Agriculture and Agri-Food Canada
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Relocation of Livestock Facilities in Manitoba

Planning Guide

Canada

Relocation of Livestock Facilities in Manitoba Planning Guide

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Foreword

This publication is prepared as a planning guide for relocating livestock confinement facilities to reduce risk to surface or groundwater sources, supporting on-farm resilience and competitiveness. It provides some background on the issue, information on importance of managing nutrients and pathogens, site assessment criteria, budget worksheets, and producer testimonials. While any type of livestock operation may have potential to impact water sources, this guide focuses on cattle operations where outdoor pens, corrals, handling and feeding areas, and loose housing are common.

The guide highlights environmental and economic aspects of relocation for consideration by producers, resource and agricultural professionals, industry representatives and other stakeholders. Agriculture and Agri-Food Canada (AAFC) technical staff involved in the design and implementation of livestock facility relocation projects provided and assembled the material in this planning guide. Farmers and ranchers may use this guide to improve their current management practices and examine new approaches to livestock management for their operations.

Due to the complexity of livestock facility relocation and the variability in local and regional environments, the recommendations and scenarios in this guide may not apply to all operations. In Section II, two large relocation projects are highlighted that involved considerable time, expense and technical resources. Not all relocation projects are as involved as those described. Farmers and ranchers should refer to the agencies listed in Section IV "Steps to Consider in a Relocation Project" for specific project guidance and technical recommendations for their operation.

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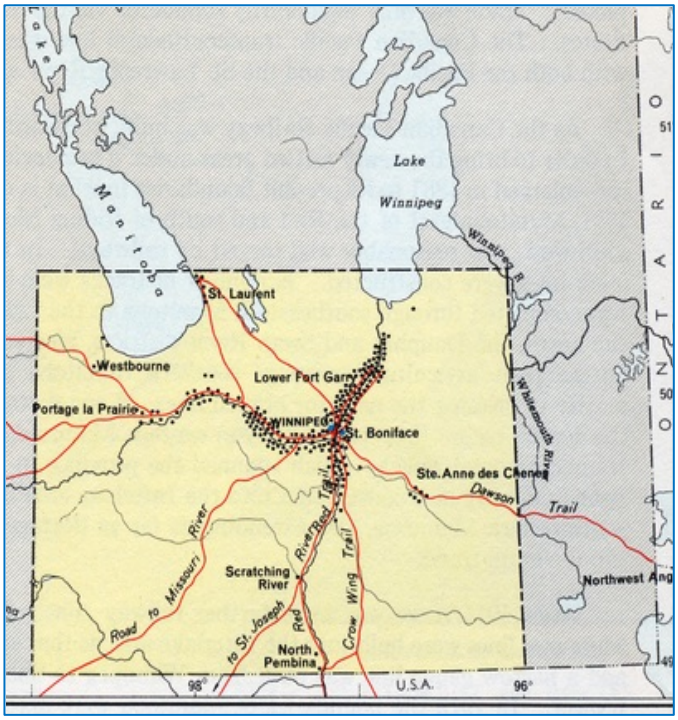
- Project Coordinators and Lead Technical Writers - Dale Timmerman and Kristin Hayward
- Technical Reviewers - Dennis Haak, Terry Kowalchuk, Fiona Briody, and Kristine Blair

Section I

Introduction - Impact of Early Settlement Patterns on Today's Farmers and Ranchers

When settlers arrived on the Prairies in the late 19th century, they required land that would provide the basic necessities for the pioneer lifestyle such as water, food, shelter and transportation. Historical records show that around 1870, most of Manitoba's 12,000 settlers had established themselves along the province's river systems. The rivers and the woody vegetation along them provided water and wood as a source of fuel, neither of which could be easily found on the plains.



Province of Manitoba, Settlement in 1870

Over the next few decades, this trend continued, with the number of farms growing and the size of these farms becoming increasingly larger. According to Statistics Canada, the average number of cattle and calves per farm in 1941 was 14. In contrast, the average number in 2012 was 161 cattle and calves per farm, representing an increase of 1150% over the past 70 years.

For many livestock operations, expansion has occurred gradually over time, on or close to the original homestead location near water sources. Along with the average size of livestock operations, public awareness and scientific understanding of the potential impact on water has increased. Similarly, producers and resource managers have recognized the importance of maintaining healthy landscapes and watersheds. Today, much greater emphasis is placed on proper design, placement, and management of livestock confinement facilities to mitigate potential impact on water quality.

Assessing and Managing Livestock Facilities for Mutual Benefits to Production and the Environment

Relocating a poorly placed livestock facility can provide significant benefits to the farm operation, downstream water users, and the broader watershed or aquifer. Benefits can include: improved water quality for the farmstead, livestock and downstream users; reduced stream bank degradation; improved riparian function; and improved herd health. In addition to environmental and production benefits, most producers who have relocated livestock facilities indicate that working with new or upgraded modern facilities can provide operational efficiencies.

The potential impact a facility may have on the environment will depend on the location and size of the facility, how it is managed, the total amount of manure generated, and the surrounding landscape (which may impact the timing and degree to which a facility interacts with water sources).

In some cases, it may be beneficial to relocate all, or a portion of a livestock facility (typically corrals and open shelters), to a more suitable location where the risk of nutrients, sediment and pathogens entering nearby surface water is reduced. Other factors that may warrant full or partial facility relocation include the presence of critical wildlife habitat, severely erodible areas, or highly sensitive groundwater systems near the facility. Learning how to assess your potential impact is discussed in Section IV "Steps to Consider in a Relocation Project".

It is recognized that many of the potential benefits of relocation are only possible through an investment of time, labour and financial resources. Relocating a livestock facility can be an expensive undertaking and options should be carefully assessed to ensure the most feasible and beneficial approach is pursued in each individual case. Some producers may be hesitant to undertake relocation due to the initial uncertainty of cost, time and actions required. The production and environmental efficiency of the facility must be closely examined before deciding whether to relocate or pursue other beneficial management practices (BMPs) to improve performance.

Other BMPs, including farmyard runoff control, extended grazing, in-field winter feeding, and riparian fencing, are techniques that can be used to mitigate potential impact on water sources. This publication focusses on the relocation BMP.

Section II

The Benefits of Relocating a Livestock Facility

Production benefits can include:

- improved feed utilization and decreased feed waste
- improved herd health
- improved access to, and movement of, animals, feed and equipment
- improved pen floor foundation allowing better and faster drainage of rainfall and snowmelt
- drier, cleaner animals.

Environmental and social benefits can include:

- meeting local zoning by-laws and regulations and federal and provincial environmental regulations
- improved farm aesthetics and public image
- reduced risk of nutrient and pathogen leaching to soils, surface water and ground water
- enhancement of natural area.

Did you know?

Feed intake of steers can decrease 15-30% in muddy conditions, resulting in lower weight gains.

Source: Alberta Feedlot Management Guide, Alberta Agriculture and Rural Development (2000)

In addition to the environmental stewardship reasons for livestock relocation, the following factors also contributed to these two producers' decision to proceed with their projects (highlighted in Section II):

1. Difficult working conditions due to poor facility design, overcrowded or muddy pens;
2. Existing facility no longer meets standards with current local, provincial or federal regulations; and
3. Deteriorated existing infrastructure in need of replacement or repair.

Significant technical assistance and professional services may be required to successfully complete a facility move. As each relocation project is unique, the degree of services warranted will vary from project to project. It is important to consult with a technical specialist to determine what services will be required, and to obtain estimates for project costs and timelines.

AAFC staff discussing environmental stewardship options with producer.

Livestock Facilities – What are the Challenges?

Business enterprises from all sectors can pose challenges to the environment. Livestock enterprises are no different. Most of the challenge from livestock production arises from manure and the inherent characteristics of the elements that comprise manure. While it provides many beneficial functions to farm health and productivity, livestock manure can pose a risk to the environment, in particular, water quality when not managed effectively.

The presence of manure alone does not imply significant risk. Many factors, including site characteristics, chemical and life cycle process of nutrients and pathogens within manure, along with farm management practices contribute to overall risk. By understanding the factors, their characteristics and the challenges associated with livestock manure and the potential link to human and environmental health, producers can make more informed decisions.

Nutrients (nitrogen and phosphorus), pathogens, salts, organic residues and sediment from the manure pack can be transported off-farm by runoff, and potentially enter surface and groundwater sources. Over time and during significant runoff events, the total concentration, or loading, of one or more of these constituents can potentially impair water quality.

In a livestock facility these substances can be found in urine, dung, feed residues and bedding. These four sources are typically referred to together as the “manure pack”. While the amount of nutrients in runoff from open livestock facilities is generally, from an agronomic perspective, not considered significant, it can upset the balance of an aquatic ecosystem and pose a threat to aquatic life.

High amounts of nitrogen and phosphorus in surface waters can result in eutrophication, a condition caused by the enrichment of water bodies with nutrients that increases plant and algal growth. As aquatic plants and algae decay, the decomposition process consumes oxygen from the water, depletes dissolved oxygen levels and deteriorates living conditions for many organisms.

Eutrophication also reduces the aesthetic and recreational value of lakes and rivers through prolific plant and algal growth, increased water turbidity (loss of clarity), habitat and species loss, and offensive odours or tastes. In particular, transport of excess phosphorus (from runoff into surface waters) is a leading concern for the health of many rivers and lakes, including Lake Winnipeg in Manitoba. All sectors, including agriculture, have a role to play in reducing total nutrient loading to water bodies.

There are off-farm environmental benefits gained by producers who proactively manage runoff associated with their facilities. However these generally come at an extra cost incurred for implementing remediation measures and tend to yield limited agronomic or economic value for the producer.

Algae bloom on Lake Winnipeg shoreline

Source: Lake Winnipeg Stewardship Board (2006). Reducing nutrient loading to Lake Winnipeg and its watershed: Our collective responsibility and commitment to action. Report to the minister of water stewardship

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1. Nitrogen

Nitrogen is an essential element needed for life by plants, animals and humans. Agricultural production systems are highly dependent on nutrients such as nitrogen, but at the same time, elevated nitrogen levels can have a negative impact in some situations.

Nitrogen can be found in many forms, but the two forms of nitrogen that dominate in livestock systems are ammonia (NH_3) and nitrate (NO_3). Ammonia is found in livestock urine, and when combined with oxygen, can form nitrate nitrogen. Nitrate nitrogen does not bind with soil particles, and as such is prone to loss in surface runoff or leaching (moving down through the soil profile by water in solution.) Excess nitrogen in water can be detrimental to amphibious aquatic life, and human consumption of water with excess nitrates can lead to human health risks.

The texture of the soil affects the tendency of nutrients to leach through the soil profile from the manure pack. The coarser the soil texture, sand for example, the lower the holding capacity of the soil and the greater the amount of nutrient solution which can be pulled down deeper into the soil profile. Fine soils, like clay, tend to pack quite tightly and deter water movement through them. In addition, clay particles are more easily able to adsorb nutrients, temporarily holding on to them.

In some larger confined livestock systems, a gleyed layer develops between the manure pack and the soil. The gleyed layer can be about 12 to 25 centimetres (5 to10 inches) thick,

is charcoal black and has the texture of felt. When soils are wet, the gleyed layer acts as a rubber seal preventing the downward movement of moisture and air through the soil profile. The nitrates that build up above this seal are eventually converted to nitrogen gas rather than leaching down through the soil. Breaking the gleyed layer during pen cleaning or exposing it to degradation by the sun and air will affect the integrity of the seal. This can potentially allow nutrients to move down through the soil and impact groundwater sources.

In many operations, especially in less intensive systems, the gleyed layer may not fully develop increasing the risk of nitrate leaching. In other cases, as pens become increasingly wet, soil mixes with the manure and, as a result, soil and some of the gleyed layer can be removed during the pen floor-cleaning process. With repeated cleanings, the pen floor or foundation can become bowl shaped allowing more water to collect and creating increasingly muddy conditions. The additional moisture arising during spring snowmelt and after heavy rainfalls may cause even worse conditions in pens, making working conditions more difficult and aggravating herd health issues.

Many people think of manure and urine as the sole source of nutrients in cattle operations. Feed and bedding residues are often overlooked, and should be taken into account when considering nutrient accumulation and movement risk. The residues in these areas contain notable amounts of "immobilized" nutrients that are held in the litter and become available to plants gradually as the residue breaks down.

Did You Know?

In the Prairies, 80-90% of runoff typically occurs during spring snowmelt.

Source: University of Manitoba (2010)

2. Phosphorus

Phosphorus is both used and generated by agriculture production systems; but, when present in excess amounts, it can adversely impact water quality. Phosphorus is found in organic and inorganic forms. In its organic form, phosphorus exists in both plant and animal residue and material.

Phosphorus is present in the soil solution, in decomposing plant and animal residues, and bound to soil and organic particles. The majority of phosphorus is associated with the solid fraction of soil particles and is either adsorbed or chemically bound to those particles. In a livestock production system, phosphorus comes from manure, feed and bedding residue. Over time, these materials can build up and represent a large source of phosphorus that can be readily transported by water. Pens which are susceptible to flooding, standing water and runoff, and pens built on coarse-textured soils, such as sand, are at higher risk for phosphorus loss.

Excess phosphorus can promote increased algal growth and thus impacts water quality of streams and lakes. Dissolved phosphorus can be transported for long distances and is very difficult to intercept once it becomes part of a concentrated water flow. It is especially difficult to intercept when it is transported with snowmelt water. During snowmelt, most of the soil is still frozen and there are no growing plants to take up and use the nutrient. Since most of the excess runoff in the Prairies is from snowmelt, reducing the potential for transportation of dissolved phosphorus from livestock areas to streams and lakes is important to maintain overall watershed health.

3. Pathogens

All animals, including humans, are hosts to various micro-organisms, most of which are harmless. Some of these organisms exist in the intestines of livestock without the animals showing any signs of illness and play an important role in animals' digestion.

In addition to healthy micro-organisms, a number of pathogens (disease-causing organisms) can be found in livestock manure. These include bacteria, protozoa and viruses. Among the numerous pathways by which pathogens are transmitted to humans, the most common means of transmission is through consuming infected or poorly prepared food, or direct contact such as touching a carrier animal, handling manure or drinking contaminated water.

4. Organic Particles and Sediment

Straw, feed residues and manure are referred to as “organic” materials, or materials derived from living things. They are made up of a number of elements, primarily carbon, but also nitrogen and phosphorus. The physical presence of large amounts of organic materials in runoff may lead to water quality issues.

As with nutrients, water is a key factor in transporting organic materials. Flowing water can have a tremendous amount of energy. With this energy comes the ability to pick up particles of soil and pieces of straw, manure and other residues. This organic matter can then be transported into a water body causing turbidity—the lack of clarity in surface water.

Turbid water can pose water quality issues including unpleasant aesthetics, taste and odour. It affects the quality of water for both recreational and domestic drinking use. Turbid water is particularly difficult to filter as the suspended organic and soil particles provide a place for potentially harmful micro-organisms to “hide”.

Turbid water can also impact aquatic life. Sediment and organic particles suspended in the water will eventually settle to the bottom. When they do, they can smother food sources and spawning areas making it difficult for aquatic species to complete their life cycle. The cloudiness of turbid water also makes it difficult for sunlight to penetrate the water, decreasing the ability of aquatic vegetation’s ability to perform photosynthesis. As plants release oxygen during photosynthesis, other organisms in the water body can also be impacted.

Organic residue deposit on soil surface

In Summary: Managing Challenges

Recognizing the possible environmental and health risks associated with excess manure, producers should assess the potential loss of nutrients, pathogens, organic particles and sediment that can arise from their facilities and management. By gauging the extent of potential loss, one can make a more informed decision to relocate all or a portion of their livestock facilities or to implement other control measures. Seeking professional guidance can assist producers in making decisions that benefit their operation and the broader landscape.

Section III

Steps to Consider in a Relocation Project

The following outlines steps to be considered when contemplating a relocation project and identifies services you may wish to secure to help complete it. When considering a relocation project it is important to remember that each situation will be unique. Each project may not involve all of the following steps, nor may each step be carried out to the extent in which it is presented here. However, these steps will assist you to view your operation with a critical eye and help you develop a plan that best suits your farm.

Improving your wintering management system can be done in a variety of ways and the approach should fit your needs—a major over-haul of the existing site may not be necessary. Improvements can come from mitigating risks at the existing site, moving only a portion of the pens to a new location or reducing the number of livestock that occupy the sensitive site. Look at the feasibility of all options and determine which will be most beneficial from an economic, practical and environmentally-sound basis.

Step 1: Assess the environmental challenges of your current facility

List how your livestock facility may impact the environment. Identify aspects of the system that may contribute to risks including:

- Slope direction and gradient as dictated by landscape form
- Soil texture
- Proximity to water bodies, wildlife habitat, shorelines and riparian areas
- Potential for groundwater leaching or groundwater contamination
- Presence of abandoned or production wells, seeps or springs
- Type, age, and number of livestock
- Intensity and duration of site use
- Potential for flooding or water movement through site
- Potential for snowmelt or rainfall carrying nutrients and sediment off-site
- Potential for livestock-induced erosion and bank degradation
- Manure, bedding, and feed waste accumulation in and around facilities.

Tools to help with this task

Aerial photos are an excellent visual tool to help identify distances between your livestock facility and water bodies or sensitive areas. They can also help illustrate the flow of water through the watershed—an important component in understanding the relationship between your facility and downstream users in your area.

Local extension or resource management staff can help you access information about soil and water resources. They can help to interpret maps and have access to various types of imagery that may be useful in assessing the potential risks at your facility, and also in planning and designing your project.

Step 2: Assess your needs

Once you have assessed the risks, you can determine what changes or additions your facility requires to meet the needs of your production system. Initial concepts and ideas for new or modified facilities should be discussed, and a number of options should be considered.

Considerations:

- Capacity and number of pens
- Processing requirements, animal flow within or between facilities/pasture
- Shelter, housing and maternity requirements
- Accessibility (e.g. Loading and unloading areas for farm machinery and cattle trailers)
- Necessity availability (e.g. water, electricity, etc.)
- Feed bunks, feed storage, access lanes
- Management of runoff and water running into pens (e.g. ditches, berms, eave troughs, retention ponds)

Step 3: Review applicable legislation and identify permit requirements

Be aware of all regulatory requirements that may apply to your project. In Manitoba, livestock facility relocations may require a permit issued under the authority of the Livestock Manure and Mortalities Management Regulation, a set of regulations under the provincial *Environment Act*. These and other regulations address a number of requirements or standards such as:

- Permit to expand, construct new or modify (especially if the operation is larger or there are plans to increase the capacity of the operation. NOTE: At the time of publication, there are specific requirements in Manitoba for operations that are larger than 300 animal units or have the capacity to hold more than 300 animal units.)
- Minimum distance between a wintering system and a well, water body or road
- Properly sloped pen floor (foundation) with an impermeable base
- Collection basin requirements.

Additional by-laws (provincial, municipal and planning district) may regulate the siting of livestock operations in relation to roadways, neighbours, and communities. Set-back variances may be applied for with reasonable justification to Manitoba Conservation and Water Stewardship for wells, water bodies, roads and property boundaries.

Federal legislation may also be applicable, depending on the nature of the work including:

- Federal Fisheries Act
- Species at Risk Act
- Navigable Waters Protection Act
- Heritage Resource Act.

While it is the responsibility of the landowner to comply with federal, provincial and municipal regulations, extension or resource management specialists can provide guidance. Various regulations may apply to your situation that will determine the facility development, construction and decommissioning requirements. There may also be costs associated with the permitting process of your project.

Step 4: Site assessment and preliminary project design

Now that you have assessed the risks associated with the existing site, outlined the needs of your production system, and corresponded with the local authorities to ensure all regulations will be met, you can begin your preliminary design. Technical advice and pre-construction technical services and information that may be beneficial include:

- Conceptual plans and drawings including what pens should be removed, added or modified
- Agronomic advice on facility set-up and operation
- Topographic survey of the proposed site
- Hydrologic analysis
- Geo-technical soils investigation (test holes, hydraulic conductivity, soil suitability for construction, etc.)
- Earthwork quantity calculations.

Take time to plan and design your facility carefully

A set of preliminary drawings should be developed to illustrate layout of buildings, pens, access roads, drainage ditches, water supplies, a catch basin, on-farm infrastructure and other features. These drawings provide a “vision” of what the new facility will look like and help to illustrate how all the components will work together.

Design Tips:

- Keep it simple—simpler designs work best!
- Sketch out many different design options and consider different approaches to handling of animals, manure, feed, etc.
- Go back to basics—rectangular pens accessed by a central alleyway are one of the easiest and most effective designs to work with.
- Allow space to expand in the future—even though you may not have plans to expand your operation right now, it’s smart to allow sufficient space to add on a few extra pens in the future should you require them.
- Seek expert advice and technical assistance, where available, to help plan and develop your project and obtain necessary permits. An outside eye often brings a fresh perspective and can see things you may overlook.

Drainage Tips:

- Use natural topography to your advantage. Examine the drainage patterns of your potential site and use man-made ditches, berms and collection basins to help control the movement of water into and out of your site.
- Facilities with multiple pens should not shed runoff water from one pen into another.
- If necessary, re-arrange or remove existing infrastructure (pens, drains, shelter, buildings and watering stations) to allow improved function and drainage of your new pens.

- Ensure incoming water is diverted around the facility to reduce the amount of runoff that will collect in the catch basin. This will reduce the risk of overflow and reduce the amount of runoff you will need to manage (e.g. pump out). You can often use material excavated from ditches or a catch basin to build up pens or berms around the facility.
- Strip away the topsoil and ensure you provide an elevated clay base with adequate slope for your pens. This extra step will make a big difference in the longevity of your pen floor and help facilitate pen drainage. Topsoil left in place makes for wet, muddy pens—a situation you are trying to rectify.
- Plan your access roads. If they cross a drainage ditch you'll need to install a culvert to keep the water flowing to the catch basin.

Infrastructure tips:

- Plan temporary or permanent fencing to keep cattle out of runoff control ditches and collection basins. This will reduce maintenance required on these structures and allow them to continue functioning properly over the long term.
- Use natural wooded areas to your advantage. You can't beat the protection it provides, as long as it is protected from direct cattle access.
- Be careful not to locate your pens too close to a shelterbelt or bluff to prevent snow accumulation in the pens. Observe snow accumulation patterns around the trees and plan your pen's location accordingly. Less snow in the pens will mean less runoff in the spring.
- Don't take down your old pens and sheds until the new facility is completely finished. Unexpected delays due to weather, contractor and material availability, and other farm commitments could significantly postpone project completion. You don't want to be without a place to treat sick animals, process calves, or calve your cows.
- Be aware that water supply and availability of electricity are important components of most livestock facilities. The cost of incorporating these utilities can be expensive and should be carefully considered.

Step 5: Final project design

Moving from preliminary plans to a final design usually requires additional planning and technical advice and modifying preliminary plans, especially for large projects. In cases where legislation requirements need to be met, input may be required from technical specialists, authorities issuing permits, professional consultants/engineers and or contractors.

Creating a detailed budget plan may save you money

- Ask for quotes from all suppliers to help estimate costs.
- Use the Budget Estimate Worksheet (Appendix B) to help develop a project budget.
- Consider new management systems that can help reduce capital costs, such as investing in portable infrastructure rather than permanent. There are numerous options for remote watering systems, portable windbreaks, fences and shelter. Remember that you are not necessarily tied to the yard anymore.
- Relocation project costs vary widely depending on the scope of the project—anywhere between $15 and $2,000 per head of livestock. Your cost will depend on the amount of infrastructure involved in your move, how much of the work you are able to do yourself without hiring a contractor, how much of the existing building materials you can recycle, the availability of utilities, etc.
- Check with local agencies and programs (federal, provincial or other non-government organizations) to see if grants or incentives are available to assist with your project and to find out what project costs are eligible under such programs.

Step 6: Site layout and construction

Producers may choose to do all or a portion of the work themselves, or hire contractors to complete building construction, electrical, plumbing and earthwork. Additional services, particularly for larger projects, may be required including:

- Layout surveys which identify location markers, cut and fill stakes
- Quality control supervision and guidance of earthwork to meet standards and achieve final project design.

TIP

The soil beneath pen areas may be compacted from many years of use. To improve plant establishment you may need to break up the compacted layer to prepare a good seed bed.

Step 7: Cleaning up the old site

From an environmental perspective, the clean-up of the old site is just as important as constructing the new site. Steps to consider:

Remove all manure

One of the first steps you should take after relocating your animals is to remove as much manure as possible from the original site. Pens and bedding areas should be scraped down to the soil surface. If old manure packs are not removed they continue to act as a source of nutrients that can be subject to leaching or runoff for years to come.

Remove Infrastructure

While you may no longer plan to use the original site for livestock, situations inevitably arise where you may be tempted to use those "extra" pens and facilities for livestock again. In most cases, these might be temporary solutions to address specific issues such as quarantining a sick animal or housing your bulls during the winter. Sometimes these "temporary" solutions can easily become a permanent practice and thwart your attempts make a positive change to your operation.

It is reasonable to leave buildings or shelters that are in good condition and use them as machinery storage. However, other infrastructure that can be used for animals (and thus concentrating them) such as gates, pen material, windbreaks, water bowls, handling facilities, feed bunks or feeders should be removed. Aesthetically, a well decommissioned site will have a much neater appearance and illustrate your environmental stewardship.

Seal wells you no longer plan to use

Wells provide direct pathways for chemicals, bacteria and nutrients to enter groundwater sources. In addition, wells that are no longer in use pose a serious safety hazard for children, pets, livestock and even farm machinery.

- If you currently are not using the well, but may want to use the well in the future, ensure the well is properly capped so that no foreign materials can enter the well. Your cap should be watertight and securely fastened to reduce the risk of potential groundwater contamination.
- If you are abandoning a site completely, you should have the well sealed properly. Local conservation groups may have programs that will subsidize costs associated with sealing an abandoned well.

Establish plant cover

It is important to establish plant cover on the site as soon as possible to take up the excess nutrients. Even after the manure has been removed, nitrogen levels can remain high beneath the pens. Quick vegetation establishment will also help minimize soil erosion in large, bare areas and minimize transport to water bodies. The sooner you can establish vegetation, the sooner you can intercept and use any nutrients that may have accumulated in the soil; adding a little extra forage production to your farm at no additional cost.

At some sites, nitrate nitrogen may have leached through the soil profile to depths that are beyond the rooting zone of many crops. These nitrates not only pose a potential risk to groundwater sources, they also may represent a valuable source of nutrients that are inaccessible to the ground cover you plan to establish. A soil fertility specialist can help you to determine if your site has deep-leached nitrates and explore strategies for retrieving them, such as planting deep-rooted legumes (e.g. alfalfa) and grasses. While you may not get a great stand the first year of establishment, it is important that you harvest vegetation from the site to remove nutrients those plants have taken up.

Section IV

PRODUCER PROFILE: Robert and Kim Vuignier, Riverpride Farms Inc., Notre Dame de Lourdes, Manitoba

Boyne River

Robert and Kim Vuignier and their family operate Riverpride Farms Inc., a mixed grain and dairy operation east of Notre Dame de Lourdes in south-central Manitoba. They milk 60 dairy cows, manage 50 cow-calf pairs for beef production, farm 81 hectares (200 acres) of tame forage, and use 46 hectares (90 acres) of native forage for pasture. They also have nearly 134 hectares (300 acres) in annual crop production.

The farm was established in the late 1800s by Robert's great-grandfather. Like many farms settled during that era, buildings and other infrastructure were established near the water course that runs through their farm to provide reliable access to water, shelter and lush riparian pasture.

Cattle watering from the Boyne River

Riverpride Farms is situated along the picturesque Boyne River. The Boyne River flows generally eastward, and becomes a tributary of the Morris River eventually meeting the Red River destined for Lake Winnipeg. The Stephenfield Reservoir is located on the Boyne River west of the town of Carman. The reservoir, constructed in the early 1960s, provides water for both agricultural and domestic use, including Carman and parts of the rural municipalities of Dufferin, Grey, Morris, Roland and Thompson. The reservoir also provides recreational opportunities for area residents and visitors. Therefore, protecting water entering the Boyne River will benefit downstream users in the region.

Map of Vuignier's old wintering system *Source: AAFC drawing. See page 18 for new site design.*

Cattle Facilities and Management Prior to Relocation

Although the Vuigniers have an enclosed barn for their milking operation, they still require outdoor pens for the dry cows, calves and heifers. They used two main corrals and a wintering area for this purpose.

Confinement pen adjacent to the Vuignier's dairy barn

The pens, approximately 1,200 metres squared (12,900 feet squared) housed dairy calves, bred beef cows and beef cow-calf pairs. The wintering area was used for bedding and feeding the older stock during the winter. The cattle were allowed unrestricted access to the riparian area and the creek for shelter and water.

North view of Vuignier's confinement pens in the foreground and semi-confinement paddock along the Boyne River in the background prior to relocation

South view of sloping semi-confinement area looking towards the dairy barn, including adjacent confinement pen

The outdoor pens and wintering area were approximately 50 metres (164 feet) away from the Boyne River, with the land sloping toward the river. During periods of high water flow, the river came closer to the wintering area, increasing the risk of water intercepting nutrients, pathogens and sediment from livestock manure.

Manure and residue build-up of Vuignier's feed and bedding adjacent to Boyne River

Manure was removed from the pens and wintering area each spring. Once removed, it was windrowed and spread on fields in late summer or early fall.

What were the Challenges for the Vuigniers?

The landscape around Riverpride Farms is gently rolling, with a variety of soils—typical of alluvial (stream) deposits. Soils in the area are well-drained to excessively well-drained, and are subject to rapid permeability (i.e. fast downward movement through the soil profile). As a result, the soil on Riverpride Farms tends to be at higher risk of excess nutrients or pathogens leaching into groundwater, and needs to be managed appropriately. Some soils at this site are also subject to rapid surface runoff, which is another concern given the close proximity of the old pens to the Boyne River.

The Vuignier's wintering area was comprised of confinement pens adjacent to their dairy barn and feeding and bedding areas that ran adjacent to the Boyne River within the riparian area. The riparian area provided the cattle easy access to a water source and trees for natural shelter and was used for many years. This layout was convenient, but it is now recognized to have posed potential risk to environment.

First, both the confinement pens and the feeding and bedding areas naturally sloped toward the river, as it was historically for many farms. The quick drainage away from the pens helped to maintain a dry healthy environment for the animals. Today, producers including the Vuigniers recognize nutrient movement from livestock areas can occur and should be minimized.

Also, the feeding and bedding area outside of the main confinement facility is considered a high-use semi-confined paddock. Feeding and bedding practices within these types of paddocks can result in accumulation of nutrients similar to what is seen in confinement pens on most farms. Often, in this type of a situation, manure removal is not performed on a regular basis, if at all, for many reasons including time, manure distribution and clean-up cost.

Finally, a well, used as a water source for the livestock on the farm, was located between the pens and the river, within range of where the river floods to during spring melt. During high runoff events, water had the potential to channel materials down the well, posing a risk to water quality within the broader aquifer.

View from Boyne River channel looking up the slope through the semi-confinement area to the holding pens

The well within the semi-confinement wintering area during spring high-water levels prior to site relocation

Vuignier Project Development

The old wintering site was evaluated to determine if mitigation, as opposed to relocation, might be an option. There may have been potential to leave the site in the same location and build runoff containment ponds to intercept the direct flow of runoff to the river, if there was a greater distance between the old site and the water course. Relocation was chosen as the best option. The new site was selected based on many positive factors: it was further from the river in a dry area that is not prone to flooding; it had a good, natural surface drainage; and it was within a beneficial proximity to the main yard site, the dairy barn, earthen lagoon and the hydro and water facilities.

The new site was located on fairly sandy soil so a clay layer was required to create an impermeable base for the new pens and reduced the potential for leaching of nutrients and pathogens through the soil profile. The Vuigniers contracted a local construction company to remove all the topsoil and replace it with a layer of clay on the project site. Clay material had to be hauled in, which added to the cost of the project. Once on site, the clay was placed and packed in incremental lifts (layers) until the desired thickness was reached.

Vuignier's newly constructed pens on the new site with sufficient distance from the creek

Pen floor construction required surveying and laying of a surface clay foundation

To help water drain from the pens, the pen surface was sloped encouraging water to flow towards a series of drainage ditches that lead into a catch basin. The catch basin was constructed adjacent to an existing manure storage lagoon so runoff collected in the basin could be pumped to the existing lagoon and then land-applied with the rest of the slurry.

Water lines were trenched from an existing pump house, providing service to four new watering sites. Concrete pads were poured around each watering station to help eliminate muddy conditions and improve footing.

Access lanes and pen drainage ditch

Trenching in a water line

After all water and electrical lines had been trenched in, the contractor graded the pens one final time to achieve the desired slope to drain runoff into the ditches along the east side of each pen. With all of the base and site preparation completed, a local carpenter was hired to construct two new open cattle shelters (pole sheds). The Vuignier family invested a significant amount of time and labour to construct the pens and corrals. Pens and wind fence were made out of railway ties and rough spruce lumber. A mechanical post-hole auger was used to pre-drill holes for the ties, which were then pushed in using a front-end loader.

Robert Vuignier and his son constructing pens

Map of Vuignier's new site after completed relocation project

Source: AAFC drawing. See page 12 for old site design

Project Costs

New Site Construction	Costs
Engineering and Permits: Engineering services provided by AAFC*	0
Earthwork: Topsoil removal, clay placement for pens, access lanes, retention basin, diversion ditches, gravel, equipment use and rental	$ 45,100
Utilities: Electrical service to site – service shed, supplies and installation	$ 7,700
Buildings: Pole shelters, lumber, crushed rock, labour, equipment use and rental	$ 26,200
Corral and Wind Fence: Portable windbreaks, slab lumber, rails, gate hardware, panels, labour, equipment use and rental	$ 17,100
Water: Concrete, heated water bowls, valves, fittings, pipe, trenching, labour, equipment use and rental	$ 16,700
Handling System: Squeeze chute, crowding tub, panels	$ 4,900
Decommissioning the Old Site	
Decommissioning: In-kind labour and equipment (estimated)	$ 3,400
Total Costs	$121,100

* Engineering services were provided by AAFC as in-kind support through the Canada-Manitoba Farm Stewardship Program, an incentive program available to Manitoba producers at the time this project was constructed.

Robert and Kim Vuignier invested more than just money in the construction of their new facility. They estimate they spent over 600 hours at the construction site. Like many other farm families, the Vuignier's children are active in daily chores and activities on the farm and helped out where they could. The dollar values above take into account some of this family labour as part of the overall cost.

Decommissioning

As a condition of the financial assistance they received from the Canada-Manitoba Farm Stewardship Program for livestock facility relocation, the Vuigniers were required to clean up their old livestock facilities including removal of all manure and decommissioning of water lines and buildings to discourage future use of the facility for livestock confinement.

The cattle no longer have access to the Boyne River nor the adjacent riparian area. This will give the green space an opportunity to replenish itself. However, the new site lacks natural shelter so the Vuigniers have put up a wind fence to make up for this deficiency and plan to plant trees for shelter in the future.

Benefits for the Vuigniers

Since the relocation of their wintering facility, the Vuigniers have realized both environmental and production benefits. The design and manipulation of the new site for better drainage has nearly eliminated muddy conditions providing an easier working environment in pens and improved footing. The new, more structured wintering area allows for easier management and movement of animals, feed and equipment.

When implementing changes, Robert and Kim Vuignier certainly considered the next generation on their family farm, they recognized the need for improved operational and environmental management efficiencies in order to move forward.

PRODUCER PROFILE: Ron and Janice Apostle, Gilbert Plains, Manitoba

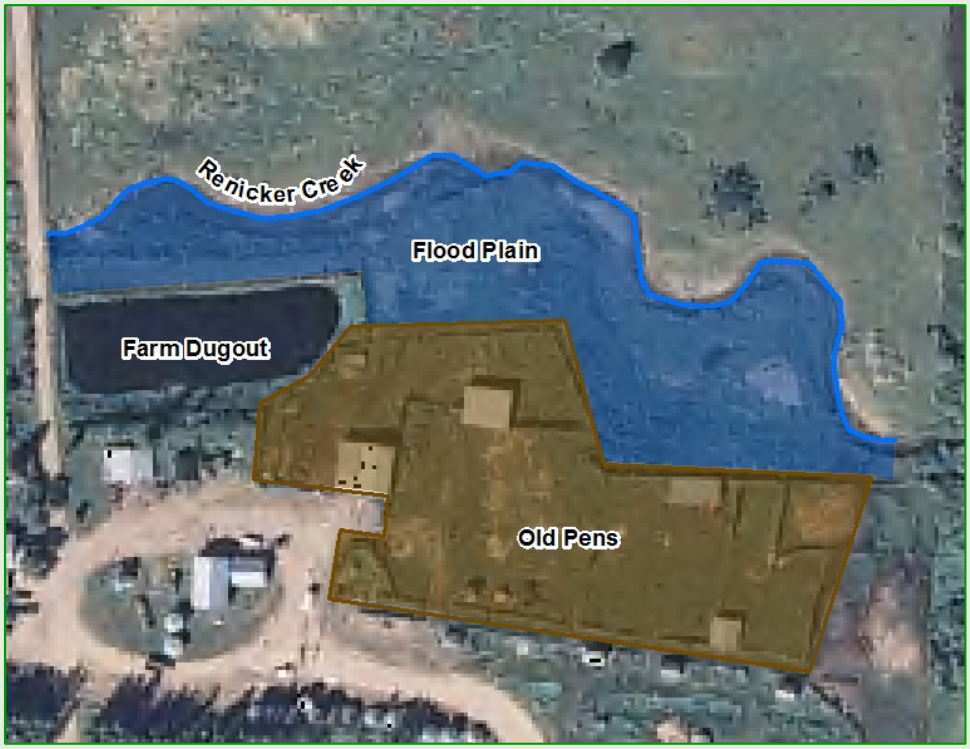
"Our new facility has made our lives easier"- Ron Apostle

Ron and Janice Apostle and family operate a second generation family farm nestled alongside Riding Mountain National Park in the Parkland region of Manitoba. Their operation consists of 420 hectares (900 acres) of cropland, a cow-calf operation and some backgrounders. To sustain their beef enterprise, they also manage 330 hectares (740 acres) of native pasture and 156 hectares (350 acres) of tame forage.

The farm, located near Gilbert Plains, is situated along Renicker Creek surrounded by a gently undulating landscape. The Renicker Creek is a tributary of the Ranch Creek, which feeds the Wilson River and eventually makes its way to Dauphin Lake.

Renicker Creek with Apostle's old livestock facilities in the background

Cattle Facilities and Management Prior to Relocation



Map of Apostle's old wintering system *Source: AAFC drawing.* *See page 24 for new site design*

Like many cow-calf producers, the Apostles' cattle typically spend seven months in the corrals and pens during the late fall, winter and early spring period. Calving begins in January, and the majority of calves are born by April. All animals remain within the facilities until May at which time they are turned back out to pasture.

Like most generational farms, the Apostles have had to overcome issues that resulted from the management practices of earlier generations. For example, twenty five years of manure removal had caused their original pens to become bowl-shaped, resulting in very poor drainage.

What were the Challenges for the Apostles?

The majority of soils in the area near Gilbert Plains, Manitoba are well drained and suitable for agricultural use. Soil texture in the area is variable; however, most of the soils on the Apostle's farm have higher clay content. The fine texture of their soils increases the potential for surface runoff during periods of significant precipitation and can elevate the risk of impact on the nearby watercourse.

The Apostle farm was established by Ron's father and, like many farms settled during this era, buildings and other infrastructure were established near the creek that runs through their farm to provide reliable access to water, shelter and lush riparian pasture.

Ron and Janice Apostle realized that the close proximity of their livestock shelters and pens to the creek posed an environmental risk. Although they had contemplated making improvements in the past, financing a relocation project of this size was a significant undertaking—a struggle many producers face when attempting to undertake a significant relocation.

While the nearness to the creek was their primary concern, there were also economic issues they wanted to address through relocation, specifically reducing operating costs.

Unstable and eroded banks of the Renicker Creek resulting from livestock activity adjacent to the former confinement facility

Apostle Project Development

When a neighbour told Ron about an Environmental Farm Plan (EFP) workshop he had recently attended, Apostle was intrigued. He wanted to take a proactive approach and address his situation.The Apostles decided to complete an EFP and apply for financial assistance through the National Farm Stewardship Program to help them address their operation's close proximity to the creek. They soon realized, however, that they would also require a significant amount of technical assistance to bring their project ideas to life.

As Agriculture and Agri-Food Canada (AAFC) was delivering the National Farm Stewardship Program in Manitoba, the Apostles contacted them to discuss their current situation and future plans. AAFC technical staff worked closely with Ron and Janice throughout the project—from project conception and design to project completion.

Map of Apostle's new site *Source: AAFC drawing. See page 22 for old site design*

In evaluating the old site for mitigation, it was obvious that the proximity of the pens to the water course did not allow for the implementation of runoff containment ponds. Repositioning pens within the immediate area of the existing facility would make little improvement due to the slope of the land towards the creek. As such, relocation was the most viable option.

The site the Apostles chose for their new facilities was adjacent to their existing yard and had been used as a feed storage area. It was close to utilities, access roads, lanes and equipment and storage, and was higher in elevation and further from the creek than the original site, providing a dry location. In order to make it more suitable for livestock pens, they needed to prepare a solid, impermeable base using clay material.

Using much of their own equipment, the Apostles stripped the topsoil at the new location and created a foundation for their new pen. Clay for the pen's floor surface was excavated at the outside base of each pen where the retention basins were to be constructed. In addition, this clay was used to construct a central alley and an adjoining access lane. The location of new pens did not interfere with existing cropping plans or other farm operations.

The area was shaped using a caterpillar and scraper, a disc, and a home-made packing machine which Ron had invented himself. Shaping included leveling, packing and digging the catch basin and drainage channels and sloping the pens towards these channels. The local Rural Municipality was contracted to grade the pens to the required slope.

Once the area had been prepared, a local contractor was hired to trench the waterline, install watering stations and hook everything up to a new well the Apostles had dug. The project required just over 305 metres (1000 feet) of trenching. To help reduce costs the Apostles used their own tractor and front-end loader to backfill the trench. While the waterlines were going in, they also installed lighting and completed the necessary wiring to run the water bowls and a couple of cameras they use during calving.

With the underground work complete, the Apostles began staking out the pens and alleyways and constructing the cattle shelter. Rather than construct a number of new buildings, they chose to erect a biotech shelter. The shelter only houses a few maternity pens, an insulated calf shack and their handling facility. The rest of the time the cattle are in outdoor pens or on pasture.

The shelter stands on a crushed gravel pad. Inside the shelter, the Apostles built a 2-metre (7 feet) high pony-wall to protect the poly-sheeting. The shelter provides much needed protection from the elements when processing, shipping and tending to their animals.

New biotech shelter for livestock processing and calving

Apostle's new over-wintering pens

While their original facility was constructed mainly from wood, the Apostles chose to construct their new pens and alleyways from steel to improve the longevity and portability of their infrastructure.

Since they were no longer providing a shed or barn for the cattle to use freely, the Apostles purchased some portable windbreak fences to line the pens and provide additional protection during the winter months.

Project Costs

New Site Construction	Costs
Engineering and Permits: Engineering services provided by AAFC*	0
Earthwork: Topsoil removal, clay placement for pens, access lanes, retention basin, biotech shelter foundation, gravel, equipment use and rental	$ 40,900
Utilities: Electrical service to site – supplies and installation	$ 7,800
Buildings: 30 x 72 ft biotech shelter, lumber, crushed rock, labour, equipment use and rental	$ 32,000
Corral and Wind Fence: Portable windbreaks, slab lumber, rails, gate hardware, panels, labour, equipment use and rental	$ 25,200
Water: Concrete, heated water bowls, valves, fittings, pipe, trenching, labour, equipment use and rental	$ 10,600
Handling System: Pre-fab handling system, loading chute, maternity pens	$ 18,800
Feeders: Alley feeder and panels	$ 8,500
Decommissioning Old Site	
Decommissioning: Labour, equipment use and rental	$ 9,900
Total Costs	$153,700

* Engineering services were provided by AAFC as in-kind support through the Canada-Manitoba Farm Stewardship Program, an incentive program available to Manitoba producers at the time this project was constructed.

Decommissioning

The original site consisted of a number of cattle shelters, wind fences, wooden corrals, watering stations and a processing area, all of which were dismantled and removed, with the exception of the cattle shelters. The cattle shelters were converted to machinery storage areas. Wherever possible, the Apostles tried to salvage materials from the old site and re-use them at their new facility or around other areas of the farm. In total, they estimate it took almost 200 hours to clean up their old site. The site has since been allowed to return to grass to stabilize the area and help utilize the remaining nutrients.

Apostle's old pens before decommissioning (left) and pens re-vegetated after site remediation (right)

Benefits for the Apostles

The Apostles had the freedom to build a less elaborate corral system at the new site because of the decreased amount of time their cattle spend in the pens. They are steadily increasing the amount of out-of-yard feeding they do in the winter, which not only reduces feeding costs, but also decreases the amount of time cattle spend in pens, therefore significantly reducing their annual manure clean-out bill.

The pens were constructed using portable free-standing steel panels, which makes manure clean-out much easier and provides additional pen flexibility should they require more pen space or want to separate their cattle at shipping time. The portable wind fences provide protection no matter which direction the wind is blowing. They have also found these portable panels handy when sorting or needing to quarantine or separate some animals for a short period of time. Special feeder panels that line the central alleyway allow the tractor to distribute feed along either side of the alley. Gravel was placed on top of the clay base along all of the alleyways to improve trafficability for the cattle and machinery.

All runoff from the new facility can now be contained in retention basins as opposed to the former site where runoff could enter into the creek. Cattle access to the creek is now managed and will give the riparian area a chance to heal. Like the Vuigniers, the Apostles also see their changes to the livestock facilities as a positive, improving their overall stewardship ethics, as well as improving the overall operation of the beef enterprise should their children decide to take over the farm operation.

Conclusion

The set-up, location and management of outdoor livestock confinement facilities are important elements to help foster an efficient and environmentally-sustainable operation. Due to the historical settlement patterns of farmsteads combined with expansion of herd sizes over time, relocation of all or a portion of some livestock operations may be warranted. The information presented in this booklet is intended to guide producers through the many considerations required to complete a relocation move whether small or large. Producers should assess how their own facilities rate in terms of environmental performance and determine whether complete relocation should be considered or if other practices can be implemented to improve stewardship. In cases where relocation is being contemplated, producers are encouraged to assess their own facility needs, legislation and permit requirements, suitability of any proposed new location, design elements, and time and financial requirements. Proper decommissioning of old facilities is equally important as construction of new ones. Producers are encouraged to seek technical assistance where possible throughout any of the steps in a relocation project.

Example of livestock facility relocation project near The Pas, Manitoba. BEFORE (above) and AFTER (below) project completion

Appendix A: Animal Unit Calculation Sheet

Animal Unit (A.U.) Calculation Sheet				
	A.U. Produced by One Livestock		Number of Livestock of Each Type	A.U. for Each Livestock Type
Dairy				
Milking cows (including associated livestock)	2.00	X	_____	= _____
Beef				
Beef cows, including associated livestock	1.250	X	_____	= _____
Backgrounder	0.500	X	_____	= _____
Summer pasture/replacement heifers	0.625	X	_____	= _____
Feedlot cattle	0.769	X	_____	= _____
Hogs				
Sows, farrow to finish	1.250	X	_____	= _____
Sows, farrow to weanling	0.313	X	_____	= _____
Sows, farrow to nursery	0.250	X	_____	= _____
Weanlings	0.033	X	_____	= _____
Grower / finishers	0.143	X	_____	= _____
Boars (artificial insemination operations)	0.200	X	_____	= _____
Chickens				
Broilers	0.0050	X	_____	= _____
Roasters	0.0100	X	_____	= _____
Layers	0.0083	X	_____	= _____
Pullets	0.0033	X	_____	= _____
Broiler Breeder Pullets	0.0033	X	_____	= _____
Broiler Breeder Hens	0.0100	X	_____	= _____
Turkeys				
Broilers	0.010	X	_____	= _____
Heavy Toms	0.020	X	_____	= _____
Heavy Hens	0.010	X	_____	= _____
Horses (PMU)				
Mares, including associated livestock	1.333	X	_____	= _____
Sheep				
Ewes, including associated livestock	0.200	X	_____	= _____
Feeder lambs	0.063	X	_____	= _____
Other livestock or operation type – please inquire with your regional agricultural engineer or livestock specialist				

One animal unit is defined as the number of livestock required to excrete 73 kilograms (160 pounds) of nitrogen in a 12 month period; Source *Farm Practices Guidelines for Beef/ Dairy/ Hog/ Poultry Producers in Manitoba*

Appendix B: Budget Estimate Worksheet – Livestock Facility Relocation

Use this worksheet to help estimate the cost to relocate your livestock facility

Disclaimer: This worksheet is a tool intended to assist with planning and budgeting a livestock facility relocation project. While every effort has been taken to ensure the information is complete and accurate, this sheet should not be considered the final word on all expected project costs. Producers should seek the advice of technical professionals who can assist with detailed planning and estimates for a specific project.

	OPTION 1	OPTION 2
Section A – Engineering and Permits		
Provincial or municipal permits required (e.g. building, electrical, excavation, etc.)	$	$
Site survey, soil sampling and analysis, design, drawings	$	$
Other	$	$
Sub-Total: Section A – Engineering and Permits	$	$
Section B – Earthwork		
Site preparation (e.g. topsoil removal)	$	$
Hauling of material to the site (e.g. gravel, clay)	$	$
Construction of runoff control works (e.g. ditches, berms, collection ponds)	$	$
Access lane development	$	$
Development of feed storage area	$	$
Pen surface development (e.g. sloping and grading)	$	$
Culverts and geo-synthetic materials	$	$
Other		
Sub-Total: Section B – Earthwork	$	$
Section C – Utilities		
Electricity (hydro/solar/other) installation at site	$	$
Electrical trenching, wiring and hook-up for buildings, lights and water bowls	$	$
Other		
Sub-Total: Section C – Utilities	$	$
Section D – Buildings		
Pole Sheds and Similar Structures		
a) Total square footage proposed _____square feet		
b) Average cost per square foot $_____ per square foot		
Sub-Total: Pole Sheds and Similar Structures (a x b)	$	$
Fully Enclosed Buildings (Heated)		
a) Total square footage proposed _____ square feet		
b) Average cost per square foot $_____ per square foot		
Sub-Total: Fully Enclosed Buildings (Heated) (a x b)	$	$
Fully Enclosed Buildings (Not Heated)		
a) Total square footage proposed _____ square feet		
b) Average cost per square foot $_____ per square foot		
Sub-Total: Fully Enclosed Buildings (Not Heated) (a x b)	$	$
Calf Shelters		
a) Number of shelters required _____		
b) Cost per shelter $_____		
Sub-Total: Calf Shelters (a x b)	$	$
Other		
Sub-Total: Section D – Buildings	$	$

Appendix B (continued):
Budget Estimate Worksheet – Livestock Facility Relocation

Use this worksheet to help estimate the cost to relocate your livestock facility

Disclaimer: This worksheet is a tool intended to assist with planning and budgeting a livestock facility relocation project. While every effort has been taken to ensure the information is complete and accurate, this sheet should not be considered the final word on all expected project costs. Producers should seek the advice of technical professionals who can assist with detailed planning and estimates for a specific project.		
	OPTION 1	OPTION 2
Section E – Corral and Wind Fence		
Permanent Fences/Corrals		
Total length of fence required _____ feet		
Cost per foot $ _____		
Sub-Total: Permanent Fences/Corrals	$	$
Temporary or Portable Fences/Corral		
Total length of fence required _____feet		
Cost per foot $_____		
Sub-Total: Temporary or Portable Fences/Corral	$	$
Temporary or Portable Wind Break		
Total length of wind break required _____feet		
Cost per foot $_____		
Sub-Total: Temporary or Portable Wind Break	$	$
Permanent Wind Fence		
Total length of fence required _____feet		
Cost per foot $_____		
Sub-Total: Permanent Wind Fence	$	$
Gates	$	$
Other		
Sub-Total: Section E – Corral and Wind Fence	$	$
Section F – Water		
Watering Sites		
a(i) Trough or water bowl $_____		
a(ii) Concrete base $_____		
a(iii) Hook up and installation $_____		
Total Cost Per Watering Site (a(i)+a(ii)+a(iii)) $_____		
b) Total number of water sites required _____		
Sub-Total: Watering Sites (a x b)	$	$
Water Distribution		
Estimated length of trenching and pipe required _____feet		
Trenching cost $_____ per foot		
Pipe cost $_____ per foot		
Valves, fittings, etc. $_____ per foot		
Sub-Total: Water Distribution	$	$
Water Source Development		
Well development $_____		
Pumphouse construction $_____		
Dugout development $_____		
Sub-Total: Water Source Development	$	$
Other		
Sub-Total: Section F – Water	$	$

Appendix B (continued):
Budget Estimate Worksheet – Livestock Facility Relocation

Use this worksheet to help estimate the cost to relocate your livestock facility

Disclaimer: This worksheet is a tool intended to assist with planning and budgeting a livestock facility relocation project. While every effort has been taken to ensure the information is complete and accurate, this sheet should not be considered the final word on all expected project costs. Producers should seek the advice of technical professionals who can assist with detailed planning and estimates for a specific project.		
	OPTION 1	OPTION 2
Section G – Handling System		
Pre-fabricated equipment to be purchased (e.g. head gate, chute, steel panels)	$	$
Sorting pens, alleyways, etc.	$	$
Gates	$	$
Other		
Sub-Total: Section G – Handling System	$	$
Section H - Feeders		
Pre-fabricated equipment to be purchased (e.g. feed barns)	$	$
Alley feeders to be constructed	$	$
Other		
Sub-Total: Section H – Feeders	$	$
Section I - Decommissioning		
Labour, seed, equipment use and rental	$	$
Other		
Sub-Total: Section I – Decommissioning	$	$
Summary		
Sub-Total: Section A – Engineering and Permits	$	$
Sub-Total: Section B – Earthwork	$	$
Sub-Total: Section C – Utilities	$	$
Sub-Total: Section D – Buildings	$	$
Sub-Total: Section E – Corral and Wind Fence	$	$
Sub-Total: Section F – Water	$	$
Sub-Total: Section G – Handling System	$	$
Sub-Total: Section H – Feeders	$	$
Sub-Total: Section I – Decommissioning	$	$
Other		
Total Cost of Construction (Add Sub-Totals: Sections A-I)	$	$

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