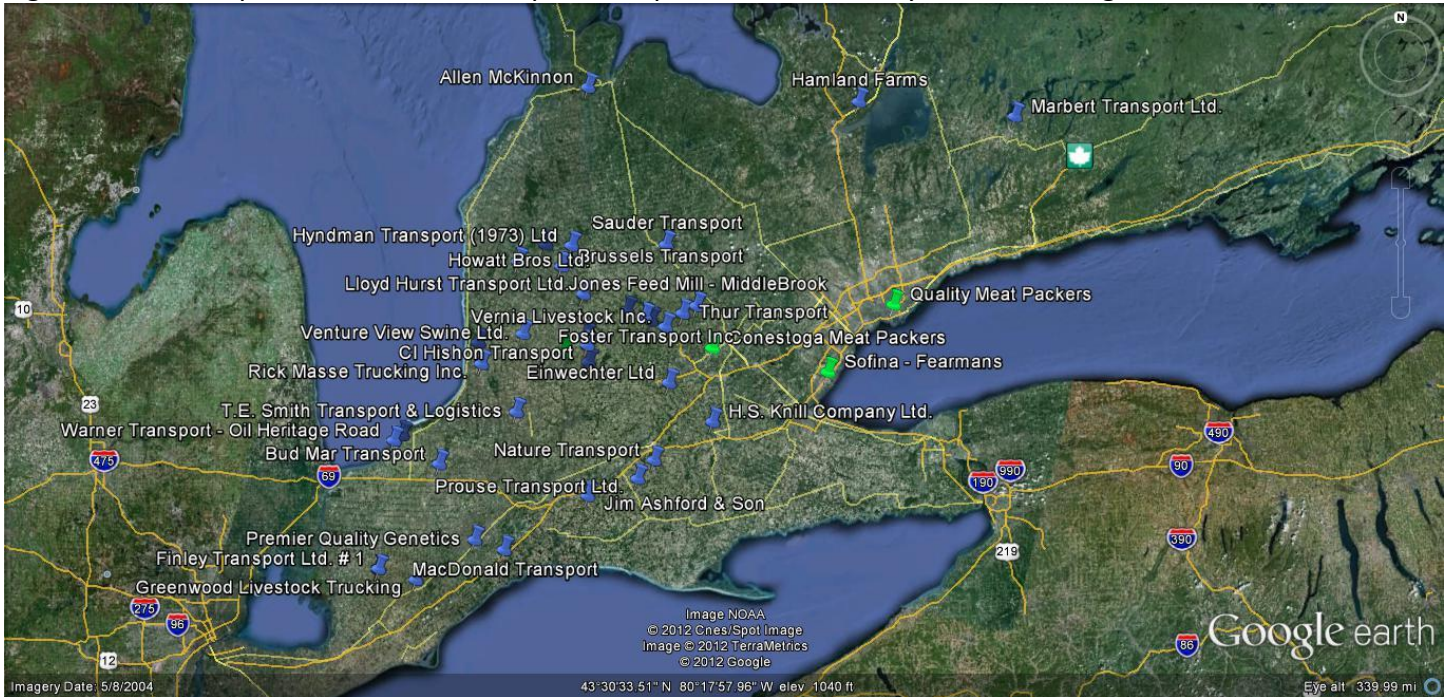
Commercial Transporters and Commercial Wash Stations Survey Results

Survey Participants

A total of 36 businesses were surveyed. All of these had trucks washed or washed trucks. Of these 28 reported that they transported swine. Of the remaining 8 companies that were surveyed – 3 were private transporters who trucked only their own swine, 4 were non-swine commercial transporters and the remaining company was a commercial truck wash station. 94% of the companies washed trucks themselves and 6% had an outside

company do the washing – either by custom washing off site or a mobile washing company that washed their trailers on site. There were two major transporters that we could not obtain survey results for. However one was interviewed. We estimate that the transporters that that were surveyed or interviewed move greater than 80% of Ontario’s pigs for this project. Figure 2 depicts the distribution of the transport companies surveyed versus the federally licensed slaughter facilities(green markers) in Ontario.

Figure 2. Map of Interviewed Transport Companies and Federally Licensed Slaughter Facilities



Industry Capacity to Wash and Dry Hog Trailers

In planning large scale disease control efforts, there needs to be sufficient capacity to apply control technologies on an industry wide basis. The starting point in looking at trailer washing capacity is to have an estimate of the number of trailer loads per unit time. Using a weekly estimate of 70,000 commercially transported market hogs and a load size of 200 hogs, there will be approximately 350 trailer loads of market hogs trucked each week in Ontario. This equates to 50 trailer loads of market hogs per day. At this point we subtracted an estimate of farms that use internal transport of the following classes of pigs. Ontario, commercial transport, would also have 100 trailer loads of feeder pigs per week (500 per load, 50,000 feeders moved per week or 20 loads per day). Additionally there will be 150,000 gilts moved annually (3000 per week in loads of 100 per load = 30 loads per week or 6 per day) and 135,000 cull sows (5 loads per day) along with 50,000 weaned pigs per week. The size of the weaned pig loads varies markedly but a rough estimate says that there are 70 trailers which carried weaned pigs to be washed in Ontario on any working day. The resulting total is 151 commercial transport trailers per day which would require washing if all trailers were washed after each load carried. As detailed in Table 2, our current capacity to wash and dry hog trailers is approximately two-thirds of the level required if all trailers are washed after each load.

Table 2. Capacity to Wash and Dry Hog Trailers per Day in Winter:

TRUCKS PER DAY	COMPANIES REPORTING THIS NUMBER WASHED PER DAY	CUMULATIVE NUMBER WASHED PER DAY	COMPANIES REPORTING THIS NUMBER DRIED PER DAY	CUMULATIVE NUMBER WASHED & DRIED PER DAY
0	4	0	5	0
1	2	2	8	8
2	10	20	8	16
3	3	9	1	3
4	7	28	5	20
5	1	5	3	15
6	4	24	1	6
8	2	16	2	16
20	1	20	1	20
Totals		124		104

Note: the figures in Table 2 are a summary of how the transporters responded to the question being asked. We identified that there is a significant gap in the level of understanding of what is involved in the process of properly washing, disinfecting and drying a truck and trailer. Therefore the above numbers are an overestimation of industry capacity. The need for farm level wash upgrades is also not factored into these numbers and from a disease control aspect they can be every bit as important.

Truck and Trailer Wash Sites

In order to gain some understanding of the type of truck wash facilities that exist in the industry, the survey asked several questions about the sites themselves. The participants were asked to describe the physical layout of the site and the activities that were carried on there. The surveyors took pictures of all sites visited. This has potential impact on the ability to keep a clean truck clean. 36% of the facilities had separate laneways for clean and dirty trucks, 64% did not. As well, as shown in Table 3, only 36% of the facilities were designed with a drive through wash bay. This is the recommended best management practice for wash bays as it minimizes the chance of recontamination a clean trailer by driving back over potentially contaminated areas.

Table 3. Industry Profile of Wash Bay Design

TYPE OF WASH	PERCENTAGE	COMMENTS
Drive in, back out	6	Not ideal as the bay must be cleaned before the truck leaves or the truck is re- contaminated on exit.
Back in, drive out	44	Viable option depending on slope of the floor etc.
Pull through	36	The preferred option that has the least chance of recontamination of the vehicle.
Wash outside, on a pad	14	Not a good option for cold weather.

83% of the wash facilities were heated, which is essential for drying in the winter. However, 17% of the wash facilities surveyed indicated that they could not provide adequately cleaned and disinfected trucks and trailers in the winter.

42% of the wash facilities had a hog assembly yard on site, 39% had cattle on site and 14% had other species (birds, horses, sheep and goats) present on site.

The survey asked what water was used to wash with. All of the respondents reported using either well water or town water. The survey also asked how the facility dealt with waste water. The responses of the respondents are reported in Table 4. Waste water disposal has environmental implications and can have an impact on the potential to recontaminate cleaned trailers on-site if not handled properly.

Table 4. Methods of Water Disposal and Truck Wash Stations

METHOD OF DISPOSAL	PERCENTAGE	COMMENTS
Sewer Disposal	16%	Effective but can be costly.
Wetland Disposal	31%	Effective.
Run off	19%	This method is questionable in its ability to control infective material and may have negative environmental implications.
Storage Tank	17%	Effective.
Weeping Bed	17%	Effective but has limited capacity unless very large.

Driver Protocols

Of the companies that hauled swine, one third had driver protocols. Half of the companies supplied their drivers with totes. 94% of the companies supplied drivers with clean coveralls and boots, although not all companies supplied clean coveralls for each pick up and not all had protocols that kept the driver from contaminating the cab i.e. not all took coveralls off to drive. 80% of the companies supplied drivers with clean gloves and only 27% supplied clean hats, despite the fact that a large percentage of the drivers used gloves and hats. A few companies supplied disinfectants, disinfectant sprayers, mats and/or hand sanitizers for the drivers.

Although there have been driver protocols published previously, clearly these do not address all the various situations arising in the livestock hauling industry. Depending on the situation and in particular, the weather, they are not always practical. There is a need to develop practical solutions to the issue of getting drivers into clean trucks and trailers without contaminating the truck and trailer.

Best Management Practices Analysis

A best practices hand book was developed as part of this project. To assist in analyzing the information gathered from the interviews, Table is organized by the steps utilized in the handbook and compares the survey results to best management practices recommended.

Table 5. Comparison of Survey Results versus Recommended Best Management Practices

Cleaning Step	Recommended Best Management Practice	Ontario Survey Results
Preparation	Use a clean source of water. Each employee is trained on: <ul style="list-style-type: none"> - The importance and methods to effectively wash disinfect and dry a trailer. - Safety. - Equipment and product use. 	All of the facilities reported using a clean source of water. Less than 1/2 of the facilities had a written protocol for washers.
Step 1 – Scrape out	Scrape out all trailers to remove manure and bedding before wash. Scrape out the trailer off site	All of the wash sites reported that they scraped out the trailers before washing. Only 31% of the truck wash facilities had an offsite scrape out for bedding and manure. 69% of the facilities scraped out the truck on site. 94% of the sites reported having a separate area for the dirty bedding.
Step 2 – Prepare the trailer for washing	Deck planks, winter panels and all equipment are removed from the trailer and washed separately.	97% removed the winter boards. 89% removed the deck planks.
Step 3 – High volume rinse	Remove the bulk of organic matter with a high volume, low pressure water rinse.	Only 36% of the sites used a high volume prewash.
Step 4 - Soap	Use soap or a detergent to make cleaning easier and assist in removing biofilm. Use a foam gun. Calibrate equipment.	47% of the facilities used soap or detergent. 33% of the facilities used a foam head to apply soap. Significantly, more than 1/2 of the facilities used nothing but water in washing.

Step 5 - Wash	Have a written standard procedure that ensures that vehicles are washed consistently. Use hot water. Wash deck planks, winter panels and equipment separately.	Less than 1/2 of the facilities had a written wash protocol. 92% used hot water. 97% removed the winter boards. 89% removed the deck planks.
Step 6 - Inspect	Inspect the wash prior to disinfecting.	This step was not assessed on the survey.
Step 7 – Wash the wash bay	The wash bay should be cleaned before reassembling the trailer and disinfecting.	60% of the respondents indicated that solids accumulated in the wash bay.
Step 8 – Reassemble the trailer	Deck planks and winter panels are put back in place before disinfection of the trailer.	Not covered in the survey.
Step 9 - Disinfect	Cleaned and reassembled trailers are disinfected with the appropriate amount of an effective product.	Only 75% of the trailers were disinfected. Only 66% of the facilities calibrated the products that were used (soap, detergent, or disinfectant).*
Step 10 - Dry	Disinfected trailers should be dried prior to use.	Greater than 32% of sites had only a limited ability to dry trailers.
Step 11 - Cab	Wash, disinfect & dry the cab interior.	Not covered in the survey.
Step 12 – Keep it clean	Clean trailers should be well away from animals and should be kept in a separate clean area away from dirty vehicles. Access to the clean vehicles should be restricted and only clean objects should enter the vehicles.	Of the locations that washed trailers 1/3 had a separate laneway for clean and dirty trucks. 48% of the wash locations were also assembly points for animals. Of these, 46% had pigs on site, 39% had ruminants on site, and 14% had other species on site. 58% of the facilities had a separate area for clean trailers

Summary of the Current Practices for Truck and Trailer Sanitation

- Broken Down by Procedure, Percent of Loads Trucked and Class of Livestock.

The survey asked transporters to identify the type of trailer cleaning that was done before transporting each class of hogs. For each class, the percentages of loads that each moved according to the hygiene level of the transport vehicle are summarized below:

Table 6. Weanling Transport

15 TRANSPORTERS	SCRAPE OUT	CLEAN FLUSH	BACKEND WASH	WASH & DISINFECT	WASH, DRY & DISINFECT
Not done	14	15	15	2	2
1 – 25% of loads				1	0
26 – 50% of loads	1			2	1
51 – 99% of loads				0	1
100% of loads				10	11

Table 7. Feeder Pig Transport

18 TRANSPORTERS	SCRAPE OUT	CLEAN FLUSH	BACKEND WASH	WASH & DISINFECT	WASH, DRY & DISINFECT
Not done	15	18	18	14	4
1 – 25% of loads				1	0
26 – 50% of loads	1			2	1
51 – 99% of loads	0			1	0
100% of loads	2			0	13

Table 8. Market Hog Transport

23 TRANSPORTERS	SCRAPE OUT	CLEAN FLUSH	BACKEND WASH	WASH & DISINFECT	WASH, DRY & DISINFECT
Not done	6	19	15	12	17
1 – 25% of loads	4	2	5	4	3
26 – 50% of loads	3	1	1	4	1
51 – 99% of loads	7	1	1	1	0
100% of loads	3	0	1	2	2

Table 9. Cull Transport

14 TRANSPORTERS	SCRAPE OUT	CLEAN FLUSH	BACKEND WASH	WASH & DISINFECT	WASH, DRY & DISINFECT
Not done	9	14	14	10	7
1 – 25% of loads					1
26 – 50% of loads				1	
51 – 99% of loads	2				
100% of loads	3			3	6

Table 10. Breeding Stock Transport

13 TRANSPORTERS	SCRAPE OUT	CLEAN FLUSH	BACKEND WASH	WASH & DISINFECT	WASH, DRY & DISINFECT
Not done	12	13	13	12	1
1 – 25% of loads					
26 – 50% of loads	1			1	
51 – 99% of loads					
100% of loads					12



Transporter and Wash Bay Operators Comments

In addition to answering the questions in the survey, each respondent had the opportunity to visit with the surveyor and to express opinions on the survey and the industry in general. Comments frequently fell into a few key areas:

1. Access to wash facilities:

The most common request from transporters was for access to a scrape out and high volume wash or flush close to the slaughter plants. Surprisingly, this was just as important to them in the summer as in the winter. Bringing a truck loaded with dirty bedding and frozen required time and money to thaw before it was ready to wash. However, in the heat of the summer, manure and other material baked onto the truck, also impeding washing. In addition to a high volume flush near the plants many transporters, especially the smaller ones, indicated that they would like to have additional places available to have trucks washed.

2. Need for standardization and education:

Most transporters were open to the idea of needing to wash transport vehicles. 58% of them washed vehicles without a specific request from producers. However, there was considerable discussion on what constituted an adequate wash. A video of what a proper vet inspection would check was suggested by three transporters. Many requested more standardization in the industry and training material for both washers and drivers. A number of washers were looking for better ideas on how to wash deck planks and winter boards. One transporter talked about working with trailer designers and manufacturers to eliminate hard to clean spots in trailers.

3. Concerns of cost versus value for the washing process:

Many felt that washing was an expected part of transport and few felt that they could charge adequately to recoup the cost of washing. Several transporters expressed frustration that the producer did not understand the cost of washing and how hard it was to get people to do the job. The most common thumb nail cost for washing / disinfecting / drying a trailer was between \$400.00 and \$450.00. In addition, they were frustrated because "different producers have different requests on how the job should be done". An example of this frustration was the request for "downtime" on the trailer which has an associated cost, but no scientific evidence to suggest that it improves transport biosecurity.

4. Issues with accessing labor for the job of washing:

Getting people to do the job of washing trailers is not easy. It is a dirty job. There were several that asked if there were better ways to get the job done and a few that suggested that they would like to see robotics developed to do the job.

5. Issues of communication:

Transporters feel out of the loop with regard to the disease status of the pigs that they were transporting. Many felt that producers should disclose to them when a change in health status had occurred. They also indicated that too many producers are unsure of their disease status. They were open to the concept of re-organizing routes to ensure that disease was not spread through transport. Another frustration voiced by some transporters was on the condition of sites where they picked up pigs. These transporters felt that there should be better cleanliness and maintenance of site. There should be adequate facilities so the driver could enter the truck in a biosecure fashion. A number of transporters felt frustrated with the varying requirements imposed by veterinarians and expressed a desire for “vets to get on the same page”.

Gaps Identified From the Commercial Transporter Survey Results

1. Regardless of methods used at wash sites in Ontario, our current capacity to wash and dry hog trailers is at most two-thirds of the level required if all trailers were washed after each load. If one includes the use of on farm internal trucking and the level of understanding, as it pertains to best management practices, we have significantly less than two-thirds of our required wash capacity.
2. 64% of transport facilities did not have a separate laneway for clean and dirty trucks. The overall risk to contaminating trailers because a separate lane is not available is low. However it does lend itself to a lack of designation of “clean”/ “dirty” area differentiation.
3. 6% of transport facilities were set up as drive in, back out. Unless the wash bay is thoroughly cleaned and disinfected along with the truck and trailer, this situation is the most risk for cross-contamination from the wash bay to the “clean” truck and trailer.
4. 14% of transporters washed outside on a pad. Although an outdoor wash can be effective in the warmer months, it poses real challenges in bad weather and the winter. Cross-contamination issues are also significant in this situation since the washing unit is housed indoors and hoses are dragged from source to trailer.
5. 17% of the wash facilities were unheated and could not provide adequately cleaned and disinfected and dry trucks and trailers in the winter. Most pathogens are preserved and remain infectious in freezing temperatures and therefore being able to properly clean trucks and trailers in the winter is highly significant. This is a major gap for our Ontario industry.

6. 42% of wash facilities had a hog assembly yard on site. Pigs and pig fluids are the top two risks associated with disease transmission. One can control for all cross-contamination vectors other than aerosol but pigs on site complicate the risk control measures needed to prevent disease transmission. Aerosol contamination of clean vehicles held on site has been previously documented.
7. 19% used run off for water disposal. The ability to contain infectious material is essentially lost using this method of waste water disposal. The opportunity for cross-contamination is therefore enhanced. Run off water may also have some negative environmental impacts.
8. 69% of transport facilities scraped out the trailer on site. This gap can be controlled for but it again lends itself to potential cross-contamination issues.
9. Less than half the facilities had written protocols for washers. Written protocols provide a standard and should be used as a resource for experienced washers and as training materials for new employees. This is a significant gap that will be corrected with this project's communication material.
10. 64% of facilities did not use a high volume prewash. The high volume wash reduces wash time and therefore reduces cost and improves efficiency. The lack of high volume wash facilities is a very significant gap for our industry. It limits overall wash capacity.
11. Significantly more than half of the facilities used only water for washing. Cleaning products are recommended to speed up the wash and remove biofilm and or mineral buildup. The number of transporters not using cleaning products is a significant gap in our industry.
12. 11% of transporters did not remove deck planks. The ability to properly wash a trailer without removing the deck planks is totally compromised. Although it was only 11% of transporters who did not remove deck planks, those trailers will increase the risk of disease transmission.
13. Approximately 60% of transporters responded that solids accumulated in the wash bay. The risk here is cross-contamination and as a gap it can be controlled for with proper protocols.
14. 25% of trailers were not disinfected. The need for disinfection is clearly documented in the scientific literature. If the prevention of transmission of disease is targeted at the pigs loaded on the truck this is a very significant gap.
15. 40% of facilities did not calibrate soap or disinfectant. The result of not calibrating is either inadequate amounts of products at incorrect concentrations are applied therefore compromising efficacy or too much product is applied increasing cost. Either way this is a significant gap.

16. A significant percentage of sites had only limited ability to dry trailers. The drying step is very important to achieve a noninfectious trailer and therefore the lack of drying facilities is a significant gap.
17. There are breeding stock, weanlings and feeder pigs that are transported with trailer that has only been scraped out.
18. There are breeding stock, weanlings and feeder pigs transported with a trailer that has only been washed and disinfected (no drying step).
19. There are market hogs transported with a trailer that has only had a back end wash.
20. The question was not specifically asked in the survey, however; there are also pigs of all classes transported on completely dirty trailers (unscraped, unwashed trailers).

Producer Survey Results

In addition to the interviews that were conducted with commercial pig transporters a producer survey was developed to assess the wash procedures used at the farm level. (Refer to Appendix 3)

A total of 74 producers were surveyed. The surveys were completed by the veterinarian of each producer. 61% of the producers surveyed transported some or all of their own livestock. In many cases this was limited to transport of pigs between their own sites. The vast majority of producers did only internal (from one site that they owned to another site that they owned) transport. All reported that they transported pigs between either the sow herds and the nurseries or the nurseries and finishers. 23% transported gilts from the grow out area back upstream to the sow herd.

37% indicated that they transported pigs externally – either feeders or breeding stock to outside buyers or market hogs and or culls to slaughter or assembly.

Gaps Identified From the Producer Survey Results

1. **Vehicle washing:** Of the producers who transported pigs – either internally or externally, 80% washed their transport vehicles. 20% did not. This is a significant gap in that contaminated trailers can be a source of infection.
2. **Control of infective material – bedding scrape out:** Regardless of whether the trailers were washed or not, 56 % of the transport vehicles returned to the farm and scraped out their vehicles within the

farm controlled access zone (CAZ). Returning with potentially contaminated material to the CAZ is a significant gap and one that to a large extent can be controlled by education.

3. **Bedding:** 90% of the producers had clean and effective storage for bedding but 10% did not.

4. **Quality of wash:**

a. **Gaps in washing procedures:**

- i. 67% of the washing was done on the farm and
- ii. 56% of it was within the CAZ itself.
- iii. 62% of the washing was done outdoors – winter or summer.
- iv. 31% did not use a disinfectant
- v. Of those that disinfected, 93% did not use a calibrated amount of product.

b. **Positive aspects of wash procedures:**

- i. 74% of the producers used a rotary nozzle
- ii. 61% used hot water
- iii. 67% used an effective disinfectant
- iv. 84 % of those that disinfected applied the product with a foamer head.

5. **Frequency of wash:** Only 31% of the vehicles were washed after every load. In many cases, the vehicles were washed only sporadically and washing in the summer was reported to be much more frequent than washing in the winter. The producers reporting washing after every load and washing indoors were, for the most part, those involved in selling breeding stock. The proportion that washed after external transport was higher than those that washed after internal transport. Again, this was reported to be variable with season – more in summer, less in winter. Winter weather increases the risk of disease transmission, but vehicles were less likely to be washed in winter.

6. **Keeping the trailer clean:** 66% of the producers reported storing their transport vehicles within the CAZ and 62 % reported storing it within 500 meters of pigs. 22% of the producers reported being able to store their trailers in a sealed building (to prevent recontamination) and only 26% of the producers had the ability to dry trailers in a heated building.

Effectiveness of Internal Transport Biosecurity:

The producer survey asked the veterinarian completing it to rank the internal transport biosecurity of producers that transported some or all of their own livestock. All producers that transported livestock were included in the ranking. The ranking was broken down into:

1. the ability to get the vehicle clean,
2. disinfection effectiveness,
3. drying of vehicles,
4. the ability to keep vehicles clean.

The average overall score was 56%. Producers scored 47% on getting the vehicle clean but only 37 and 36 % respectively on disinfecting and drying the vehicle. Much of this is related to the lack of sufficient infrastructure for washing and drying vehicles. The score on keeping the vehicle clean was 59% and this score was higher because the majority of producers have clean bedding and bedding storage.

The results on the Internal Transport Biosecurity Score were not normally distributed. A few producers had very high score, and the remainder scored much lower.

Conclusions on Producer Transport

1. Much of the pig transport by producers is perceived to be lower risk because it is internal to the farm system. This is often not true. This in combination with the lack of adequate facilities to wash reduced the frequency of washing. This was especially true in the high risk winter months.
2. Education is needed on risk management – specifically, the risk of bringing contaminated material back to the farm site (CAZ), aspects of wash quality, the use of disinfectants and other cleaning aids.
3. Infrastructure is required to improve the quality of wash (wash indoors, dry in heated building, store bedding properly, keep vehicle inside to prevent recontamination).

Conclusion

This project was developed and executed in recognition of the importance of pig transport in disease transmission, particularly transmission, control and elimination of PRRS virus. The primary goals of the project were:

1. Assess the capacity of the Ontario industry to wash swine transport trucks and trailers and the current range of practices being used. Identify the gaps and provide recommendations to address these gaps.

2. Identify the best practices and protocols already used in the North American swine industry and modify and or improve on them for use in the Ontario industry. This included assessment of practices at a truck wash facility considered to be a gold standard in the industry (see Appendix XX, Steve's Livestock Transport Visit Report). Training materials, reference materials and a standardized truck wash facility audit as well as a standardized truck and trailer audit were developed.
3. Engage the industry and make it truly a consultative project. It was our goal to develop materials with long term value because this was an inclusive project.

The primary gaps and solutions or recommendations are discussed in the project summary. There are specific areas where scientific research would enhance our ability to know pig health status at a given site. Pigs testing methods that are easier and more cost effective could be developed. There remain gaps in our knowledge of what different strategies could be cost effectively used to reduce disease transmission. These would be technologies, in addition to, or as a substitute for, the proven technology of a cleaned, washed, disinfected and dried truck and trailer. The science is available to ensure that trucks can be low risk for PRRSV transmission. There is a need to develop better ways to do this – ways that are cheaper and more cost effective. There is a need to scientifically evaluate some of the currently proposed alternate disease transmission control methods.

Transporters are fully committed to providing clean trucks to their customers. We need to develop a culture of transparency amongst producers and transporters, with respect to disease status. In addition to enhanced technological tools, cost, capacity and education are the road blocks to prevent disease transmission during livestock. If we work together we can make a difference.

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