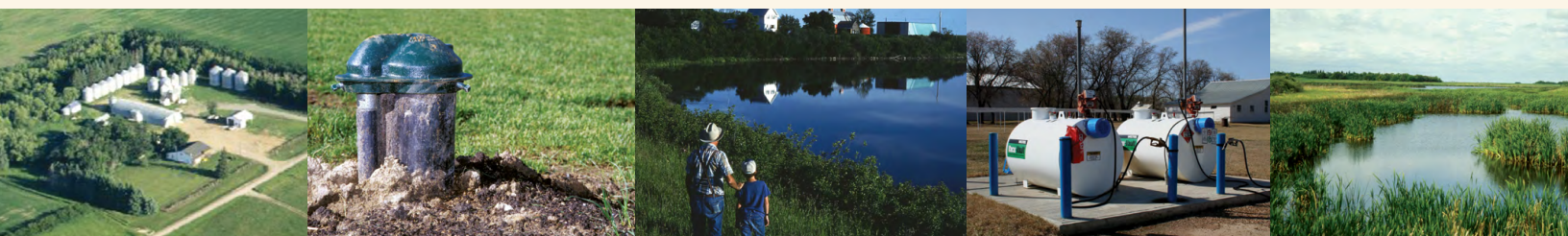


# BENEFICIAL MANAGEMENT PRACTICES

## Environmental Manual for Alberta Farmsteads



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Agri-Food Canada

Agriculture et  
Agroalimentaire Canada

Prairie Farm Rehabilitation  
Administration

Administration du rétablissement  
agricole des Prairies

*Alberta*  
Government

## **Beneficial Management Practices: Environmental Manual for Alberta Farmsteads**

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## Disclaimer

This manual was prepared for Alberta's rural community to create a greater understanding of environmental risks associated with farmsteads and to assist individuals in implementing beneficial management practices to reduce those risks. It was written using the best available information from industry, government and interested stakeholders.

While the authors have made every effort to ensure the manual is accurate and complete, it should not be considered the final word on areas of law and practices covered. Individuals should seek the advice of appropriate professionals and experts as each situation may differ from those set out in the manual.

The guidelines are intended to provide management options for farmstead and acreage owners of various sizes and types. Individuals should not extract portions of this publication, nor draw inference, without considering all aspects of the farmstead and operation. Any level of government should not adopt these guidelines literally into legislation in whole or in part.

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# CHAPTER 1.0

## Introduction

## 1.1 Purpose

A beneficial management practice (BMP) is defined as any management practice that reduces or eliminates an environmental risk.

This manual has been designed to provide you, an Alberta producer, with information about **beneficial management practices** (BMPs) that deal with environmental risks on rural farmstead sites. BMPs maintain or improve a farm's soil, water, air and wildlife habitat resources, and therefore contribute to the farmstead's overall sustainability and to the economic and environmental health of the farm family, as well as the surrounding landscape and community. Since the farmstead is the heart of your operation, it is important to learn how to identify areas of potential risk. This manual offers you options for managing those areas of risk so that your farmstead remains the key to the health of your family, your livestock and the environment.

Each farm is unique. Not all beneficial management practices provided in the manual are suited to every situation or farmstead site. You will need to consider your site's specific environmental risks, and review the various options available to address those risks. Then you can choose those options best suited to your needs, and adapt them to the specific conditions on your farm.

More information on beneficial management practices to address environmental risks associated with crop and livestock production can be found for specific commodity groups. A series of Beneficial Management Practices manuals for Alberta producers are listed at the end of Chapter 2.

## 1.2 Background

Agricultural producers in Alberta value the environment and feel strongly about their role as stewards of the land. They also understand that for their farm to remain productive and for Alberta's agricultural industry to be competitive in world markets, they need to safeguard environmental quality.

The competition for land and water resources has increased in recent decades as Alberta's population and economy have grown. This trend makes it increasingly important for everyone, including farmers, to manage these resources wisely.

Analyzing the location of any farmstead is a critical first step in improving the health of the operation's environment. By understanding how the farmstead fits into the landscape, producers can identify potential contaminants, foresee possible pathways for those contaminants to travel and predict where those contaminants might end up.

Understanding the farmstead's layout will ultimately assist in making appropriate management decisions. While some physical properties of a site, such as slope, soil type, water table and climate may be beyond a producer's control, management decisions can be influenced by these physical properties. Factors that can be managed include water supply, storage locations of potential contaminants and run-on and runoff control of surface waters. An emergency plan can also be developed to manage risk.

Managing risk and adopting BMPs suited to your farmstead are important in building and maintaining an operation that is economically sound as well as socially and environmentally responsible.

A glossary of terms is listed at the end of the manual; words defined in the glossary are highlighted in bold when they first appear in the main text.





# CHAPTER 2.0

## Environmental Considerations

This chapter discusses environmental risks on a farmstead and introduces the steps to assessing those risks.

Environmental risks may occur anywhere on a farmstead where water supplies are located and potential contaminants exist. A producer needs to consider the entire farmstead, when identifying any potential environmental risk. Humans and animals may be at a greater risk on farmsteads, due to their proximity to hazards stored and used on the farm.

## 2.1 What is an Environmental Risk?

An environmental risk, with respect to agricultural farmsteads, can be defined as an actual or potential threat of an adverse effect on living organisms, resources or biological systems associated with a compound, emission, waste or contaminant arising out of a farm operation's activities. Several factors need to be considered when identifying environmental risks. Once identified, they can be evaluated to determine the severity of the risk, the level of tolerance for the risk, and the need for addressing the risk through the adoption of beneficial management practices (BMPs).

**Beneficial Management Practices (BMPs)** are any management practice that reduces or eliminates a potential risk.

### Three factors must exist for an environmental risk to be present:

1. There must be a **hazard** or **contaminant** present, e.g., a source.
2. There needs to be a **receptor** that can be affected by the contaminant.
3. There must be a **pathway** that has the capacity to carry the contaminant or hazard to the receptor.

A hazard is defined as any source of **contamination** that has the potential to negatively affect a receptor. A receptor is something that has the potential to be affected by a given hazard, usually in an adverse way. The pathway is the method by which a hazard travels to a receptor. Pathways can include water, air, soil, humans, animals, or any combination of these.

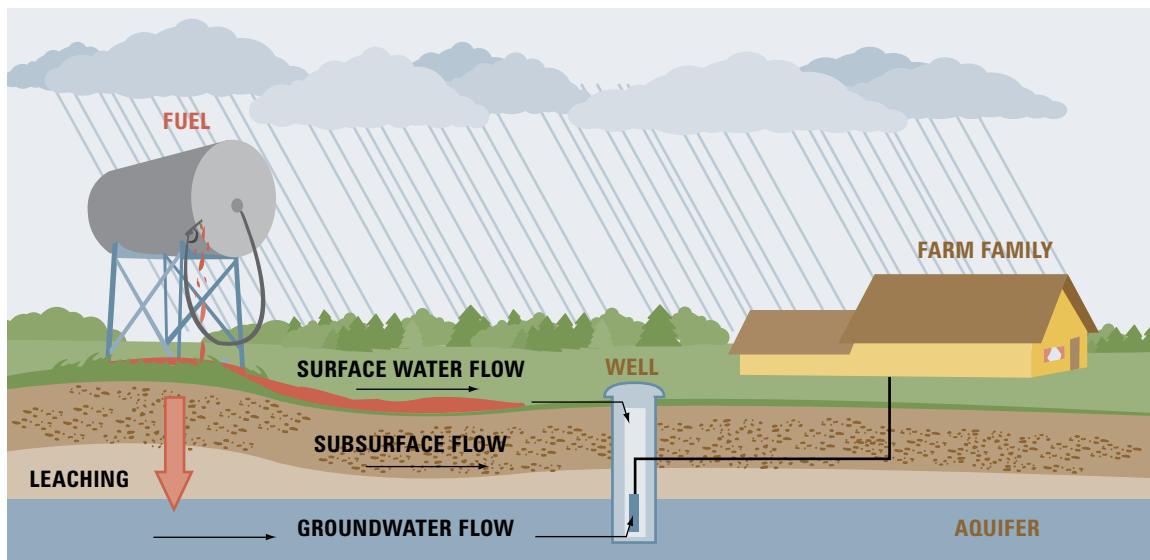
In some situations the receptor can also be a pathway, by which other receptors can be impacted. The best example is the contamination of surface runoff by a compound. Clean surface runoff can be impacted by contaminants as it flows over or through a contaminant, which can negatively impact the quality of the surface runoff. That runoff can also be responsible for carrying the contaminant to another receptor, like a well or surface water body, ultimately negatively impacting a second receptor.

Using a hypothetical situation, in this case a fuel leak from a storage tank, we can identify the three factors for the environmental risk.

A fuel tank has a leak that goes unnoticed for a day. The fuel from the leak has moved through the gravel pad underneath the tank and into the soil. The following day, there is a major summer rainfall and the water infiltrates and flows down through the soil profile. Once the soil becomes saturated, water begins to flow overland. A water well is located downslope from the fuel tank, and the surface water flows to the well and then down the side of the **well casing** into the aquifer. This is the well that is used by the farm family for drinking.



FIGURE 2.1 ENVIRONMENT RISKS ASSOCIATED WITH FUEL STORAGE LEAKS



**The hazard is the fuel, while the following pathways include:**

- soil containing the spill
- rainwater flowing over the ground and through the soil profile into the well
- **groundwater** entering the aquifer

**The ultimate receptor is the farm family and livestock who drinks the water.**

**Other receptors include:**

- soil and grass – fuel-contaminated water flowing over the ground may have sterilization effects on soil and soil microbes.
- Aquifer – fuel-contaminated water leaches through the soil affecting water supplies that may be used by other neighbours.

Every operation and farmstead is different and the combination of potential contaminants on a site varies. Environmental risks need to be identified based on site-specific characteristics evaluations that determines the potential sources or contaminants, and the potential receptors and pathways based on these site-specific features.

The rest of this chapter identifies some specific hazards and provides information on potential pathways and receptors that may exist on your operation. The purpose of the chapter is to enable you to identify potential environmental risks on your operation. The rest of the manual provides BMPs and tips on how to manage the relationship between sources, pathways and receptors.

## 2.2 Environmental Hazards

Many different hazards exist on a farmstead, and when managed, stored or used responsibly, they pose little or no threat to the environment and your family's health. When these same compounds are mismanaged or allowed to contact sensitive or susceptible receptors (i.e., soil, water, animals, humans) they become contaminants. Outlined in the table below (Table 2.1) are some examples of potential hazards and their possible sources that may exist within a farmstead. You may be able to identify other compounds, specific to your operation that could negatively impact a receptor such as water or soil and therefore be considered a contaminant if not managed properly.

TABLE 2.1 POSSIBLE SOURCES OF HAZARDS ON A FARMSTEAD

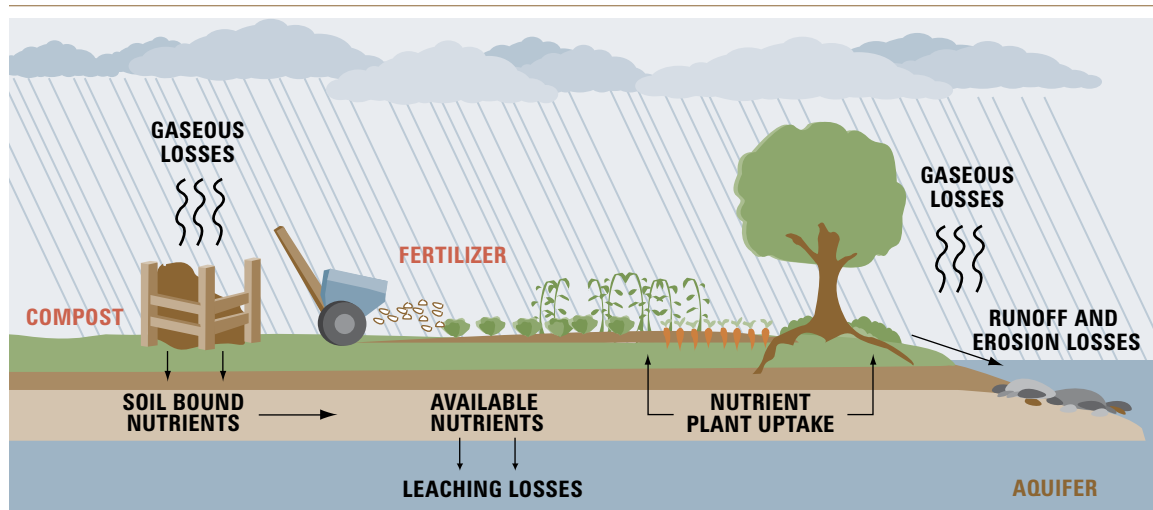
HAZARDS	SOURCES
Nutrients	Soil, inorganic fertilizer, manure, silage, household wastewater, compost materials, bales (organic residues)
Pathogens	Household wastewaters, manure, livestock mortalities, animal health care products
Hydrocarbons	Gasoline, diesel, kerosene, lubricants, oil
Salt	Feed, supplements, manure, inorganic fertilizer, hydrocarbons, pesticides, household wastewater, groundwater
Pesticides	Agricultural, household, garden
Noise	Loud machinery and equipment
Odour	Manure, inorganic fertilizers, silage, livestock mortalities, decomposing plant and animal residues
Dust and Smoke	Vehicle and machinery traffic, burning residues or wastes
Other Chemicals	Pharmaceuticals, cleaning solutions, aerosols, paints, solvents, stains, automotive fluids, refrigerant and air conditioning freons, farm wastes

### 2.2.1 Nutrients

**Nutrients** are essential for plant growth and benefit crop production but if not managed, stored, and applied properly nutrients have the potential to become hazards; negatively impacting soil and water quality. Common sources of nutrients on a farmstead include chemical fertilizers, animal manure, household wastewaters, silage, soil and compost. Two nutrients of primary concern are nitrogen (N) and phosphorus (P).

The pathways for nutrient movement may be direct or indirect. Nutrients may be applied, over-applied or deposited directly onto or into sensitive receptors such as water bodies, through direct action of man or animals. Nutrients can also be transported across the landscape either dissolved in water, bound to soil or organic particles or be released in a gaseous form and potentially contaminate receptors (see Figure 2.2).

FIGURE 2.2 POSSIBLE NUTRIENTS LOST BY LEACHING, IN RUNOFF OR AS GASES



Nutrients dissolved in water can potentially enter water bodies as runoff during snow melt, rainfall or irrigation. Dissolved nutrients can also be carried downwards through the soil profile by **leaching**, potentially entering groundwater supplies.

Nitrogen, specifically can be released into the atmosphere in gaseous forms such as ammonia ( $\text{NH}_3$ ), nitrous oxide ( $\text{N}_2\text{O}$ ), or nitrogen gas ( $\text{N}_2$ ).

Ammonia ( $\text{NH}_3$ ) losses can cause odour impacts downwind. Ammonia can also be re-deposited on the soil from the atmosphere, this can be beneficial if the ammonia is deposited on crop land but if deposited in sensitive or low nutrient ecosystems the additional nitrogen can promote species change, negatively impacting the ecosystem.

Nitrous oxide ( $\text{N}_2\text{O}$ ) is one of the major contributors to **greenhouse gases** (GHG). Excess nitrogen in the atmosphere can produce pollutants such as ammonia and ozone, which can impair our ability to breathe, limit visibility and alter plant growth. When excess nitrogen comes back to earth from the atmosphere, it can harm the health of forests, soils and waterways.

Drinking water with high nitrate-nitrogen ( $\text{NO}_3$ ) levels may cause nitrate poisoning in animals and humans. Nitrate-nitrogen reduces the amount of oxygen absorbed by body tissues causing the skin to turn a bluish colour, particularly around the eyes and mouth, in human babies, this condition is known as “blue baby” syndrome. Livestock show symptoms of nitrate poisoning by having problems standing up and staggering. With prolonged exposure, excessive nitrate levels can eventually be fatal.

Nutrients such as nitrogen and phosphorus are natural parts of aquatic ecosystems. They support the growth of algae and aquatic plants, which provide food and habitat for fish, and aquatic organisms. But when too much nutrients enter the environment they can degrade surface water quality by promoting growth of aquatic plants and algae faster than ecosystems can handle. Significant plant and algal growth can harm habitats, and decrease the oxygen that aquatic species need to survive.

Large growths of algae called algal blooms exhaust the supply of oxygen in the water, during growth and decomposition. During decomposition, microorganisms breakdown organic material, removing dissolved oxygen from the water. This reduction of oxygen can result in the death of fish and other aquatic organisms. Some types of blue-green algae can also release toxins deadly to livestock and humans during decomposition. Algae can also block water intakes, reduce the appeal of water bodies for recreation and give an unpleasant taste and odour to drinking water.



Water erosion carries nutrients in the topsoil off-site, potentially contaminating nearby water bodies —  
*Courtesy of AF*

### 2.2.2 Pathogens

Microorganisms such as bacteria, parasites, protozoa and viruses occur naturally in animals, humans, soil and water. Disease-causing microorganisms that can infect other animals and humans resulting in severe or fatal illnesses are called pathogens. A few common pathogens associated with farmsteads are *Escherichia coli* (*E. coli*), *Salmonella* species, *Cryptosporidium parvum* (“crypto”) and *Giardia lamblia* (“beaver fever”). Common sources of pathogens include animals, animal manure, contaminated animal products, contaminated food, water, feed or equipment.

Humans and livestock can be exposed to pathogens through air, soil and water pathways but their survivability is limited by environmental conditions once they are shed or excreted by their host. Some pathogens can survive freezing or low temperatures for extended periods of time, while other pathogens may survive for much shorter periods in warm temperatures.

Water is a popular transmitter of pathogens. People who drink contaminated water or eat contaminated food will more than likely become ill. Infection and illness may also occur in people using contaminated water for recreational purposes.

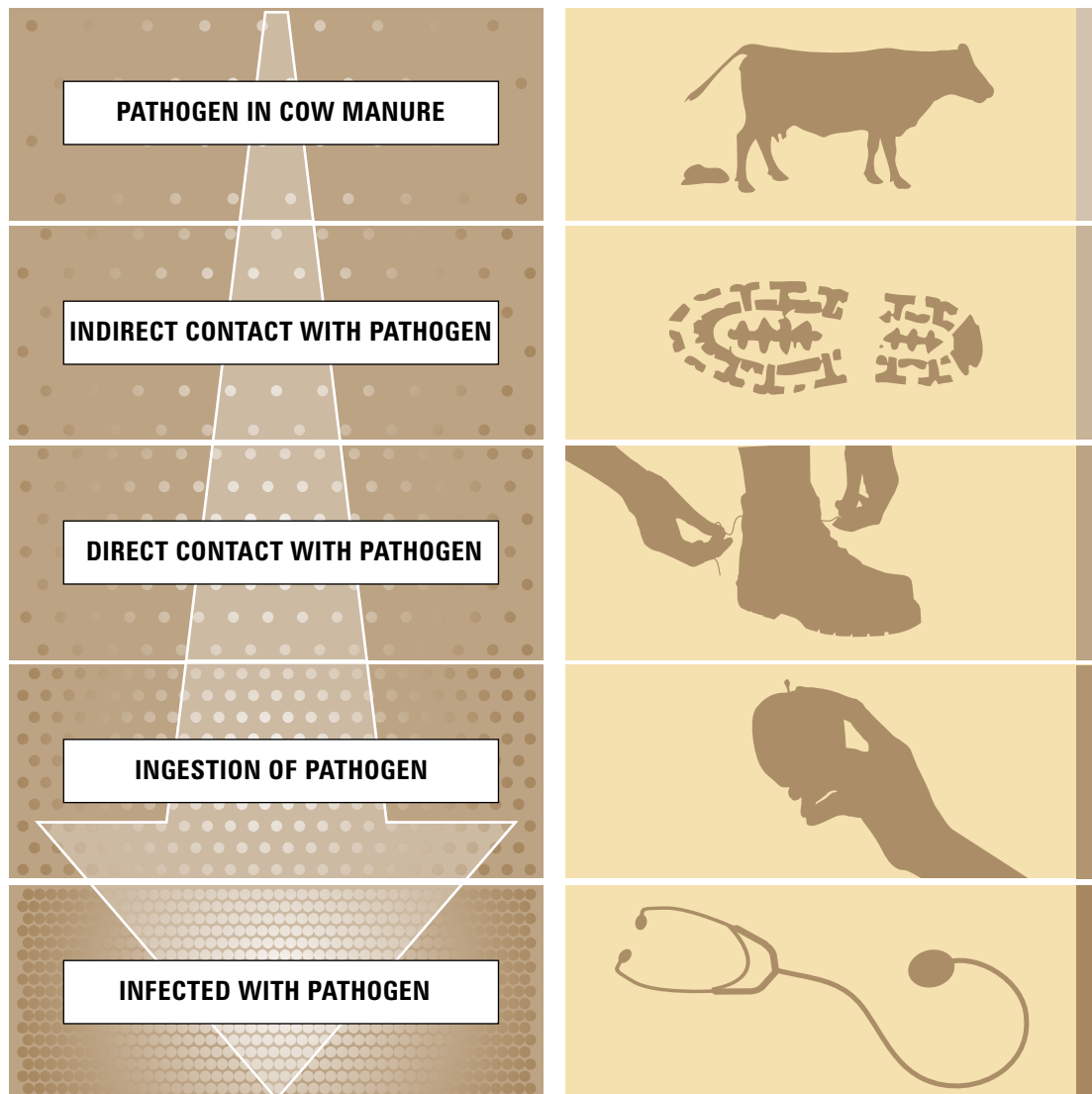
Pathogens can contaminate food sources either through direct surface contamination or indirect contamination from soil, or water. In addition, raw or inadequately cooked food, in particular meat and eggs, and non-pasteurized fruit juices and dairy products can potentially infect people.

Pathogens can potentially transfer between animals and people through direct and indirect contact. Common pathways of transmission include contact with animals, animal manure, contaminated animal products, feed or equipment (see Figure 2.3).

Activities that potentially increase the risk of infection include working closely with livestock, treating sick animals, hunting, or processing animal products for food. Person-to-person transmissions can occur as well, especially when infected people do not use proper hygiene such as washing hands before cooking or eating, or after using the washroom.

Through proper management practices, you can minimize the risk of pathogen infection and the introduction of pathogens to the food chain and the environment. Using proper personal hygiene, food handling, processing and cooking procedures can prevent transmission. Good animal care, sanitary livestock facilities and sound manure management practices will also significantly reduce or completely stop the transmission of pathogens from animals to people.

FIGURE 2.3 AN EXAMPLE SHOWING PATHOGEN TRANSFER FROM CATTLE TO PEOPLE



### 2.2.3 Hydrocarbons

Hydrocarbons are a class of compounds primarily composed of carbon and hydrogen, and they are major components of oil, natural gas and pesticides. Hydrocarbons, if not managed, stored, and applied properly have the potential to become hazards; negatively impacting the environment and human and animal health. Information on health risks can be found in Material Safety Data Sheets (MSDS) for each of these products that are available from your supplier.

Some of the more common sources of hydrocarbons on a farmstead are gasoline, diesel, oil, lubricants, propane, and chemicals. Some products containing hydrocarbons such as gasoline, propane and kerosene can be explosive and very volatile. The build-up of vapours in an area can be toxic to humans or livestock. Thus when working with fuels, work in a well-ventilated area, and follow all safety precautions such as wearing goggles, gloves, coveralls and masks.

The direct effects of hydrocarbons can be the result of a spill, which can contaminate water bodies and water sources. Fuel can flow over the soil surface or move with runoff into surface water bodies or leach downwards through the soil into groundwater supplies. It only takes a few litres of



gasoline to severely pollute a farmstead's drinking water. The water may smell and taste fine, but may still be contaminated even though the amount of contaminant is small. Most soil and water contamination occurs when there is a fuel spill or a leak.

The combustion of hydrocarbons, such as fuel, can directly impact the environment through the release of greenhouse gases.

Chapter 6.0 of the manual discusses best practices of fuel storage, transportation, use, and management, which can help you minimize the risk hydrocarbons on the farmstead and to the environment.

Chapter 10.0 of the manual discusses energy efficiency. Correctly storing fuel, regular servicing of vehicles and equipment, gearing up and throttling down while working in the field, using the correct sized tractor and equipment for the job, and optimizing travel patterns in the field and on roads can help to maximize fuel efficiency, reducing fuel consumption, costs and GHG emissions.

## 2.2.4 Salts

Common sources of salt on a farmstead include hydrocarbons, inorganic fertilizers, feed, supplements, manure, some pesticides and household wastewater as well as naturally occurring salts in the soil.

Salts can be moved via surface and groundwater. Salts can alter the soils structure, reduce the soil's capacity to hold water, alter soil pH and the ability of plants to efficiently absorb water and nutrients from the soil. In the case of septic fields, high salinity in the soil decreases the field's ability to treat the wastewater and ultimately shortens the life of the system. Remediation of saline areas is possible, but the cost is high and results are not observed for a long time.



Saline seeps form where saline groundwater comes to the soil surface — *Courtesy of AF*

## 2.2.5 Pesticides

Pesticides are designed to suppress or kill plants, insects, animals or pathogens. Types of pesticides used in farmstead management include herbicides, fungicides, insecticides, rodenticides, pesticide-treated seed and topical parasiticides (pour-on or powders for treating parasites on livestock). Some pesticides are designed to act on a small range or even just one specific type of pest. Narrow spectrum pesticides, or selective pesticides, target only a specific type of insect or family of insects.



Other pesticides act more generally, affecting many species and are referred to as broad spectrum pesticides.

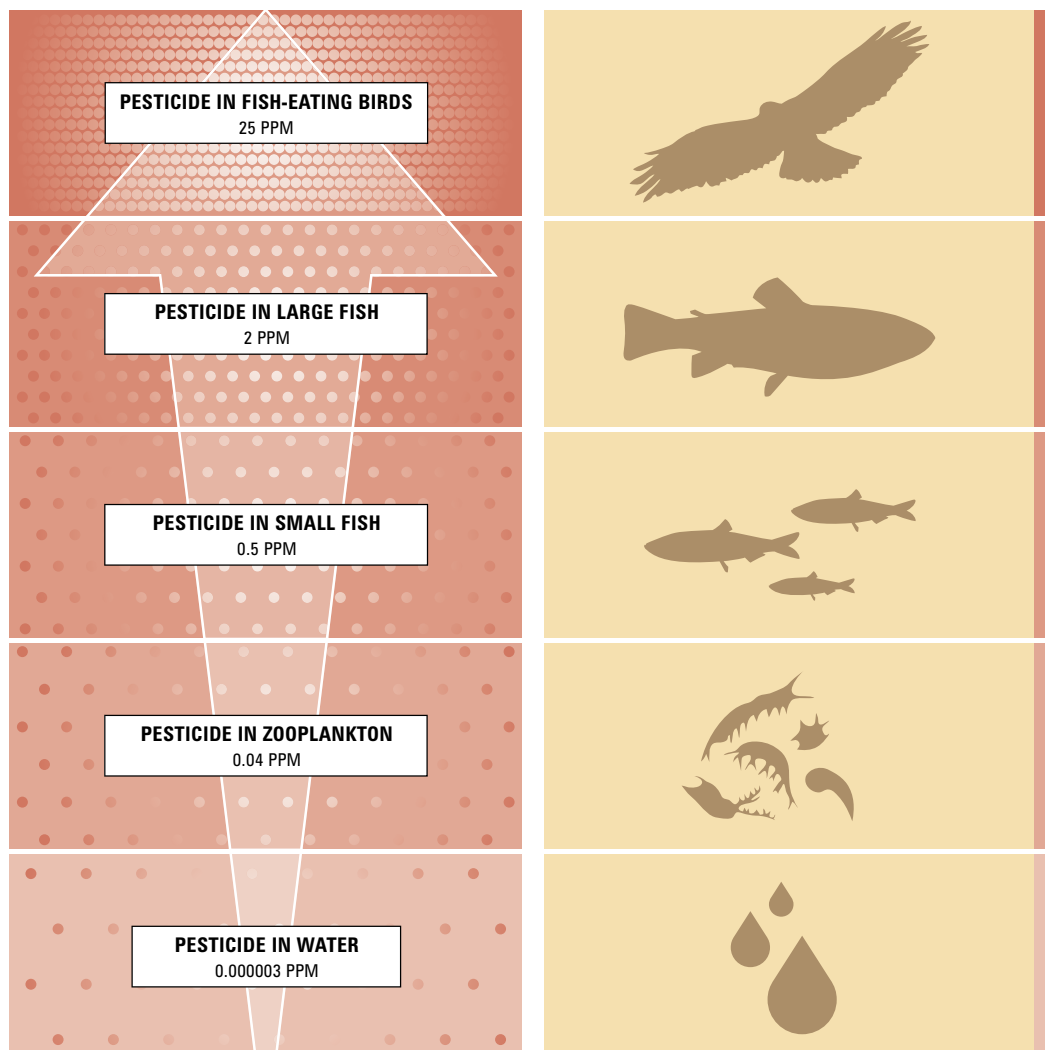
**Pesticides can be a risk to non-target organisms if these products are not handled and applied properly. Common pathways of transmission or movement of pesticides include:**

- dissolved in runoff water moving away from treated areas or from sites on which pesticides have been spilled
- attached to soil particles and carried by wind or runoff water
- wind carrying spray drift onto water bodies or non-targeted areas

The movement of pesticides to non-targeted areas, such as spray drift, can negatively impact water sources, or damage susceptible species, impacting gardens, trees, vegetation, and susceptible crops. Depending on the pesticide, its movement may create health problems in animals or humans.

While some pesticides degrade quickly in the environment, others can persist over a significant time period, accumulating in the tissue of organisms through a process called **bioconcentration**. With every step in the food chain, larger quantities of the accumulated pesticide are consumed. This accumulation, called **biomagnification**, may continue to the point where animals are harmed or become unsafe for human consumption (see Figure 2.4).

FIGURE 2.4 BIOMAGNIFICATION



Although most pesticides currently used are not toxic to humans, there is the potential for acute or chronic problems if pesticide label directions are not followed. Proper transportation, storage and handling practices should be followed to reduce risks associated with pesticide use. Knowledge of the chemical, proper application practices and disposal are the bases for responsible pesticide use in and around the farm. More information on pesticide storage, handling and application can be found in Chapter 4.0 of the manual.

### 2.2.6 Odours

Sources of odours on the farm can include compost, manure, commercial fertilizers, silage, livestock, decomposing **organic matter**, livestock mortalities and household wastewaters. Most of the odours from these sources are a result of ammonia (NH<sub>3</sub>) and hydrogen sulphide (H<sub>2</sub>S) gas levels.

Odours differ depending on the source material, environmental conditions and the receiver's unique response. Response to odour is different for each person and extremely variable.

The impact of odour on neighbours is generally considered a **nuisance** rather than a health risk because of the degree of dilution and dispersion that occurs within short distances from the odour source.

#### **It is difficult to evaluate odour and its effects for several reasons:**

- The proportion and characteristics of odour contributed by each of the primary sources (barns, storages and land application) are not well understood. Research is underway to characterize odours released from each of these sources.
- Odour from manure is made up of about 160 compounds and everyone responds differently to each of these compounds.
- Odour intensity and offensiveness varies between individuals.
- The combination of different odours can have positive and negative effects on intensity and offensiveness. These effects are not easily predicted.
- The environment has a huge impact on odour, its generation, intensity, dispersion and longevity.

Understanding how odours are perceived is an important first step. While preventing odours is desirable, it is not always possible, and it becomes important to understand the tools and approaches that can be used to assess, mitigate and manage odours and odour concerns. Odour mitigation practices should focus on reducing the nuisance to neighbours, by minimizing the frequency, intensity, duration and offensiveness of odours.

#### **While research and development are underway to find solutions for odours, the following factors should be considered:**

- To date, no technology emerges as a clear choice for the industry because of costs (real and perceived) associated with implementation and long term operation of the technology.
- The technology to completely prevent and remove odour either does not exist or is prohibitively expensive to install and/or manage.
- Many odour control technology studies have focused on mitigation of odour at a particular location of the operation or reducing emissions from a single source.
- Effective odour control strategy for a livestock operation may require using more than one technology or management practice.

- More research is needed to further evaluate the effectiveness of some of the odour control technologies that have been developed or proposed.

Odours and their sources are diverse and managing them is often not an easy undertaking. However, there are management practices that can control odour within reasonable limits, see Chapter 11.0.

#### GREENHOUSE GASES AND AGRICULTURE PRODUCTION

Water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), ozone (O<sub>3</sub>), nitrous oxide (N<sub>2</sub>O) and halocarbons (used in refrigerants) are the main greenhouse gases in the atmosphere. The trapping of heat by these gases controls the earth's surface temperature. Emissions from human activities are important additional sources of greenhouse gases. Increasing concentrations of these gases are believed to increase global warming. Global warming may affect water quality and quantity and may result in problems such as more severe or extreme weather events like tornadoes, droughts, winter storms and more forest fires.

### 2.2.7 Dust

Dust at a minimum is a nuisance but it has the potential to create significant environmental problems, human and livestock health concerns, and on a large scale dust can create significant social concerns. Dust can be generated by many agricultural practices such as through the actions of livestock, tillage, harvesting, manure spreading and the most significant sources is through the movement of vehicles and equipment on gravel roads. The intensity and amount of dust generated and the extent of its impact is governed primarily by environmental conditions; moisture, temperature and wind conditions.

Dust can cause respiratory problems, negatively impacting livestock, workers, and neighbours. Dust particles may contain nutrients, diseases, seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides. Significant dusty events can reduce visibility on nearby roadways and may result in traffic accidents.

Dust is sometimes not easy to manage but understanding what generates dust, and how environmental conditions impact dust is an important first step to management. There are management practices available and can be found in Chapter 11.0 of the manual.

### 2.2.8 Smoke

Burning wastes on the farm has been a common practice for years, but there are hazards associated with this practice. Depending on the type of waste, various by-products can be produced while burning that can cause respiratory concerns for animals and humans. As well, the ash left behind can be contaminated with heavy metals that should be disposed of properly. Smoke from burning brush or other farm wastes can also reduce visibility on nearby roads similar to dust. When burning wastes on the farm, it is important to sort them and consider other disposal alternatives. For more information on managing farm wastes, refer to Chapter 8.0 in this manual.



Dust generated from farming activities can increase environmental risks — *Courtesy of PFRA*

### 2.2.9 Other Chemicals

All chemicals found on the farm are potential hazards to the environment if not managed, stored and disposed of properly. Improper storage and handling of chemical can contaminate soil, water and air. Always follow proper procedures and precautions. There are other farm chemicals besides pesticides that need to be managed with the same care and responsibility.

**Some of the other chemicals commonly found on farms include:**

- animal and human pharmaceuticals (expired, banned and unused antibiotics, vaccines, etc.)
- cleaning solutions, stain removers, disinfectants, aerosols
- paints, stains, adhesives
- automotive fluids (antifreeze, transmission fluids, etc.)
- freon (from refrigerants and air conditioning units)

While some chemicals degrade quickly in the environment, others can persist over a significant time period, accumulating in the tissue of organisms through a process called bioconcentration. There is the potential for acute or chronic problems if chemical label directions are not followed. Proper transportation, storage and handling practices should be followed to reduce risks associated with chemical use and storage.

For further information on how to deal with hazardous chemicals, refer to Chapter 8.0.

## 2.3 Environmental Pathways and Receptors

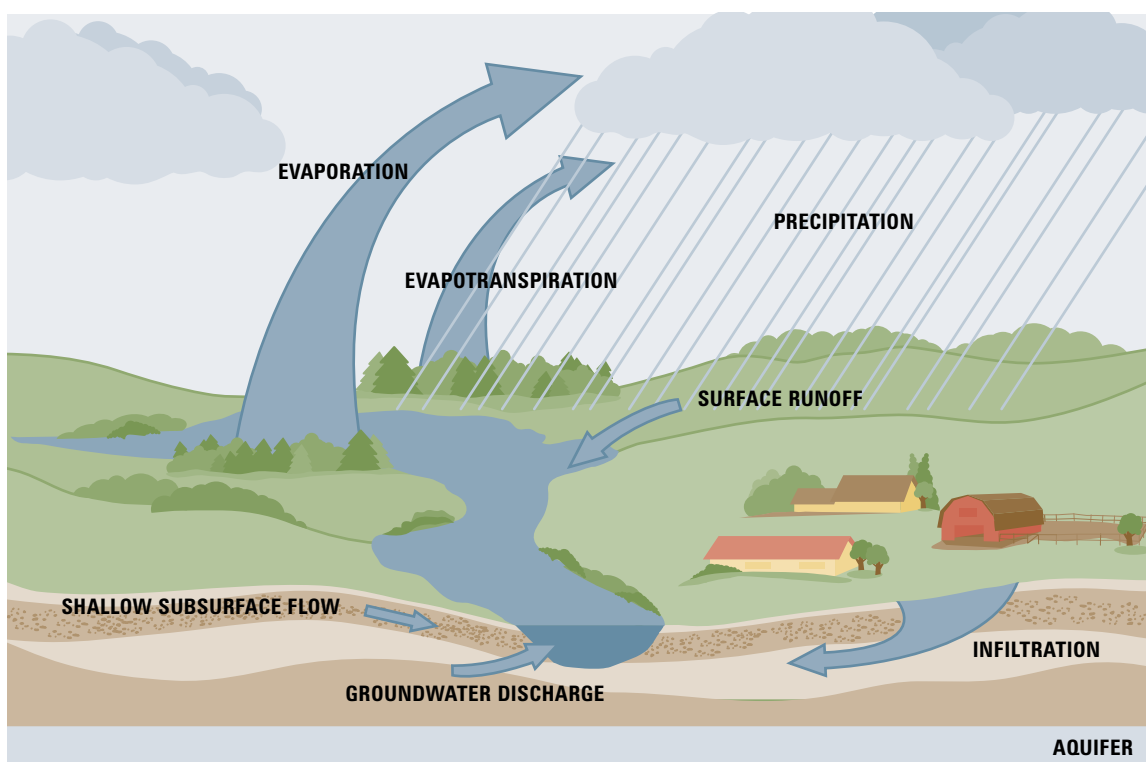
After reviewing farmstead environmental hazards, it is necessary to look at pathways and receptors as the final requirements to defining a risk. A receptor is something that has the potential to be affected, usually in an adverse way, by a given hazard. A receptor could be a well, surface water source, animals or people. The pathway describes how that hazard travels from a source to a given receptor. Pathways can include water, air, soil, humans, animals or any combination of these. Remember that some pathways can also be considered receptors depending on the chain of events when a hazard is released.

Water, soil and air pathways can become quite complex and intertwined, making it easy to overlook a potential risk. The following sections provide more information to help you identify the pathways and potential receptors on your farm.

### 2.3.1 Water

Within a farmstead, water can be found in various locations including permanent water bodies such as creeks, dugouts, ponds, lakes, sloughs and wetlands, groundwater aquifers and wells. They can also include seasonal or intermittent water bodies resulting from runoff created by snow melt or rainfall. Waterbodies, both permanent and temporary can function as both receptors or as pathways that can transport hazards. The water cycle in Figure 2.5 demonstrates water movement and outlines how surface water and groundwater are interconnected.

FIGURE 2.5 WATER CYCLE



When the water source is a receptor, the level of risk that a hazard can depend on its specific use. Specific uses include domestic or livestock consumption, irrigation, recreation and habitat for aquatic life. How a water source is evaluated will also depend on the connection between the surface water and groundwater at the site as well as the potential for the surface water to move offsite. If water moves offsite, whether above or below ground, the concern is that you no longer have control of it, not the hazard that it may carry.

Surface water, especially flowing water can function as a pathway, transporting hazards to susceptible receptors. To effectively reduce environmental risks, the goal is to prevent water from contacting potential hazards or to control the flow of contaminated water. Preventing water from contacting or intercepting hazards can include covering areas to prevent rainfall contact, using berms to divert clean water or using catch basins to collect the water so it can be treated before contacting a potential receptor.

**The following factors that affect water pathways should be considered when developing action plans to reduce risks:**

- Most runoff comes from spring snow melt and presents a great risk to surface water, potentially contaminating it as the soil is still frozen and water infiltration is limited.
- Infiltration of water is slower in fine-textured soils (clay), increasing the amount of runoff from these soils into surface water.
- Infiltration of water is faster in coarse-textured soils (sand), increasing the amount of water that will infiltrate the soil and potentially reaching groundwater.
- Long and steep slopes will increase the speed and distance at which water will travel, increase the size of material that can be carried by the flowing water, reduces water infiltration rates and capture of hazards.
- Packed soils and paved surfaces, as found in farmsteads, will reduce infiltration and increase surface water runoff.
- Permanent vegetation cover within the pathway will slow water down and can, in turn, help to capture both dissolved and particulate hazards. Depending on the hazard, this approach may be a form of treatment thereby reducing the risk.

### 2.3.2 Soil

Soil can be the source of a hazard, either due to natural or introduced contaminants that can be dissolved or suspended in the water component of the soil, as vapours in the soils' pore spaces, as precipitants, or physically attached to soil particles. Soils can also be the receptor of contaminants, such as organic compounds or inorganic salts, and can be contaminated by these hazards. Some hazards can have no real long term affect as they become bound in the soil matrix or consumed by soil microorganisms. Other contaminants can have a long term effect, negatively impacting soil structure, or physical, chemical or biological processes and ultimately the productivity of a soil. Soil is generally not the direct pathway for hazard transport. Contaminated soils become a source and the movement of that soil, by wind, water, animal or man, can then transports the hazard to other receptors (such as other field sites).

Soil characteristics can determine the seriousness of risk that may occur. High organic matter soils will be less susceptible to erosion or movement by water and wind. These soils will hold more water and therefore more nutrients and other hazards. On the other hand, high organic matter soils will contain more microbes that may be able to treat or breakdown hazards.

Typically within a farmstead, many areas will have compacted soils. Roadways, equipment storage areas and building floors all have reduced permeability, increasing the surface movement of water and potential above ground transport of contaminants. This movement may carry contaminants into areas of your farmstead where surface water and groundwater are located or connected, increasing the risk to these water sources or receptors.

To effectively reduce environmental risk, the management options of soil pathways could include controlling the movement of the soil and maintaining healthy soils that will increase the chance for the hazard to be treated.

**The following factors affect soil pathways and should be considered when developing action plans to reduce risks:**

- Roadways and some equipment storage areas will not have the ability to absorb water and will increase runoff of water. The direction of the runoff water should be considered when looking



at environmental risks. Due to poorer structure and less organic matter, these soils will be unable to treat some hazards.

- Soil covered by with growing crops, standing stubble or plant residues are less susceptible to water and wind erosion than bare soil. Growing plants and a crop residue cover absorb the energy of raindrops and slow the flow of runoff, reducing the risk of erosion. Roots hold soil in place and contribute organic matter, which further stabilizes the soil.

### 2.3.3 Air

Air can be both another pathway through which a hazard may travel or the receptor which is negatively impacted by a contaminant. As a pathways, air can carry contaminants or hazardous materials through the environment from a source to a point of contact with receptors. For example, the release of hazardous materials can have an effect downwind.

Air pathways are governed by wind speed, wind direction, topography of the land and the climate of the area such as temperature and rainfall. The point of contact will change as quickly as the wind changes its direction and speed. The extent of the impact of a hazard being carried in the air can be very large depending on air movement. This can have a positive and negative impact. The contaminant can impact a large number of receptor as it moves with the air but it can also become more diluted and have less of an impact as it is carried over a large area. Compared to other pathways, exposure by air pathways is generally hard to predict and very hard to control.

The form and chemical makeup of the hazardous materials influence how they are dispersed into the environment. Some hazards will evaporate when exposed to air; others can be suspended in the air as very small particles. They can become attached to dust or soil particles, or they can be dissolved in fine water droplets, both of which are then easily moved by wind.

**To effectively reduce environmental risks associated with air pathways, consider controlling the movement of air and reducing the incidence of contaminants or hazards release in the air:**

- Watering or treating dusty areas (i.e. roadways, livestock pens) can help reduce the impacts of wind on the area and reduce the transfer of particulates into the air.
- Incorporation of manure can increase nutrient capture, and reduce the loss of nutrient and other contaminants to the air, reducing the potential of a nuisance to others due to odours.
- Wind breaks or shelterbelts can be used to slow, divert and dilute air movement.
- Timing of spraying or movement of livestock based on environmental conditions can influence both the movement of contaminants into the air but also the distribution of those contaminants once airborne.
- Building and site design can be used to minimize the exposure of contaminant or impact air flow, so that airborne contaminants have less impact on surrounding receptors. For example, when building barns they act as a wind break or placing a barn so that ventilation exhaust will be diluted.

### 2.3.4 Humans and Livestock

Human and animal activities can transfer hazards as well as being receptors susceptible to the impacts of contaminants. Activities can result in the intentional or unintentional; direct or indirect transfer of a hazard to a receptor. The deposition of feces in a water source or waterway can negatively impact water quality. The movement of soil on equipment can transfer soil pathogens, such as clubroot, only to the field that the equipment move to, but it can be picked up

by other vehicles on the road and transferred to other fields in the area. Being cognizant of the contaminants and hazards being worked with and your potential role in their transportation is the first step in minimizing human and livestock transfer pathways.

**A few examples of how to reduce the potential for human or animal pathway transfer.**

- Manage livestock access to surface water sources or wells to reduce the potential for nutrient or pathogen contamination of the source.
- Have emergency plans in place to deal with spills or leaks.
- Use protective clothing when working with chemicals or create a cleanup area where dirty cloths can be exchanged for clean clothing before entering the home and transferring hazards into the home.

The term **biosecurity** refers to precautions taken to reduce the risk of introducing livestock or poultry diseases to a farm or region where the disease does not already exist. Examples of common biosecurity practices include quarantining new stock, controlling rodents, providing animal and worker foot baths, cleaning equipment, cleaning footwear and changing coveralls.

**Biosecurity is important because it can:**

- Prevent the introduction of diseases from other countries, such as foot-and-mouth disease. These foreign diseases can spread quickly, resulting in the loss of export markets. They can also have severe economic consequences for the entire livestock industry.
- Prevent the spread of certain diseases already found in Alberta, such as transmissible gastroenteritis in pigs or Johne's disease in cattle. These diseases can have a significant financial effect on a farm operation, and visitors could potentially be held liable if proven to be the cause of an outbreak.
- Protect the operator and his or her family from diseases found in animals that are transmissible to humans, such as salmonella, E. coli 0157:H7 and campylobacter.
- Be an indicator of the operation's commitment to the health of the livestock and poultry industry, as well as to its visitors

A biosecurity program should be practiced by anyone who owns or works with livestock, and visits farms, stockyards, auction markets, abattoirs, livestock shows or premises where livestock or poultry products are handled.

**Each business must assess their own potential risks and develop a flexible and practical biosecurity plan tailored to its circumstances**

**A complete farm biosecurity program will cover the following:**

- incoming stock
- vaccinations
- feedstuffs
- water
- pets
- pest control (birds, rodents, wildlife, insects, etc.)
- farm visitors



### BIODIVERSITY ON FARMSTEAD

Once you have identified and considered environmental risks on your farmstead, you need to take a step back and look at the entire farmstead. **Biodiversity** is one benefit of having a well-managed farm. The loss of biological diversity can decrease future land use opportunities and threaten sustainability as biodiversity is an important part of various **ecological processes**.

Biodiversity helps ensure that the environment can handle hazards. For instance, having a well-vegetated water pathway with a wide variety of plant and soil microbe species can act as a buffer to manage hazards that may exist. This also slows water down as it cycles in its natural system and allows the environment to filter out hazards as they pass through the system. If there are many plants of the same species, the chance that a species will survive if a hazard affects its growth is reduced. With a diverse number of species, there is a greater chance that at least one, or a combination of more will survive and be able to reduce risks due to the hazard.

## 2.4 Taking the Next Steps

**The steps in assessing environmental risk include:**

1. Identify all potential hazards, pathways, receptors and combinations of these on your operation.
2. Determine the likelihood that receptors would be at risk because of those hazards.
3. Assess the level of effect these risks have to determine their seriousness and what level of action is required.
4. Identify reasonable actions or beneficial management practices that are necessary to manage high-risk situations.

This Environmental Manual for Alberta Farmsteads will give you a start at dealing with environmental risks on your farm and provide you with some beneficial management practices or options to address them. Listed at the end of this chapter are other manuals that provide more information about managing risks on other aspects of farming operations.

The Environmental Farm Plan (EFP) is a voluntary, whole farm, self-assessment tool that helps producers identify their environmental risks and develop plans to mitigate identified risks. For more information on doing a self-assessment of environmental risks on your farm, contact the Alberta Environmental Farm Plan Company.

## 2.5 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### **Alberta Agriculture & Forestry**

#### **Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Ammonia Emissions and Safety Agdex 086-6
- Beneficial Management Practices: Environmental Manual for Alberta Cow/Calf Producers Manual 2004 Agdex 420/28-2
- Beneficial Management Practices: Environmental Manual for Crop Producers in Alberta 2004 Agdex 100/25-1
- Beneficial Management Practices: Environmental Manual for Livestock Producers in Alberta 2003 Agdex 410/28-2
- Biosecurity Considerations for Ag Tourism Ventures Agdex 888-7
- Dryland Saline Seeps: Types and Causes Agdex 518-12
- Emergency Measures for Control of Wind Erosion Agdex 572-1
- Introduction to Water Erosion Control Agdex 572-3
- Introduction to Wind Erosion Control Agdex 572-2
- Nitrate Poisoning and Feeding: Nitrate Feeds to Livestock Agdex 400/60-1
- Nutrient Management Planning Guide
- Watercourse Improvement and Gully Restoration Agdex 573-5

### **Alberta Environment & Parks**

Information Centre: 310-ESRD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

### **Pest Management Regulatory Agency**

Phone: 1-800-267-6315

Website: [www.pmra-arla.gc.ca](http://www.pmra-arla.gc.ca)

### **Alberta Environmental Farm Plan Company**

Office: 780-612-9712

Website: [www.albertaefp.com](http://www.albertaefp.com)





# CHAPTER 3.0

## **Farmstead Water Sources**

This chapter discusses beneficial management practices that address water sources on the farmstead.



Water supply is critical to any farm or farmstead. Both the quantity and quality of water are important, and every effort must be made to conserve supplies and prevent contamination.

Common water sources for farmsteads include water wells, dugouts, natural water sources and pipelines. Contamination of any water supply can occur in a variety of ways. However, with proper planning and management, most environmental or health safety risks can be eliminated or minimized.

### 3.1 Water Wells

One of the most important assets on your farmstead is the water well. Albertans typically choose water wells wherever there is an adequate supply of good quality groundwater.

**When analyzing the quality and quantity of water from the well, gather as much information about all wells, used and unused, on the farmstead that you can, including the following:**

- number of wells located on the farmstead
- well type (drilled, bored, etc.)
- purpose (domestic, livestock, etc.)
- construction date(s)
- depth
- casing size
- well yield in gallons per minute
- supply or quality problems
- location of the well in proximity to potential environmental hazards

If you do not have copies of the original water well driller's reports, you can obtain them from Alberta Environment and Parks' Groundwater Information Center. (For contact information, refer to For More Information at the end of this chapter.)

#### 3.1.1 Water Volume

Aquifers are recharged by precipitation or infiltration from surface water bodies normally in the spring and early summer when precipitation exceeds evaporation and transpiration rates of plants. Shallow **water table** levels will naturally fluctuate seasonally (increasing in the spring and decreasing over the rest of the year) as the water is used by plants, discharged to springs or recharging deeper aquifers. Water levels in deeper aquifers will fluctuate less and only show changes after long periods of drought or water use. Over-pumping of wells will reduce the levels further. It is extremely important that the volume of water being pumped from the well does not exceed the recharge capacity of the aquifer supplying the well. This situation can potentially make the groundwater unavailable over time.

If groundwater withdrawal from an aquifer is faster than its recharge rate, then the groundwater is "mined" from the aquifer. Groundwater mining is often an unintentional process. As the old adage says "you don't miss the water until the well goes dry."

In some areas, wells with a low production rate (e.g. less than five gallons per minute (gpm)) may not supply enough water to meet demands during peak use. In these situations, it may become necessary to create additional water storage using a tank or cistern. If the short term water requirements exceed the well pumping rate, it is often beneficial to use a cistern to accumulate

water during periods of non-use. This stored water can then be re-pumped into the distribution system to meet short term (peak) demands.

For example, a well capable of pumping only 1 gpm could only supply enough water for a few cows if it was pumped directly into a stock waterer. However, if that same well pumped into a cistern for storage for 15 hours per day and then pumped to a stock tank at 10 gpm, it could supply 60 cows.

### CISTERNS

Adding a cistern to a farmstead can help supplement low-producing wells that do not produce sufficient water to meet peak water demands. A cistern that will hold one half to one day's water storage can often eliminate the need for another well or wells. The water can then be re-pumped at a much faster rate to meet the peak demands.

### 3.1.2 Well Location

To avoid water quality problems, a well should be located on high ground that is not subject to flooding and upslope from any potential or known contaminant sources such as livestock corrals, manure storage, household sewage systems, etc. (see Figure 3.1). Setback distances, also known as **minimum distance separations** (MDS), are required legally or recommended for locating your well.

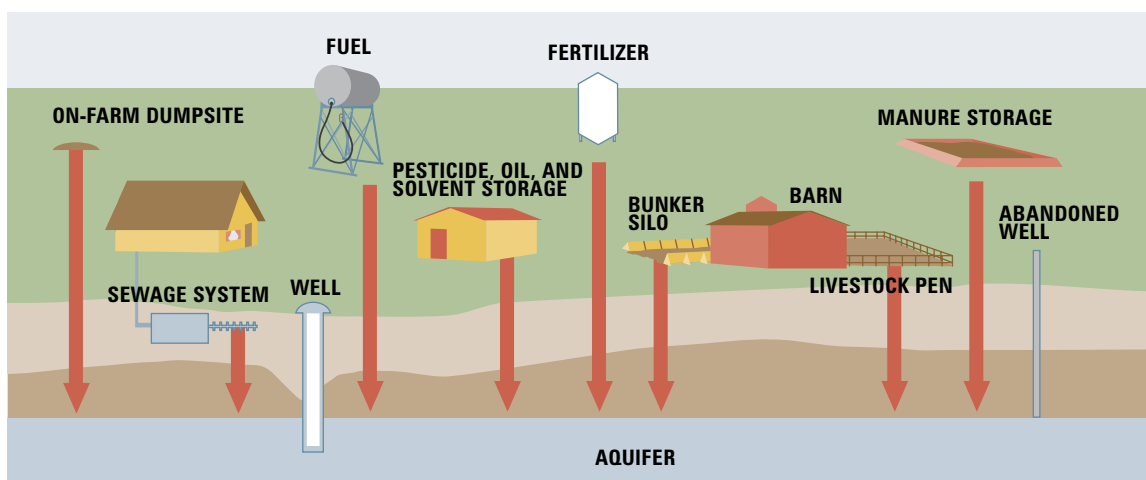
**Minimum distance requirements in Alberta indicate the well must be at least:**

- at a site where the well is accessible for servicing
- 3.25 m (11 ft) from a building
- 10 m (33 ft) from a watertight septic tank
- 15 m (49 ft) from a sub-surface weeping tile effluent disposal field or treatment mound
- 30 m (98 ft) from any old existing leaching cesspool; the installation of a leaching cesspool is no longer permitted
- 50 m (164 ft) from sewage effluent discharge to the ground
- 100 m (328 ft) from a sewage lagoon
- 30m (98 ft) from pesticide or fertilizer storage
- 50 m (164 ft) from above-ground fuel storage tanks
- 100 m (328 ft) from a manure storage facility or collection area or livestock yard
- 30 m (98 ft) from a manure or composting material application area
- 100 m (328 ft) from any dead animal burial or composting site
- 450 m (1,476 ft) from any area where waste is or may be disposed of at a landfill

(Note: equivalent imperial distances in feet are rounded up to nearest foot.)

For additional separation distances refer to the Water Wells that Last publication (link provided in the For More Information section the end of this chapter.)

FIGURE 3.1 POSSIBLE HAZARDS TO WATER WELL



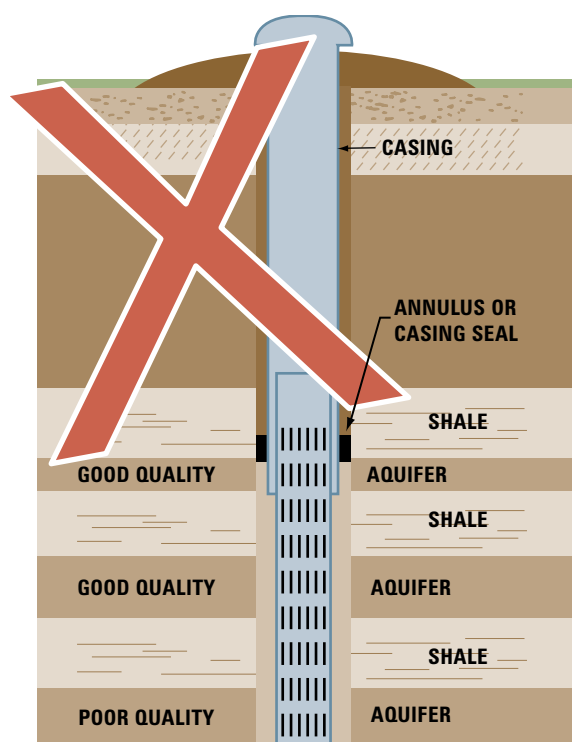
### 3.1.3 Well Construction

A water system that is well planned and properly constructed will ensure that you and your family have a reliable and safe water supply. A poorly constructed or located well can provide a direct path for contaminants to travel from the surface directly to the aquifer.

Multi-aquifer well completion allows water to mix from several aquifers, which may have significantly different water qualities (see Figure 3.2). Multi-aquifer completion can also allow water to drain from one aquifer into another, depleting some aquifers and potentially contaminating others. The driller must ensure that the water well is constructed in a manner that does not result in multi-aquifer completion.

Installing a proper well casing and formation seal effectively prevents contaminated surface water or groundwater from seeping along the outside of the casing and entering your well (see Figure 3.3).

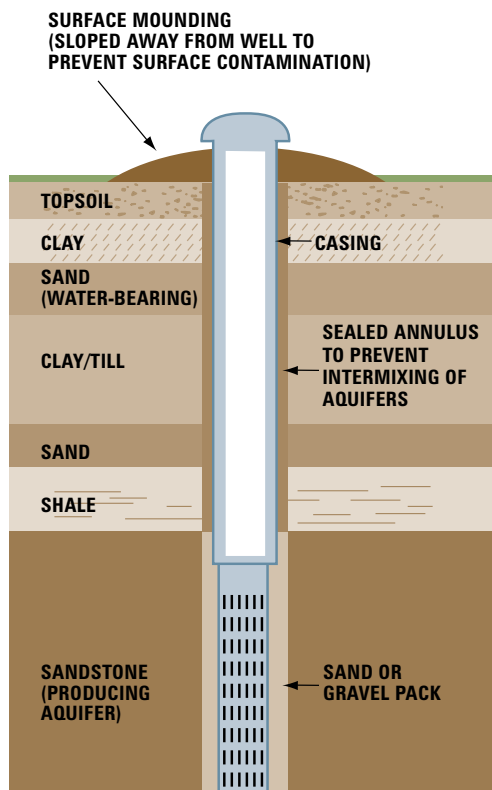
FIGURE 3.2 MULTI-AQUIFER WELL COMPLETION



### TESTING FOR WATER QUALITY

All farm water sources should be tested when the supply is connected initially and again every year for microbiological and every 2-5 years for chemical analysis. Test the water more often if you notice a significant change in the water quality, if a toxic spill occurs nearby or if a change occurs in land use or activity. A thorough chemical and microbiological analysis of water for household use can be done through your local community healthcentre. Water samples for agricultural purposes can be taken to private labs for testing. These labs will supply sample bottles and the correct procedures for sampling.

FIGURE 3.3 ANNULUS OR CASING SEAL



### 3.1.4 Well Pits

Provincial regulation now prohibits locating wells in pits. **Well pits** provide a place for contaminated surface water or shallow groundwater to collect, which can contaminate the aquifer by seeping around the outside of the well casing or flowing directly into the well. This type of construction also makes the well very susceptible to contamination by small animals and insects.

Well pits can be a deadly safety hazard and should not be used for storage areas. With changes in atmospheric pressure, air from within the well casing can displace breathable air in the well pit. Methane gas may also build up in the pit creating potentially dangerous situations such as explosions. Well gases or low oxygen content in well pits have resulted in human deaths as people entering these well pits become asphyxiated. It is strongly recommended that well pits be removed by an experienced backhoe or well drilling contractor and **pitless adaptors** be installed.



Well pits are no longer used in new well construction — *Courtesy of AF*

#### FARM WATER HYDRANTS INSTALLED IN A WELL OR WELL PIT

Hydrants are designed to prevent freezing by draining water from the hydrant standpipe whenever the hydrant is shut off. If a hydrant is installed in a well casing or well pit, the contents of the standpipe will siphon back into the well. If a hose is directly connected to the hydrant and the other end of the hose is in a stock tank or pesticide sprayer tank, the contents of the tank will be siphoned down the well. The contents of stock tanks or sprayers are definite contaminants. Always maintain an air gap between the end of a hose and the water surface, and disconnect hoses from the hydrants when not in use. Using a hose connection vacuum breaker on every hydrant can also provide additional protection.

### 3.1.5 Flowing Wells

The water from flowing wells must be controlled to prevent depletion of the water resource. Free-flowing water wells in some areas of the province have drastically lowered water levels in neighbouring wells, wasted the resource and contributed to saline soil conditions in the overflow area.

Under the *Water Act*, flowing wells must be controlled. Ideally the flow should be shut off when the water is not in use. The regulations require that the flow rate does not exceed either the water requirements of the well owner, or 100 cubic metres per week (2.18 gal/min), whichever is smaller. If the flow requirement exceeds 100 cubic metres per week, the water use must be licensed.

Restricting the flow can be accomplished by a variety of methods. Talk to a licensed water well driller about the most practical method for your situation.

### 3.1.6 Old and Abandoned Wells

A great number of rural residents rely on water wells. While the exact number of **abandoned** and unused wells in Alberta is unknown, it is estimated to be in the tens of thousands. Abandoned wells that are no longer used or maintained for future use pose a serious threat to the preservation of groundwater quality. They are also a serious safety and environmental hazard for children and animals.

Old wells may be poorly constructed or have a rusted steel casing that can lead to the contamination of aquifers and neighbouring wells. When the steel casing of an abandoned well starts to corrode, holes will develop. When this situation occurs, surface contaminants or poor quality water from shallow aquifers may migrate into the deeper aquifers of nearby operating wells.

Unfortunately, groundwater contamination and its effects are usually not recognized until groundwater quality is seriously affected and nearby wells have been contaminated. Surface contaminants can enter a well directly through the top of the casing, if there is not a proper well cap, or along the outside of the casing if the annular space is inadequately sealed.

**Unused, old and abandoned wells should be decommissioned or plugged to prevent the following problems:**

- downward movement of water in the well or well annulus
- surface contamination from reaching aquifers
- intermixing of water between aquifers of different water quality

#### WHO IS RESPONSIBLE?

In Alberta, responsibility for plugging a water well is defined by legislation. The drilling contractor is legally responsible for immediately plugging a well that is not completed due to construction problems or inadequate yield. The well owner is responsible for plugging the well when:

- the well is no longer being used as a water supply
- the well is in a poor state of repair and the pumping equipment has been removed or cannot be repaired or replaced
- the well produces water that is unsuitable for drinking

Unless you use the right plugging materials and have them properly placed in the well, you will end up with a poorly sealed well that can allow contaminants to enter the groundwater. It is generally best to hire a drilling contractor to complete the plugging of your well. This person has the expertise and equipment to do a proper job.



### 3.2 Dugouts

Dugouts are often used on farmsteads as a water source. If the site has a low producing or poor quality groundwater supply, dugouts may be used exclusively, or in combination with a well. If a farmstead has both, the well water is usually saved for household use because it is typically of better quality.

Dugouts are usually filled by surface water and can provide good quality water for livestock and irrigation purposes. However, there is a greater risk of contaminants entering the dugout as many are typically filled by spring runoff or water from irrigation canals, creeks, rivers or lakes. Some dugouts are groundwater-filled and may pose a high risk of groundwater contamination and should be managed accordingly. It is important to always monitor a dugout's water quality.



Dugout fenced to protect water quality — *Courtesy of AF*

Generally, dugouts have high levels of organic matter, but surface runoff high in particulate matter and plant nutrients increase these levels. This situation results in significant algae and weed growth, eventually resulting in poor water quality. Thus, it is important that dugouts be monitored, maintained and treated to avoid water quality issues.

Traditionally, dugout water was not treated or treatment consisted of a combination of chlorination, rapid sand filtration and/or granular activated carbon filtration. However, better water treatment systems exist today and include conventional treatment systems involving chemical coagulation. Coagulation is the process of adding chemicals to the dugout water to reduce turbidity, dissolved organic compounds and colour. The chemicals cause small particles to bind together forming larger particles that can be removed from the water either through sedimentation or direct filtration. This treatment can occur in dugouts or coagulation cells that treat a six to twelve-month supply of household water.

Dugouts that are only filled by spring runoff should be designed to hold at least a two-year water supply plus any additional evaporation and seepage losses, unless an alternative water source can be used to fill the dugout in a drought year. Dugouts in irrigated areas or adjacent to rivers or lakes must be at least large enough to supply water from the time the water is not available in the fall until water flows again in the spring.

The size of a dugout required varies with the water requirements of the farm operation, the refill frequency of the dugout and assessments of seepage and ice thickness. Seepage losses from dugouts do occur and are variable. Dugout evaporation ranges from 15 percent in northern Alberta to 30 to 50 percent in southern Alberta, while dugouts used for winter water supplies will lose approximately 25 percent to ice. A deeper dugout with steep slopes will provide the best water quality and help minimize such losses.

**Some dugouts may require licensing or approval by Alberta Environment and Parks (AEP) prior to construction. Check with AEP to ensure all legislative requirements are met when planning any of the following situations where dugouts are:**

- constructed in waterways or wetlands
- intercepting groundwater
- over 12,500 cubic metres (2,749,615 gallons) in size
- using more than 6,250 cubic metres (1,374,807 gallons) of water a year

Contact your local Alberta Agriculture and Forestry (AF) water specialists for proper dugout planning and design information.

### 3.2.1 Management of Inflow Water into Dugouts

**If you are planning to fill the dugout from runoff or an irrigation canal, be sure to:**

- locate the dugout upstream of any livestock area
- construct a berm around the dugout (if filled from irrigation water) to prevent potential runoff from entering water supply
- fence the dugout to prevent animals from entering the water supply
- install a pumping system with a floating intake
- aerate to prevent the water from becoming stagnant

A dugout in the middle of a waterway becomes a sediment trap and silts in more quickly. Wherever possible, dugouts should be located beside the water runway and have a short water diversion channel connecting the two. This set-up allows you to control the water that flows into the dugout, while unwanted or contaminated water can be redirected to bypass the dugout. For more information on planning, designing and operating dugouts, refer to AF publications listed at the end of this chapter.

## 3.3 Natural Water Sources

Natural water sources exist on many farmsteads and include undeveloped springs, lakes, wetlands, creeks and sloughs. These may be locations where water flows year round, intermittently or seasonally. Managing for healthy water sources ensures a sustainable water supply for the future.

The concern when dealing with natural water sources is the distance of potential hazards, such as pesticides, fertilizers or manure to the water source. For example, when animals have direct or limited access to a spring or creek, the risk for contamination increases. Animals may affect the quantity or outflow of the water source. Protecting pasture riparian areas and other buffer zones allows you to manage and maintain water quality. Offsite livestock watering systems, such as solar and nose pumps, will also protect water sources from potential contamination.



Alternative livestock watering systems help protect water sources from contamination risks — *Courtesy of AF*

### 3.4 Pipelines

Some rural residents are supplied with water from community pipelines, most of which deliver treated potable water.

If the pipeline supplies treated potable water, the major concern is maintaining the water quality once it is at the farmstead. Most pipelines deliver a low volume of water (often 1-2 gallons per minute) to a cistern at the farm site. It is important that the cistern be secure with a cover to prevent access by rodents, insects, children, etc. or contaminants from entering the water supply.

#### **Clean and disinfect your cistern at least once a year:**

1. Drain and clean the tank.
2. Inspect for cracks or leaks as water can leak both in and out.
3. Fill the tank with potable water.
4. Disinfect with 50 mg/l chlorine solution with 1 litre of household, unscented bleach (5%) per 1000 litres (220 gal) of water.
5. Run water out of each water line to get the bleach into the entire piping system.
6. Let sit for 6-12 hours.
7. Drain the chlorinated water from the tank, being sure to divert the water away from your septic system, sensitive plants and water bodies.
8. Refill with potable water.

If your pipeline supplies untreated water to the farmstead, make sure the water is treated appropriately, so the water becomes suitable for home use. Many treatment systems are available for a variety of water quality concerns. Check with an AF water specialist or public health inspector to determine what options may be best for you.

Any community pipeline system should be protected from backflow and cross connections that may originate at a farm. This precaution usually involves backflow prevention devices that are specified by the utility that supplies the water. These are designed to keep contaminated water from being pumped or “sucked” into the pipeline.

Shallow buried pipelines that are not designed for year round use are more susceptible to contamination and breaks. Proper backflow prevention is strongly recommended for farms that use these shallow buried pipelines to supply water to livestock pastures. Prevention may be as simple as maintaining an air gap at the float valve or installing a special backflow preventer.

As mentioned previously, it is very important to test all farm water sources on a regular basis, including water supplied from community pipelines as potential contamination of the water source may occur at different points along the pipeline.

### 3.5 Legislation

Producers should be aware of the following pieces of legislation that pertain to water sources and the potential environmental risks. For more information on the legislation, refer to Chapter 12.0 of this manual.

#### Federal Legislation

*Fisheries Act*

#### Provincial Legislation

*Water Act*

*Environmental Protection and Enhancement Act*

*Alberta Wetland Policy*



### 3.6 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.

#### Alberta Agriculture & Forestry

**Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Farm Water Supply Requirements Agdex 716 (C01)
- Farm Water Quality Testing
- Livestock Water Supply
- Chemical Analysis Interpretation of Rural Household Farm Water Supplies Agdex 716 (B36)
- Water Wells that Last for Generations Agdex 716 (A10)
- Quality Farm Dugouts Agdex 716 (B01))
- Aerating Dugouts with Compressed Air Agdex 716 (B36)

#### Alberta Environment and Parks

**Information Centre: 310-ERSD (3773)**

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

Publications:

- Stepping Back from the Water
- Water Act: Fact Sheets

**Groundwater Information Centre: 780-427-2770**

- Alberta Water Well Information Database

#### Working Well

Provides factsheets, videos and workshops to well owners and others interested in water well management and groundwater protection.

Website: [www.workingwell.alberta.ca](http://www.workingwell.alberta.ca)

#### Health Canada

Publications: 1-800-635-7943

- Guidelines for Canadian Drinking Water Quality

Website: [www.canada.ca/en/health-canada](http://www.canada.ca/en/health-canada)





# CHAPTER 4.0

## **Pesticide Storage, Handling and Application**

This chapter discusses beneficial management practices that address storage, handling and application of pesticides on the farmstead.

Pesticides provide producers with effective means to control weeds and pests such as insects and rodents, as well as bacteria, fungi, parasites and pathogens. Storage, handling and application of pesticides carries inherent environmental, health and safety risks associated with handling hazardous materials. Care must be taken to avoid leaks, spills or misapplication of these products. Understanding potential hazards can minimize or eliminate any potential risks that may exist on your farm.

## 4.1 Pesticide Storage

The best way to eliminate any environmental risk associated with pesticide storage is to avoid storing pesticides on the farmstead. If you cannot use the pesticide within a reasonable time, then make arrangements with your supplier for storage, or minimize the volumes you have by sharing the extra pesticide with your neighbours. When storing or transporting pesticides, the best practice is to keep the pesticide in the original container with all labelling clearly visible. Always ensure the container is transported with secondary containment to catch any spills or leaks.

**If you must store pesticides, do so with the following guidelines in mind:**

- Store pesticides in a locked shed, room or locker that is exclusively used for storing pesticides.
- Store minimal amounts of product. Storage time should not exceed the growing season.
- Use secondary containment made of an impermeable material to contain possible leaks. For example, store chemical jugs in tubs or trays on storage shelves.
- All original containers must retain manufacturers' labels, and any secondary containers must also be properly labelled, detailing the contents and date.
- Consult the pesticide label for specific storage instructions.
- Do not store with or near food, animal feed, seed, drinking water, and fertilizers.
- Have protective equipment and emergency response equipment close to, but not in the storage areas.
- Store and handle pesticides at a distance greater than 30 m (98 ft.) from a water body and 90 m (295 ft.) from a water well.
- Return unopened or non-compromised product to the dealer for a refund.
- If a product container is leaking, over pack the container by packing it in a larger container with leak collection material (such as kitty litter) until it can be properly transferred to a good container.
- Dispose of opened leftover product as a hazardous waste. For more information, refer to Chapter 8.0

### 4.1.1 Storage Facilities

**When storing pesticides, ensure the facility:**

- Is secure with signs posted indicating the storage contents.
- Is constructed to minimize or eliminate potential soil and water contamination by having curbs and an impermeable floor to contain spills and leaks.
- Is built using fire-resistant building materials and use metal shelves in the storage area.
- Is well ventilated to the outside with appropriate vents or exhaust vents.
- Protects pesticides from temperature extremes.
- Does not have a floor drain, unless there is a proper holding tank for drainage collection. If there is a tank, it should be monitored regularly, and the fluid disposed of in accordance with hazardous waste regulations.





Store chemicals in a secure facility with appropriate signage — *Courtesy of AF*

## 4.2 Large and Small Scale Pesticide Handling and Application

Activities that may affect the environment in and around a farmstead could range from mixing and loading of field sprayers to applications in a livestock yard, garden or surrounding field.

**Whether dealing with large or small amounts of pesticides, use the following guidelines to reduce contamination and toxicity risks:**

- Identify the problem and determine if the use of a pesticide is the only option or if there are other mechanical or biological means of control.
- If the use of a pesticide is the only option, choose the least toxic, most appropriate chemical for your situation.
- Carefully read and follow product label directions as outlined by the manufacturer for:
  - proper mixing procedures
  - recommended application methods, rates and timing
  - application restrictions for weather conditions
  - use restrictions for cropping, grazing or harvesting
  - special safety precautions and equipment
  - proper disposal procedures for leftover product
- Record chemical type, rates and methods used as well as weather conditions, growth stages of crop and pests and application purpose for future reference.

### 4.2.1 Mixing and Loading Locations

The best option is to mix and load pesticides near the application site to minimize the risk of water or soil contamination. Any mixing and loading areas must be more than 30 m (98 ft) from a surface water body and more than 90 m (295 ft) from a water well. If you are mixing pesticides at a regular site on your farmstead, make sure the site is designed to contain spills and leaks.

**When loading pesticides, remember to:**

- Never leave filling procedures unattended (someone over the age of 16 must be present at all times).
- Protect yourself by wearing personal protective equipment that is in good working order, properly fitted and of the correct type, as indicated by the label.
- Have spill containment and cleanup equipment ready, such as an absorbent material like kitty litter or floor dry.
- Have a cell phone or two way-radio available (if possible) for emergencies.
- Prevent **backflow** from the sprayer to the water source:
  - Never place the end of a hose into the sprayer tank or container below the water line. A space of at least 15 cm (6 in) should be between the end of the hose and the highest point that the water level will reach.
  - Install backflow preventer devices on all water lines leading to the storage area and pad.
  - Fit spray equipment with an operational backflow preventer.

### 4.3 Cleaning and Maintaining Application Equipment

To reduce or eliminate risks associated with equipment problems, plant damage or animal toxicity, it is important to clean and maintain all chemical application equipment. This practice ensures pesticide efficacy, as well as reduces risks associated with cracked hoses and leftover residue. Any chemical residues in spray containers or tanks can potentially contaminate other pesticides used in other applications.

**Considerations for efficient and effective sprayer cleanout**

- An on-board rinse water tank will allow you to rinse and apply the rinsate right in the field that was just sprayed with the same product.
- Splitting the rinse tank volume into three smaller (100L) rinses is 14 times more effective than one large (300L) rinse. The reason for this is that if there were about 50 L of solution left in the tank, dumping all 657 L of clean water in at once will dilute the remainder by a factor of 14, but if you split that rinse into 3 smaller ones, it dilutes the remainder by a factor of nearly 200.
- A good practice is to ensure that the sprayer is emptied and rinsed at least once at the end of each day so that pesticides cannot seep into the sprayer components. Certain pesticides can seep into the plastic parts (including the tank) and then later be pulled off those parts by surfactants, causing crop damage.
- The sprayer should definitely be emptied and rinsed when it will be sitting for an extended period of time.
- To properly clean the boom, endcaps must be removed to eliminate any buildup in the boom ends. A good solution for this is to use “Nozzle Body End Caps” which are placed at the end of the boom, eliminating dead ends that can collect residue.

**When preparing for the next pesticide application:**

- Inspect and perform regular maintenance checks on all equipment.
- Calibrate application equipment.
- Clean and rinse all parts of the application equipment thoroughly with water or other solution as advised by the product label.
- Designate sites to clean, flush and rinse the equipment.
- Dispose of the **rinsate** according to product label directions:
  - If possible, apply rinsate directly to treatment area.
  - If you cannot apply it on the treatment area, then:
    - Apply it on land away from surface water, water wells, septic systems, gardens, shelterbelts and other environmentally sensitive areas.
    - Use it as mix water for later applications when the same chemical is being applied.
    - Apply it on areas requiring pesticide control.



Dispose of rinsate away from environmentally sensitive areas — *Courtesy of AF*

## 4.4 Transporting Pesticides

The *Transportation of Dangerous Goods Act* applies when transporting pesticides on public roads. However, it is best to have your local vendor deliver pesticides to the place of use. If delivery is not an option, safely secure all pesticides before and during transportation. Never leave pesticides unsupervised in a vehicle, unless the chemicals are located in a place inaccessible to the public or in an enclosed compartment of the vehicle. Remember to never transport pesticides with food, feed, household furnishings, toiletries, clothes, bedding or similar items.

## 4.5 Custom Applicators

A beneficial management practice is to hire a certified custom applicator to reduce risks with pesticide application. Custom pesticide applicators performing pesticide application for hire



or reward must have attended and passed a Certified Pesticide Applicator course and have a Service Registration. As a producer, you have the legal responsibility to ensure that any pesticide application performed on your property does not harm adjacent properties or people. By hiring a custom applicator and working with them to control pests and weeds on your farm, you are minimizing your environmental risk.

## 4.6 Pesticide Training

There are voluntary pesticide training and certificate courses available for Alberta producers. The training provides you with the knowledge to safely and effectively use pesticides, from understanding how they work (mode of action) to clean-up and disposal. Some pesticides require producers to obtain special certification before they can purchase and use these products on their own property. By taking a pesticide application course, you also learn about the risks associated with pesticide use. Knowing and understanding these risks will help you eliminate or reduce any environmental risk when working with pesticides on your operation.

For more information on these courses, contact 310-FARM (3267) or contact your local agricultural college.



Obtaining a Pesticide Applicator Certificate eliminates or minimizes environmental risks when working with pesticides — *Courtesy of AF*

### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

## 4.7 Legislation

Producers should be aware of the following pieces of legislation that pertain to pesticides and the environmental risks associated with their use. For more information on legislation, refer to Chapter 12.0 of this manual.

### Federal Legislation

*Fisheries Act*

*Pest Control Products Act*

*Transportation of Dangerous Goods Act*

### Provincial Legislation

*Agricultural Pests Act*

*Environmental Protection and Enhancement Act*

*Weed Control Act*

## 4.8 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### Alberta Agriculture & Forestry

**Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Crop Protection – the Bluebook Agdex 606-1
- How Herbicides Work: Biology to Application Agdex 606-2
- Protect Groundwater Quality – Minimize the Risks Agdex 576-5

### Alberta Environment and Parks

**Information Centre: 310-ERSD (3773)**

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

Publications:

- Mobile Pesticide Storage Facility Guidelines
- Pesticide Use In or Near Water

**Direct all pesticide complaints or reports of spills/releases to Alberta Environmental Response Centre at the 24-hour-toll free line: 1-800-222-6514.**

### Alberta Transportation

Website: [www.alberta.ca/transportation.aspx](http://www.alberta.ca/transportation.aspx)

Publications: 1-800-272-9600

- Dangerous Goods and the Agricultural Industry



**Queen's Printer**

Phone: 780-427-4952

Website: [www.qp.alberta.ca](http://www.qp.alberta.ca)

Publications:

- Environmental Code of Practice for Pesticides

**Pest Management Regulatory Agency**

Phone: 1-800-267-6315

Website: [www.pmr-arla.gc.ca](http://www.pmr-arla.gc.ca)

**CleanFarms**

Website: [www.cleanfarms.ca](http://www.cleanfarms.ca)

**CropLife Canada**

Website: [www.croplife.ca](http://www.croplife.ca)



# CHAPTER 5.0

## **Fertilizer Storage, Handling and Application**

This chapter discusses beneficial management practices that address storage, handling and application of fertilizers on the farmstead.

Fertilizers are inorganic or organic forms of nutrients that are used to support crop growth. The types of fertilizers include compressed gas (liquefied under pressure), solids (such as granules, crystals and pellets), and liquids (solutions).

The benefits of fertilizers is that it provides nutrients in a concentrated form that can be used by crops. The potential hazards with fertilizers are the potential corrosive, toxic and explosive nature if mishandled. Two main concerns regarding fertilizer on the farm are the storage of the product and their use within the farmstead area.

## 5.1 Anhydrous Ammonia

Anhydrous ammonia is a corrosive, compressed gas that is liquefied under pressure. It can present significant health and safety risks if not handled and stored properly. Handlers and applicators should:

- Ensure all equipment is inspected prior to use, checking for properly functioning valves, breakaway couplers and ensuring all high-pressure hoses are free of cracks or wear.
- Ensure all pressure has been released from hoses when working around equipment or when connecting or disconnecting hoses.
- Always use appropriate personal protective equipment and exercise rigorous care when handling.
- Use water as the first aid treatment of choice. Flush affected areas for 15 minutes and get medical help as soon as possible.

Many regulations are in place to keep the use of anhydrous ammonia safe. All equipment and parts used for storing, transporting and applying anhydrous ammonia must be registered and inspected on a regular basis to meet strict design standards and pressure tests. Under federal law, anyone handling, offering for transport or transporting anhydrous ammonia must also complete Transportation of Dangerous Goods (TDG) training every three years.

Growers are responsible, as employers, to ensure anyone handling anhydrous ammonia on their farm receives TDG training, which is offered through most anhydrous ammonia retailers. Finally, anhydrous ammonia retailers have put 24-hour emergency response teams into place to ensure the safety of communities, equipment and the product.



Anhydrous ammonia tank  
— Courtesy of AF

## 5.2 Dry Fertilizer Storage

Dry fertilizers are generally incorporated into solid (crystalline, powdered, prilled or granular) of various size ranges. The greatest advantage of a dry fertilizer is that it dissolves slowly into the soil. For this reason it is generally used in large fields since it lasts longer than any other fertilizer. Dry fertilizers can be broadcast, seed-placed or used in a band application.



**To properly store dry fertilizer, you need to:**

- Store fertilizers away from drinking water, food, fuel, seed, animal feeds or protective equipment to prevent contamination.
- Locate storage facility more than 100 m (330 ft) from water wells and more than 20 m (60 ft) from surface water bodies.
- Store on an impermeable surface such as sealed concrete. For field operations, storage should be in a building or epoxy-lined bin.
- Post signs stating the contents of the storage facility for large fertilizer amounts in case of an emergency or fire.
- Maintain and monitor the storage area, checking regularly for fertilizer leaks and spills.
- Ensure the storage facility is secure when storing large amounts of fertilizer. Building or storage bins should be separate from all other activities that could damage containers or spill fertilizer. This could mean a locked fenced area.

### 5.3 Liquid Fertilizer Storage

Liquid fertilizers contain one or more available plant nutrients. They can be true solutions where all the nutrients are dissolved in water or held in suspension. They can be either surface applied or foliar applied. Liquids can be broadcast, used in a band application at planting and as mid-season side-dress or through irrigation systems (fertigation). A drawback of the liquid fertilizer system is that it requires special storage and application tanks and pumps.

**To properly store liquid fertilizer, you need to:**

- Inspect all tanks, valves and plumbing used for large liquid fertilizer storage regularly.
- Ensure that you have adequate secondary containment to hold any spills or leaks.
- Use sight gauges and lock-on valves on large storage containers.



Use proper procedures and precautions when loading fertilizer at all times — *Courtesy of AAFC*

## 5.4 Fertilizer Mixing and Loading

When mixing and loading fertilizers, it is inevitable that a spill will occur. Using proper clean up procedures and precautions to minimize spills, you will reduce or eliminate environmental risks

**Follow these guidelines for proper fertilizer mixing and loading:**

- Never leave filling procedures unattended.
- Ensure loading takes place at least 30 m (98 ft) away from a well or surface water.
- Clean up spills when they occur.
- For dry fertilizer, if you use a permanent mixing and loading area, the mixing pad should be impermeable. Sweep up any spilled dry fertilizer, and store it in a clean container until it can be used.
- For liquid fertilizer, if you use a permanent mixing and loading area, ensure that any spills or leaks can be collected and contained. The mixing pad should have an impermeable floor, curbs and a sump. Liquids from the sump can be used for future applications.
- For mixing liquid fertilizers, either have a backflow preventer on the water supply or ensure that there is a 15 cm (6 in) air gap between the end of the hose and the highest point that the water level will reach. If possible, use a **closed handling system** to transfer the fertilizer directly from the storage container to the applicator equipment, so people and the environment are not exposed to the fertilizer.

## 5.5 Application of Fertilizers

4R Nutrient Stewardship is a framework for nutrient management to support cropping system objectives, including increased production and profitability, minimizing environmental impact and improved sustainability. The 4R concept incorporates the Right fertilizer source at the Right rate, at the Right time and in the Right place.

When properly managed, fertilizers provide economic, social and environmental benefits. Whereas, poorly managed nutrient applications can decrease profitability and increase nutrient losses, potentially degrading water and air.

To avoid potential risks associated with the application of fertilizers, ensure application rates do not exceed crop requirements. Too much fertilizer is not only economically wasteful, but nutrients applied beyond plant use may be lost. Nutrients lost through volatilization, leaching and runoff may potentially contaminate surface water or groundwater sources. Ensure that fertilizer application rates are calculated and based on soil nutrient content and crop nutrient needs. Using soil tests to ensure proper amounts of nutrients are applied can help reduce the level of environmental losses associated with excessive nutrients and the added costs associated with high application rates.

4R nutrient stewardship includes the implementation of beneficial management practices (BMPs) that optimize fertilizer use efficiency, match nutrient supply to crop requirements and minimize nutrient losses from fields. Selection of fertilizer BMPs will vary by location. They are dependent on local soil and climatic conditions, crop, management conditions and other field specific factors.

Many factors may affect the amount of nutrients available in the soil. These factors include previous crop grown, soil type and soil moisture, as well as climatic factors such as rainfall, temperature and growing season length. Management factors that affect fertilizer nutrient availability include nutrient sources, application methods (broadcasting versus banding), timing (spring versus fall) and rate of application. Fertilizer BMPs are most effective when applied



with other agronomic and conservation practices, including reduced tillage and direct seeding in support of 4R nutrient stewardship.

#### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

## 5.6 Legislation

Producers should be aware of the following pieces of legislation that pertain to nutrients and the environmental risks associated with their use. For more information on legislation, refer to Chapter 12.0 of this manual.

### Federal Legislation

*Transportation of Dangerous Goods Act*

### Provincial Legislation

*Agricultural Operation Practices Act*

*Environmental Protection and Enhancement Act*

## 5.7 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### Alberta Agriculture & Forestry

**Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Alberta Farm Fertilizer Information & Recommendation Manager (AFFIRM)
- Agricultural Operations Practices Act (AOPA) Legislation Resources
- Managing Nitrogen to Protect Water Quality Agdex 576-1
- Managing Phosphorus to Protect Water Quality Agdex 576-2
- Minerals for Plants, Animals and Man Agdex 531-3
- Protect Groundwater Quality – Minimize the Risks Agdex 576-5
- Nutrient Management Planning Guide

### Alberta Transportation

Website: [www.alberta.ca/transportation.aspx](http://www.alberta.ca/transportation.aspx)

Publications: 1-800-272-9600

- Dangerous Goods and the Agricultural Industry – July 2017

**Fertilizer Canada**

Publications: 613-230-2600

Website: [www.fertilizercanada.ca](http://www.fertilizercanada.ca)

- Anhydrous Ammonia Code of Practice – January 2017

**Yara Canada**

- Storage of Fertilizer
- Yara's Guide to the Safe Use of Fertilizers on Farm
- From Factory to Field



# CHAPTER 6.0

## Fuel Storage and Handling

This chapter discusses beneficial management practices that address storage and handling of all petroleum products on the farm.

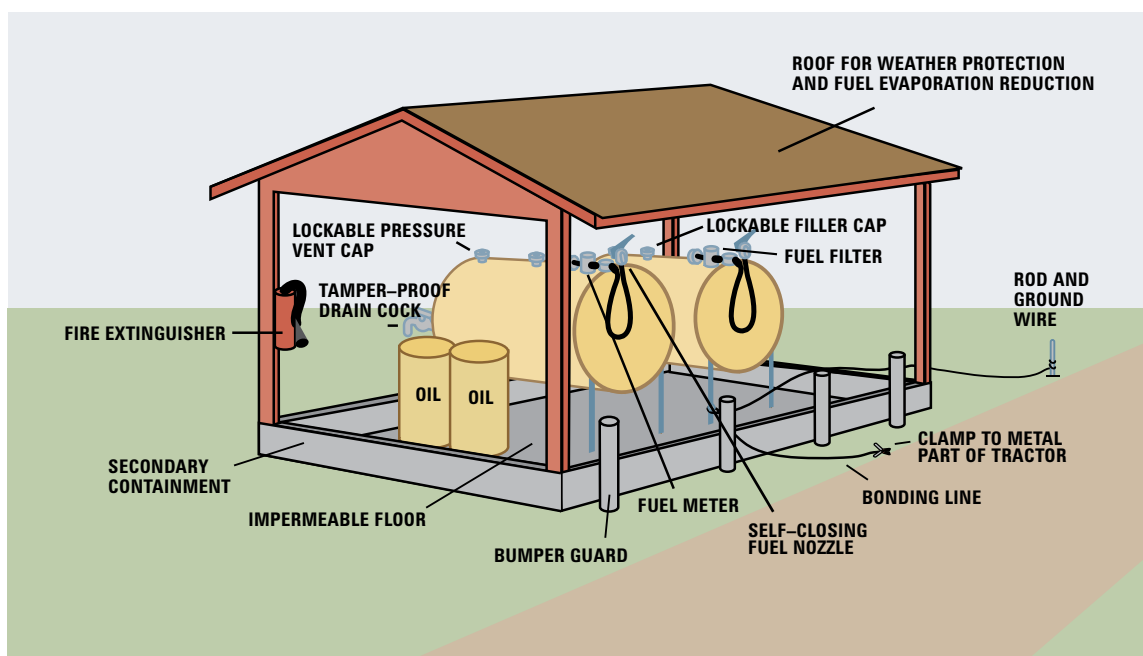
Diesel, gasoline, lubricants and oils are used extensively on farms today. In Alberta, there are at least 250 million litres of diesel and gasoline storage. Financial (increasing costs), environmental (potential for spills and leaks) and safety (potential fires) concerns are associated with handling and storing fuel on the farm.

At present, the *Alberta Fire Code* governs the storage and handling of petroleum products. Although Alberta producers are exempt from the Code, its standards are used as guidelines for producers to follow as beneficial management practices.

## 6.1 Siting and Setup

Proper siting and setup of your storage area is important in minimizing or eliminating risks associated with handling fuel (see Figure 6.1). When determining fuel storage locations on your farm, keep minimum separation distances from areas that could be affected by fire and fuel leaks and spills. Prior to installing storage tanks or facilities, ensure equipment such as tanks, support stands and dispensers are in accordance with the *Alberta Fire Code*.

FIGURE 6.1 A WELL PLANNED FARM FUEL STORAGE SITE



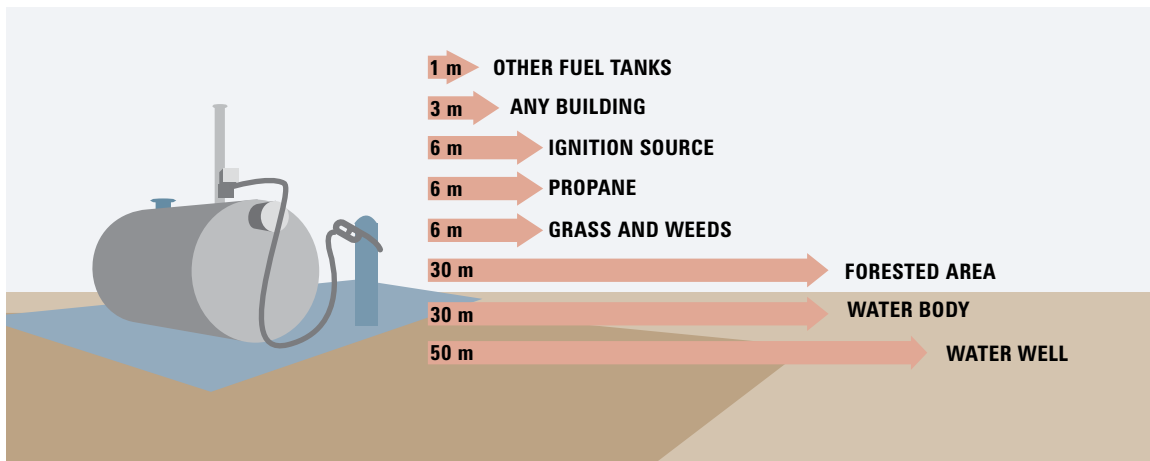
### 6.1.1 Minimum Separation Distances

Fuel storage areas should be located well away from buildings, trees, ignition sources, other fuel tanks, water bodies and water sources to reduce environmental and safety risks. Keeping the storage area free of vegetation and away from buildings and ignition sources helps reduce the danger to fuel tanks in the event of a fire. Ignition sources include electric motors, road traffic, yard lights, power lines, cell phones, air conditioning or heating units and garbage burning barrels.

The following diagram (Figure 6.2) provides guidelines for distances when siting petroleum storage.



FIGURE 6.2 MINIMUM SEPARATION DISTANCES FROM FUEL STORAGE AREAS



### 6.1.2 Stands

Although becoming less common, there are still many farm sites in Alberta that have gravity-fed tanks on stands 1 to 3 m (4 to 9 ft) high. These tanks tend to become unstable because of the weight of the fuel, or they melt due to a fire, resulting in a spill. The best practice is to mount tanks at ground level, or on solid concrete or steel supports no higher than 0.3 m (1 ft) off the ground. Supports should provide a minimum two-hour fire-resistant rating and be on a firm foundation to help prevent uneven settling.



Aboveground or gravity-fed tanks located too close to trees increase fire hazards and damage from fallen trees — *Courtesy of AF*



### 6.1.3 Secondary Containment

As a safety precaution, secondary containment that contains 110 percent of the maximum volume of the storage tank is recommended. Installing a double-walled tank or using a diking system can accomplish this goal.

Double-walled tanks provide excellent protection against leaks and also provide thermal insulation, reducing extreme changes in fuel temperature. Each double-walled tank has a space between two walls that will contain 10 percent more volume than the storage capacity of the tank.

A dike is an impermeable spill containment area or berm constructed of earth, steel, concrete, solid masonry or synthetic liner that will also hold 110 percent of the tank capacity. If there is more than one tank, then the containment area must hold 110 percent of the largest tank, or the capacity of the largest tank plus 10 percent of the total volume of the remaining tanks, whichever is greater.

### 6.1.4 Evaporation

Losses due to evaporation vary with the type of storage, fuel and management practices to prevent evaporation. Fuel losses range from minimal in underground tanks, to maximal in poorly located or maintained overhead tanks. The heating of aboveground tanks from the sun causes the fuel to evaporate (volatilize) into the atmosphere. The more the fuel temperature changes, the greater the potential for fuel losses and risk of contamination due to condensation. Evaporation losses are greater for gasoline than diesel because gasoline is more volatile. For estimations of evaporative losses due to different tank conditions in summer months for aboveground storage, refer to Table 6.1.

**TABLE 6.1 EVAPORATIVE LOSSES FROM A 1,200 LITRE (265 GALLONS) ABOVEGROUND GASOLINE STORAGE TANK.**

TANK CONDITIONS			EVAPORATION LOST PER SUMMER MONTHS		% OF FULL TANK LOST
			Litres	Gallons	%
Dark tank	in sun		38	8.4	3.2
White tank	in sun		23	5.1	1.9
Dark tank	in sun	with pressure vent cap	21	4.6	1.8
White tank	in sun	with pressure vent cap	9	2.0	0.8
Dark tank	in shade		9	2.0	0.8
White tank	in shade	with pressure vent cap	5	1.1	0.4
<b>FOR COMPARISON PURPOSES:</b>					
Underground tank			< 4	< 1	0.3
Double-walled aboveground tank			Losses similar to underground tank		

Source: *Farm Storage and Handling of Petroleum Products, Farm Mechanization Factsheet No. 210.510-1, Resource Management Branch, British Columbia Ministry of Agriculture and Lands.*

**The following steps reduce fuel evaporation losses:**

- Paint the tank with reflective paint (silver or white) and reduce evaporation losses by up to 40 percent compared to a dark-coloured tank.
- Use a pressure ventilated cap to reduce evaporation losses by 50 percent. This type of cap restricts direct venting of tank fumes until a slight pressure has built up in the tank. Having a painted and pressure-vented tank has a 75 percent evaporation loss reduction compared to a dark-coloured tank.
- Locate a painted and pressure-vented tank in the shade to further reduce evaporation losses by over 40 percent. A shelter with a roof also helps reduce weathering of hoses and valves (see Figure 6.1).
- Do not fill the tank to more than 90 percent of its capacity; this practice reduces pressure in the tank, and thus, evaporative or spill losses.

## 6.2 Dispensing Fuel

Care and caution should be taken while fuelling vehicles, farm machinery or jerry cans.

**To reduce spills and avoid fires, use the following procedures when dispensing fuels:**

- Ensure the dispenser unit is **ULC and CSA approved**, with automatic shut-off valves.
- Use a hand or electric pump. If using an electric pump, it must be installed according to the Code of Electrical Installations at Oil and Gas Facilities.
- Close the valves on tank discharges when they are not in use to prevent leakage through the hose or nozzle.
- Never leave the area unattended even if automatic shut-off nozzles are being used. There is always the possibility of nozzles malfunctioning or getting knocked out of the tank.

## 6.3 Fuel Tank Safety

**To prevent further fuel losses from occurring, you need to regularly maintain and monitor storage facilities by taking the following additional precautions:**

- Protect tanks and piping against corrosion to prevent leaks.
- Protect all pumps, lines and tanks from collision damage by installing bollards (barriers constructed of a sturdy material, such as steel piping filled with cement, set up close to fuel tanks to guard against collision damage).
- Make sure fill-up hoses are long enough, so vehicles and farm equipment can be kept at a safe distance from the tanks.
- Keep fuel lines, hoses, valves and nozzles in good repair. Install anti-siphon valves between the pump and tank to prevent the tank from draining if the line breaks.
- Lock all fuel tanks when not in use to reduce the risk of spills caused by vandalism or theft.
- Ground the pumps and vehicles to avoid buildup of static electricity, explosions and fires. Attach a bonding line to the vehicle prior to filling it from an aboveground fuel storage tank to reduce the risk of static electricity igniting fuel vapours (see Figure 6.1).

### JUST IN CASE OF A FIRE...

**To effectively fight a fire, first you need to know what type of fire you are dealing with:**

Class A – involves ordinary combustibles such as wood, paper, cloth, plastic, etc.

Class B – involves flammable and combustible liquids such as grease, gas, oils, paints, etc.

Class C – involves electrical equipment such as appliances, computers, breakers, motors, switches, etc.

Class D – involves burning metals such as aluminum, magnesium, sodium, etc.

**Each type of fire requires a different type of fire extinguisher:**

Pressurized Water – used for Class A fires, but not for Class B, C and D fires

Dry Chemical – used for Class ABC fires. These include Type ABC and Type BC fire extinguishers.

Carbon Dioxide (CO<sub>2</sub>) – used for Class B and C fires, but not for class A and D fires. These extinguishers do not leave harmful residues behind like dry chemical extinguishers.

Metal or Sand – used for Class D fires, but not Class ABC fires. The most common extinguishing agent in this class is sodium chloride, but there are a variety of other options.

Fire extinguishers should be accessible in the case of an emergency and should be checked and maintained on a regular basis. When storing and handling fuel on your farm, ensure a dry chemical such as a 40 pound Type BC or carbon dioxide fire extinguisher is located close enough to the fuel storage site, yet far enough away that the intensity of a fire would not stop you from getting it if necessary.

## 6.4 Small Containers

Precautions during storage and filling of small containers, such as jerry cans, need to be considered. Small containers should be stored away from direct sunlight and supported in an upright position. They should not be stored in or near living quarters such as basements.

To avoid mixing fuels, place different fuels in different coloured jerry cans. As a general rule of thumb, a gasoline jerry can is red, diesel is yellow and kerosene is blue.

To prevent spills when pouring from a jerry can, use funnels, spill-proof or stop-flow spouts or nozzles. Hand pumps are also available to eliminate or reduce spills and leaks.

## 6.5 Monitoring for Fuel Losses

To avoid spills and catch leaks, it is recommended that fuel tanks be monitored at least every 2 weeks. The best way to determine if there is a leak is through a visual inspection when walking around the tank, looking for rust spots, stains on the ground or cracks, breaks or bends in the hose.

Another way to determine if fuel losses are occurring is to maintain inventory records. An example of a fuel inventory control sheet is included in Figure 6.3. If the tank is equipped with a meter, an ongoing inventory record, kept for a minimum of two years or as long as the life of the tank, should be updated when fuel is used and added to the tank. The expected volume is compared to the actual volume. This amount is obtained from fuel dipping, which is measuring the amount of fuel in a tank with a dipstick or tape. Do not dip tanks immediately after fuel delivery; allow time for fuel agitation to subside.

FIGURE 6.3 SAMPLE FUEL INVENTORY CONTROL SHEET

**Fuel Inventory****Sample Fuel Inventory Control Sheet**

<b>TANK 1</b>		
Fuel Type		
Fuel Dips (cm)	97	This value is determined by dipping your tanks with a measuring rod or tape. The measurement is taken in centimeters.
Actual Volume (L)	2,054	This value is determined from the chart supplied by tank manufacturers. A depth of 97 centimeters converts to a volume of 2,054 litres (for this example).
Previous Actual Volume	1,710	Obtained from actual volume figures on your last inventory sheet.
Deliveries	+ 500	Fuel delivered since last inventory sheet.
Present Volume	= 2,210	Previous actual volume plus deliveries.
Usage	- 162	Fuel removed from the tanks since last inventory sheet.
Expected Inventory	= 2,048	The amount of fuel you expect to be in your tank (present volume minus usage).
Actual Volume (from dips)	2,054	
Expected Inventory	- 2,048	Actual fuel in the tank as calculated from fuel dip.
Today's Variance*	= +6	This figure is the expected inventory as calculated above.
Previous YTD Variance*	+ - 52	
YTD Variance*	= - 46	The difference between actual volume and expected inventory.
Water Reading (cm)	= 0.5	Cumulative year-to-date (YTD) variance from the last inventory sheet.

\*A negative variance indicates a fuel shortage.

Current YTD variance.

The water reading in the tank using water-sensitive paste on the dipstick.



If the tank size is unknown and is not equipped with a meter, it may not be possible to maintain an ongoing inventory record. Allow the tank to sit unused for 24 hours and measure the level of fuel at the start and end of the 24-hour period. Compare the measurements for signs of fuel loss. These measurements will be more consistent if done at least 24 hours after fuel delivery.

Any trend of unexplained losses of fuel or increases may indicate a leak and should be investigated further. You can also verify that a leak is occurring by using water-sensitive paste on the tip of the stick. If water can get into the tank, fuel can get out of the tank.

Despite taking necessary precautions to prevent spills and leaks, they do occur and must be dealt with effectively and efficiently. If a spill does occur, stop the flow as quickly as possible to prevent fuel from entering water bodies or sources and catching fire. Fuel can ignite easily when it overflows a vehicle's tank and comes in contact with a hot exhaust system. Use non-combustible materials such as soil to contain the spill; never use rags or sawdust to absorb it as these materials can easily catch fire. Contact your local fire department if the spill is more than 50 litres (13 gallons). If the spill is greater than 200 litres (53 gallons), as a regulatory requirement, you must report it to Alberta Environment by contacting their emergency department. (For contact information, refer to For More Information at the end of this chapter.)

## 6.6 Transportation of Fuel

The *Transportation of Dangerous Goods Regulations* regulates the transporting of fuel on Alberta highways.

When transporting gasoline or diesel by road shipping documents, UN numbers are training are not required if:

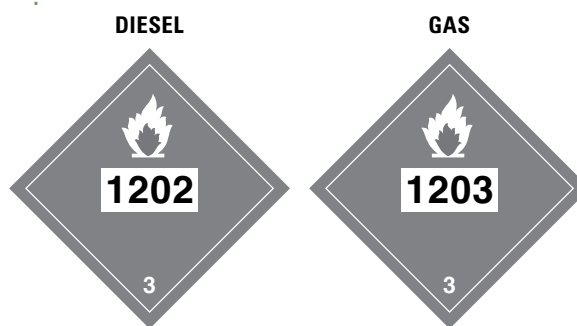
- the total capacity of all the containers is less than or equal to 2000L
- each of the containers displays the label or placard required
- at least one label or placard on each container is visible from outside the vehicle during transport and
- the container is visible from outside the vehicle during transport.

For example: a slip tank with a capacity between 450 L and 2000 L only requires one visible Class 3 placard secured to the tank.

Small containers (less than 450 L) of gasoline need to display the proper label (Class 3). Small containers of diesel requires only a flammable placard or sticker.

The UN number for diesel and gasoline are 1202 and 1203 respectively (see Figure 6.4).

FIGURE 6.4 PLACARDS SHOWING FLAMMABLE SYMBOL, CLASS AND UN NUMBER.



### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

## 6.7 Legislation

Producers should be aware of the following pieces of legislation that pertain to petroleum storage and handling and the potential environmental risks. For more information on the legislation, refer to Chapter 12.0 of this manual.

### Federal Legislation

*Transportation of Dangerous Goods Act*

*Transportation of Dangerous Goods Regulations*

### Provincial Legislation

*Environmental Protection and Enhancement Act*

## 6.8 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000**

### Alberta Agriculture & Forestry

**Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Farm Fuel Storage & Handling

### Alberta Environment and Parks

Information Centre: 310-ESRD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

Report spills or releases to Alberta Environment and Parks' Response Centre 24-hour-toll free line: 1-800-222-6514

### Alberta Municipal Affairs

Safety Services: 1-866-421-6929

Website: [www.alberta.ca/municipal-affairs.aspx](http://www.alberta.ca/municipal-affairs.aspx)

### Alberta Transportation

Co-ordination and Information Centre - 1-800-272-9600

- Dangerous Goods and the Agricultural Industry

Website: <https://www.alberta.ca/transportation.aspx>

**Safety Codes Council**

General Inquiries: 1-888-413-0099

Website: [www.safetycodes.ab.ca](http://www.safetycodes.ab.ca)

**Canadian Standards Association (CSA)**

General Inquiries: 1-800-463-6727

Website: [www.csagroup.org](http://www.csagroup.org)

**Petroleum Tank Management Association of Alberta**

General Inquiries: 1-866-222-8265

- Farm Tanks

Website: [www.ptmaa.ab.ca](http://www.ptmaa.ab.ca)





# CHAPTER 7.0

## Surface Water

This chapter discusses beneficial management practices and environmental risks associated with surface water pathways in and around the farmstead.



Surface water flowing onto the farmstead is called run-on and can be a result of runoff from adjacent land, rainfall or snow melt. Some surface water may be absorbed by the soil on the farm site. However, if the soil becomes saturated or is frozen, then water collecting on the soil surface will flow through the farmstead and become runoff.

If the water comes in contact with potential hazards such as pesticides, fuel, manure or sewage, it can carry contaminants such as chemicals or nutrients with it as it travels. Contaminated surface water should not be allowed to enter or adversely affect any water sources, such as dugouts or wells, or water bodies, such as groundwater, sloughs or streams. Contaminated runoff should not be allowed to travel off farm site property. Pathways, which potentially allow contaminated water to reach water supplies, should be carefully assessed to evaluate the level of environmental and safety risk that exists. If the risk is too high, then actions are necessary to reduce those risks.

## 7.1 Surface Water Pathways

When locating new or evaluating existing storage areas, animal facilities, water sources, buildings, septic fields and other facilities on farmsteads, keep in mind the natural water flow. Consider not only surface water run-on, but also surface water runoff pathways (especially if the water could contain contaminants).

Surface water run-on into the farmstead area is occasionally an advantage (when used to fill a dugout), but if run-on flows through contaminated areas, it becomes an environmental risk.

Where surface water run-on and runoff occur, the site must be managed to prevent contamination of watercourses and groundwater. To do this effectively, individual characteristics of each water pathway must be considered, as each pathway is different and will pose different levels of risk.

### 7.1.1. Water Pathway Characteristics

The topography of the area (slope steepness and length) affects how fast surface water will flow through pathways on the farmstead. For instance, the steeper the hill, the more energy the water has and the faster it flows. This situation creates greater potential for runoff to cause erosion and move contaminants into water supplies or beyond property lines.

Soil types also affect water pathways. Fine-textured soils (clay and silt) have slower water infiltration rates than coarse-textured soils, increasing the amount of surface runoff and posing a greater environmental risk to surface water. Coarse-textured soils (sand) with higher infiltration rates result in greater environmental risk to groundwater.

Precipitation influences the amount of run-on and runoff around and on the farm site. When rainfall is intense or occurs over a long duration, large amounts of surface runoff can be produced. This increases the risk of water erosion and surface water contamination. In winter, trees and snow fences, influence snow distribution patterns and snow melt rates which will change the amount of spring runoff and infiltration that occurs.

Areas with no plant cover or very little plant residue are susceptible to water erosion. Thin plant stands provide the soil with little protection from rainfall or surface runoff. The type of vegetation also influences the amount of erosion as dense, sod-forming plants provide more protection than do bunch-type plants or those in rows.

During winter conditions, when pathways are frozen or snow covered, the impact of runoff into waterways will be increased. Frozen soils do not have the same ability to absorb runoff water as

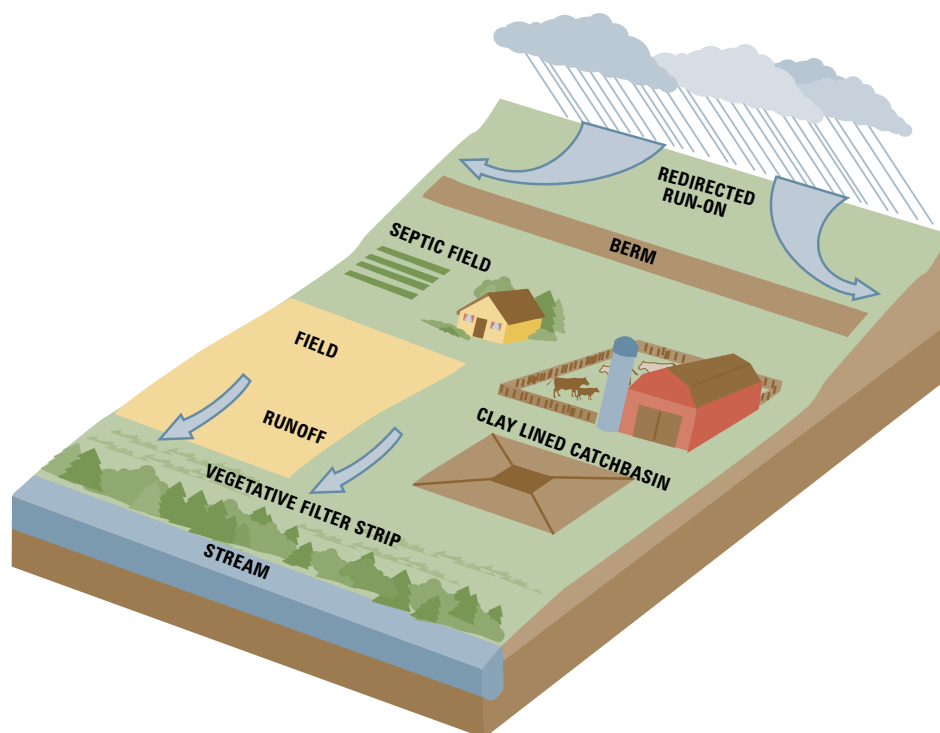
unfrozen soils and as a result the volume of runoff from melt waters will be increased. As well, any vegetative cover will be dormant and will not act as a filter to slow down water flow as it does in non-winter periods.

Understanding these characteristics and managing water pathways properly may help to reduce environmental risks associated with water movement on the farmstead.

## 7.2 Managing Water Pathways

Water pathways can be managed by reducing the volume of water, eliminating or minimizing potential hazards and controlling the movement of surface water within the farmstead (see Figure 7.1).

FIGURE 7.1 MANAGING SURFACE WATER PATHWAYS



### Follow these general guidelines to manage your water pathways:

- Locate the farm site on higher ground than that which surrounds it to avoid or prevent potential run-on from flowing onto the farmstead.
- Locate potential hazards such as manure storage areas away from water flow pathways and potential flood zones on the farm site, or protect storage sites so that contact with surface water is minimized or eliminated.
- Reduce the amount of run-on from flowing through yards.
  - Divert run-on waters around the farmstead using natural topography or man-made structures such as ditches, dykes, berms or pipes to avoid water contact with manure, sewage or other farm hazards to minimize water contamination. Keep in mind that large-scale diversions are regulated by the provincial *Water Act*, and these diversions may change water supplies and soil salinity patterns:
- Modify pathways to reduce the impact that surface water runoff may have for your particular situation. For example, designing and planting a vegetative filter strip in the pathway can

slow down water movement and settle out suspended solids. Another option to consider is a constructed wetland. Constructed wetlands will slow down water movement and contain it for a period of time, allowing biological activity to help reduce nutrient levels during the growing season.

- Reduce water usage by fixing leaks and using water restrictors when appropriate to conserve water and reduce the volume of runoff.
- Collect and store rainwater from roofs to water lawns and gardens or to wash objects on the farm site. Collected rainwater can be made clean enough for these uses by simply settling particles, separating solids, aerating or any combination of these.
- Contain and treat runoff that has come into contact with hazards:
  - Collect water that contains excess nutrients in a catch basin and use as fertilizer in the field.
  - Plant vegetative strips near riparian areas or ditches to settle sediments, filter, dilute and absorb nutrients.
  - Collect, contain and properly dispose of water that has pesticides, petroleum or other non-biodegradable hazards appropriately.

### 7.2.1 Manure Storage and Composting Operations

Water that has come in contact with manure or compost can absorb nutrients (of particular concern are phosphorus and nitrogen) as well as pathogens. These substances can contaminate clean surface water or groundwater supplies.

The *Agricultural Operation Practices Act (AOPA)* includes standards for the siting and construction of solid and liquid manure storages as well as compost storage areas to protect water quality. Surface water control systems are constructed to prevent runoff from leaving these storage areas. For more information, refer to the *AOPA Standards and Administration Regulation* listed at the end of this chapter.

### 7.2.2 Animal Facilities

Planning the livestock yard to minimize the amount of run-on (using topography, roofs, gutters, trenches or water diversions) will keep the yard drier and reduce the runoff produced. Siting of short term and long term animal facilities is regulated by AOPA. The livestock yard should be sloped for drainage, and runoff should be diverted to a collection area to be stored. A two-stage collection system works well, with the first shallow basin being used to settle out solids, with the runoff continuing on to a deeper holding basin. This runoff, along with the solids taken from the shallow settling basin, can be spread on fields as fertilizer since it is full of nutrients. It may also contain pathogens of which some are killed with time by sunlight or soil bacteria. An alternative would be to use vegetative filter strips or constructed wetlands to settle sediments and reduce nutrient losses into nearby water resources.



A clean water inlet pipe collects clean run-on water upslope of a livestock yard and discharges it below the yard through a drain outlet

— Courtesy of AF



Eroded waterway



Construction of grassed waterway



New grassed waterway



Constructing grassed waterways or vegetative strips can help control water erosion and treat water —  
*Courtesy of AF*



### 7.2.3 Disposal Sites for Mortalities

Be aware of the risks involved in handling dead animals and the runoff coming from burial or compost sites as it may contain pathogens as well as nutrients. The runoff should be stored and used as fertilizer on fields where there will be no contact with animals.

Proper disposal of dead animals is important to control disease transfer and to limit scavenging by wildlife as outlined in the *Animal Health Act*. Arrange for pickup by a rendering plant, burn in an approved incinerator or compost or bury mortalities as outlined in the Destruction and Disposal of Dead Animal Regulation. For more information, refer to Section 8.5 of Chapter 8.0.

### 7.2.4 Silage Storage

Silage leachate or runoff contains many nutrients. When large quantities are released into water bodies or soil, oxygen can be depleted, killing bacteria, fish or plants. Silage leachate is also acidic and may corrode metals and concrete, or dissolve soil minerals such as iron and manganese into soil water, which can then enter groundwater. Surface water and groundwater may also receive unwanted organisms such as molds or bacteria which can produce deadly toxins if the plant material is not at optimum moisture conditions for producing silage.

Depending on silage moisture levels, leachate may occur from the storage area or from runoff due to precipitation. If the silage cover is in good condition, precipitation should not be contaminated and can simply be directed away from the silage storage area.

If leachate does occur, it should be collected in a non-metallic, vented storage area. Deadly gases such as hydrogen sulfide can form if the leachate mixes with manure on-site. Treat the leachate using aeration, dilution or neutralization methods or use as a fertilizer in the field. When fertilizing fields with silage leachate, use amounts that will not burn crops, deplete soil oxygen levels or migrate into watercourses. Another option is to use silage leachate as added moisture when making compost. Aerobic composting bacteria use the nutrients in the leachate and the pH is returned to non-acidic values.

### 7.2.5 Disposal Field Systems

Both run-on and runoff should be considered when operating or locating septic systems such as disposal fields or open discharge systems. These systems rely on aerobic (oxygen-using) bacteria in the soil to filter nutrients, so they do not leach into groundwater. If the field becomes waterlogged from excessive run-on or use, then the bacteria cannot get enough oxygen. When this occurs, nutrient levels may increase and reach groundwater or surface water. The bacteria may also end up in the groundwater or clog soil pores. Overloading a septic field also creates risks associated with increased runoff. For more information, refer to Chapter 9.0.

The pathways to and from the septic systems should be studied carefully; keeping in mind that rainwater from roofs, patios and driveways should not discharge into the same area. Any runoff that has been in contact with the area should be collected and used as fertilizer.

#### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

## 7.3 Legislation

Producers should be aware of the following pieces of legislation that pertain to managing surface water. For more information on the legislation, refer to Chapter 12.0 of this manual.

### Federal Legislation

*Fisheries Act*

### Provincial Legislation

*Agricultural Operation Practices Act (AOPA)*

Standards and Administration Regulation

*Animal Health Act*

Disposal of Dead Animals Regulation

*Environmental Protection and Enhancement Act*

Waste Control Regulation

*Safety Codes Act*

Private Sewage Disposal Systems Regulation 229/97

Alberta Private Sewage Systems Standard of Practice 2015

*Water Act*

Water (Ministerial) Regulation

## 7.4 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### Alberta Agriculture & Forestry

#### Ag-Info Centre: 310-FARM (3276)

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Agricultural Operation Practices Act (AOPA) – 2008 Reference Guide Agdex 096-1
- Cattle Wintering Sites Agdex 420/580-2
- Emergency Wind Erosion Control Measures Agdex 572-1
- Grassed Waterway Construction Agdex 573-6
- Introduction to Water Erosion Control Agdex 572-3
- Introduction to Wind Erosion Control Agdex 572-2
- Livestock Mortality Management Agdex 400/29-1
- The Standard – Environmental Standards for Alberta's Livestock Industry Fact Sheets
- Quality Farm Dugouts Agdex 716 (B01)
- Wintering Site Assessment and Design Tool Agdex 420/580-3

### Alberta Environment and Parks

Information Centre: 310-ERSD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

- Alberta Water Well Information Database

**Alberta Municipal Affairs**

Safety Services: 1-866- 421-6929

Website: [www.alberta.ca/municipal-affairs.aspx](http://www.alberta.ca/municipal-affairs.aspx)

Publications:

- Alberta Private Sewage Systems Standards of Practice Manual

**Feeder Associations of Alberta Limited**

Website: [www.feederassoc.com](http://www.feederassoc.com)

Publications:

- Alberta Feedlot Management Guide

**Cows and Fish - Alberta Riparian Habitat Management Society**

Website: [www.cowsandfish.org](http://www.cowsandfish.org)

Publications: 403-381-5538

- Caring For The Green Zone: Riparian Areas and Grazing Management
- Riparian Areas: A User's Guide to Health
- Riparian Health Assessment



# CHAPTER 8.0

## **Farmstead Waste Management**

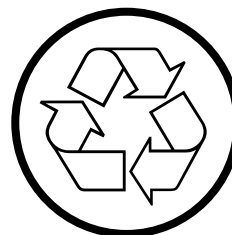
This chapter discusses beneficial management practices that address waste management on the farm.



Farm waste items pose an environmental risk if they are not stored or disposed of properly.

The best strategy for managing waste on a farmstead starts by:

- **Reducing** the amount of waste created. This is the best waste management option.
- **Reusing** items for the same or different purposes.
- **Recycling**, composting and recovering energy as alternatives to waste disposal.
- **Disposing** of items only when other options are not possible.



Finding out what services are available in your community is your first step to waste management. Waste programs vary across Alberta, with municipalities developing management strategies that work best for their particular circumstance and location. The Government of Alberta is responsible for provincial waste standards and guidelines, but Alberta's municipalities manage "on-the-ground" operations of municipal and regional landfills, as well as community waste diversion efforts. Many local community groups and non-government organizations devote a tremendous amount of time to promoting waste reduction and recycling programs.

The following table (Table 8.1) outlines options for managing different farm wastes. To ensure facilities will accept your waste, take the necessary steps or precautions prior to delivery. For more details on how to manage your wastes, contact the organizations listed in "For More Information" at the end of this chapter.

TABLE 8.1 TIPS ON HOW TO MANAGE FARM WASTES

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Refrigerators or freezers	Have refrigerant removed by certified technician		Use as pesticide or animal health care product storage (where no refrigeration required)	Scrap dealer	Licensed landfill (Some sites will remove refrigerant for a fee)
Electronic wastes				Recycling depot (a fee may apply)	
Cardboard and plastic packaging	Keep clean and dry	Purchase products in bulk		Recycling depot	Licensed landfill
Petroleum product packaging	Empty and dry				Licensed landfill
Inert materials (brick, concrete, metal and wood building materials)	Store in secure area		Reuse on farm	Recycle dealers	Licensed landfill Only burn wood products with no preservatives (see Section 8.1)

TABLE 8.1 (CONTINUED) TIPS ON HOW TO MANAGE FARM WASTES

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Restricted use materials (insulation, treated lumber, asbestos, composite products and lead pipe)	Store in secure area		Reuse except for asbestos	Recycle except for asbestos	Licensed landfill Dispose of asbestos as a hazardous waste
Old vehicles and farm equipment	Remove any fluids (oil, antifreeze, fuel)			Use for parts or take to scrap dealers	
Automotive wastes (lubricants, antifreeze, filters)	Store in secure area, ensure no water can get into fluids and do not mix antifreeze with other automotive wastes			Fuel dealers	Dispose of as a hazardous waste
Batteries	Store in secure area where spills or leaks can be contained			Recyclers (Automotive batteries cannot be transported in bulk)	Battery collection Dispose of as a hazardous waste
Pressurized tanks				Return to supplier	
Tires			Reuse	Tire recycling depot or retailer	Licensed landfill that will accept tires
Used motor oils and filters	Store in secure storage units with secondary containment		Reuse as a lubricant or as road dust control (see Section 8.8)	Oil recycling depot Local fuel retailer	Dispose of as a hazardous waste
Unused pesticides (see Section 8.6)				Return unopened and leftover product to dealer	Dispose of as a hazardous waste
Pesticide containers and contaminated packaging (see Section 8.6)	Triple-rinse or pressure rinse containers		Do not reuse	Take to pesticide container recycling depot or return to dealers where possible	
Organic wastes (grass clippings, trees, shrubs, and food waste)				Compost	Burn trees and shrubs (see Section 8.1)

TABLE 8.1 (CONTINUED) TIPS ON HOW TO MANAGE FARM WASTES

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Treated seed (see Section 8.7)	Secure in a sealed container	Only treat what is needed	Seed for silage		Licensed landfill
Mortalities (see Section 8.5)					
Sharps (see Section 8.4)	Secure storage to prevent injury and separate from other wastes				Class II landfill that accepts medical wastes Veterinary clinic that can handle sharps
Glass	Secure storage to prevent injury and separate from other wastes				Licensed landfill
Animal health care products and medical wastes (see Sections 8.3 and 8.4)	Store in original container in secure area		Return unused to retailer		Expired drugs Class II landfill that accepts medical waste Dispose of as a hazardous waste
Household hazardous wastes (see Section 8.2)					Dispose of as a hazardous waste
Paints, adhesives and cleaners	Store in secure area and dry out paint cans		Reuse or share with others in properly labeled containers		Dispose of as a hazardous waste

**LICENSED LANDFILL:**

Waste disposal creates issues involving leachate, methane gas and odour. A licensed landfill is a specific place designed to dispose of waste in a safe manner. All licensed landfills in Alberta go through a rigorous engineering site assessment to guard against surface water and groundwater pollution. Licensed sites separate wastes, such as construction materials, paint containers, batteries and household garbage. In general, licensed sites will have approval from the Province, which also classifies landfills based on the type of waste material collected.

## 8.1 Burning

Some farmsteads have a burning barrel, but burning waste not only poses a fire hazard, it also releases many chemicals creating environmental risks. Burning barrels do not reach high enough temperatures to destroy complex chemicals and they only tend to smolder and smoke. These chemicals are released into your backyard and surrounding community. They can be quite toxic to animals and humans potentially contaminating food processed from animals that consumed residue-contaminated feed.

**To reduce environmental and health risks associated with burning waste, only burn items listed under the Substance Release Regulation of the *Environmental Protection and Enhancement Act*, as “burnable debris,” which includes:**

- brush and fallen trees
- used power and telephone poles that **do not contain preservatives**
- wood or wood products **not containing preservatives**
- solid waste from post and pole operations that **do not contain wood preservatives**
- solid waste from tree harvesting
- straw, stubble, grass, weeds, leaves and tree pruning's



A typical farmstead burning barrel for burnable wastes only — *Courtesy of AF*

**Under the same Regulation, “prohibited debris,” which cannot be burned without a special permit, includes::**

- animal manure
- wood or wood products containing wood preservatives
- waste materials from construction sites
- rubber, including tires
- plastics, including baler twine
- oil, pesticides or any other chemical containers
- plastic or rubber-coated materials, including copper wire
- any waste that causes dense smoke, offensive odours or releases toxic substances

If using a burn barrel, ensure to use proper ventilation and screens, locate it far enough away from combustible materials and never leave it unattended during use. Remember, there are other alternatives to burning waste: reduce, reuse, recycle, recover and finally proper disposal.



## 8.2 Household Hazardous Waste

Household hazardous waste refers to materials used in daily activities that are potentially damaging to our environment, health and safety. Typical household hazardous wastes are materials leftover from activities such as painting, cleaning, disinfecting and gardening.

Communities throughout Alberta participate in annual one-day hazardous waste roundups and/or offer year-round collection facilities. Municipalities organize the roundups and pay for collection of the material. The Province provides funds for the transportation, treatment and disposal of collected material at the Swan Hills Treatment Centre.

To view a schedule for roundup days or permanent collection facilities, contact Alberta Recycling Management Authority by visiting their website at [www.albertarecycling.ca](http://www.albertarecycling.ca).

### HAZARDOUS WASTE DISPOSAL

Hazardous wastes can be solids, liquids or gases held in containers that may be flammable, corrosive, explosive or toxic. Because of these dangerous characteristics, these wastes should not be disposed of in landfills or sewage systems.

Products that have potentially hazardous characteristics display at least one of the following warning symbols:



**Flammable** - burn easily like paints, degreasers and other solvents.



**Corrosive** - eat away surfaces and skin. Familiar examples are waste acids, rust removers, alkaline cleaning fluids and old battery acid.



**Reactive/Explosive** - react violently when mixed with other chemicals or that react under pressure or heat such as aerosols.



**Toxic/Poison** - poison or cause damage to living organisms. Materials containing heavy metals like mercury, lead or cadmium.

When a product displays one or more warning symbols, it should be disposed of as a hazardous waste.

For more information on disposing hazardous wastes, visit Recycling Council of Alberta's website or call the Hotline at 1-800-463-6326

## 8.3 Medical Wastes

Medicines may need to be disposed of for various reasons including expiry, spoilage or simply because they are no longer needed. Expired drugs can be returned to where they were purchased as many manufacturers will take them back for disposal.

Expired drugs can also be discarded in the same ways as sharps. When disposing of expired medicines, do not attempt to empty or wash bottles; discard them with their contents. Consult a local vet or pharmacist to learn more about medicine disposal.

Modified live virus vaccines should be rendered non-infectious before disposal to prevent the virus from potentially infecting workers or animals. Freezing or adding bleach to the bottle can do this.

## 8.4 Animal Health Care Products

Any leftover or re-useable animal health care products should be returned to the place of purchase or stored in the original container in a secure storage area. Often, these products have recommendations for disposal printed on their labels.

Items that are not usable or have expired beyond the best-before date can be returned to the place of purchase or taken to a hazardous waste depot for proper disposal.

### 8.4.1 Disposing of Veterinary Waste

Sharps are veterinary and laboratory materials capable of causing cuts or punctures. Sharps include needles, syringes, scalpel blades, slides, coverslips, pipettes, broken glass and empty or expired pharmaceutical containers. There are risks of needle stick injuries or cuts when these materials are not handled or disposed of properly. Certain drugs or vaccines may cause reactions or infections if they are present on broken glass or used needles that break the skin. Blood on used needles, collection tubes or other equipment may contain viruses or bacteria that can cause illness following a cut or needle stick injury. Currently, no regulations cover the disposal of sharps in agriculture.

#### To safely dispose of sharps:

- Separate sharps from other waste.
- Use a labelled, puncture-proof container with a sealed lid for needles and surgical blades. Special containers can be obtained from many local veterinary clinics.
- Containers must be labelled clearly as containing sharps and must not be used for recycling.
- Do not use containers that allow easy access to the contents. Ensure children or animals cannot remove the lid. A plastic jug with a narrow mouth or a pail with a narrow opening in the lid also works well.
- Use another pail or rigid container for pharmaceutical bottles and syringes.
- Do not burn disposal containers. Use disposal facilities that are set up to accept the waste. This may include a local vet clinic, hospital or waste disposal company. Contact a local vet clinic or hospital for more information. Labelled sealed containers can also be taken to Class II landfills that accept medical waste.

#### OTHER ANIMAL HEALTH CARE PRODUCTS:

Items including antibiotics, parasite treatments, vaccines, implants and banned drug products need to be disposed of immediately after use. In addition to returning those products back to the place of purchase, you can take them to a hazardous waste facility to be disposed of properly. Regularly consult your supplier or veterinarian about products that may have been banned.

## 8.5 Livestock, Poultry and Farm Animal Mortalities

Livestock and animal deaths may occur no matter how well an operation is managed. Disposing of dead animals quickly and effectively is important to reduce the risk and spread of disease. Carcasses can be a source of disease if scavenged by wildlife or pets. Some of these diseases can then be passed back to livestock or even humans. Carcasses are also unsightly, odourous and a breeding site for flies.

**The choices for disposal under *Alberta's Animal Health Act* - Destruction and Disposal Dead Animal Regulation are:**

- landfill
- burial
- burning or incineration
- composting
- rendering
- natural disposal (except for animals that have been euthanized with drugs and chemicals or if the animal is known or suspected to have died from an infectious or reportable disease)

**The owner of a dead animal shall dispose of it within 7 days unless the dead animal is stored:**

- outside during winter when the temperature is low enough to keep the dead animal completely frozen,
- in a freezer, or
- in accordance with the directions of the Chief Provincial Veterinarian, an inspector appointed under the *Animal Health Act* or a veterinarian inspector appointed under the *Health of Animals Act*.

### 8.5.1 Landfills

Dead animals may be disposed of in a Class I or Class II landfill as defined in the *Waste Control Regulation* (AR192/96).

### 8.5.2 Burial

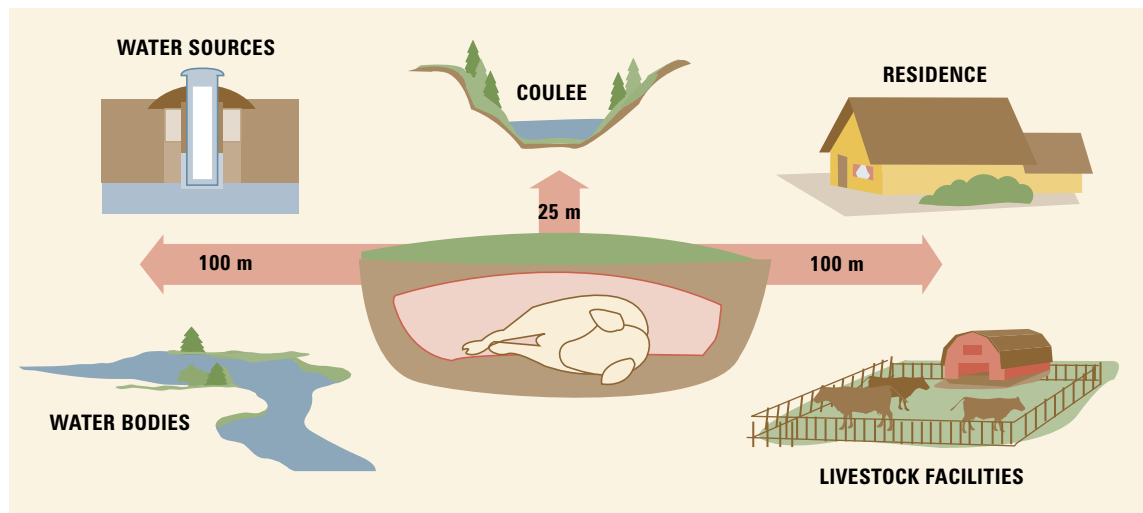
If carcasses are to be buried, do it promptly to control odour, insects and scavenging. Screen the burial pit area from view with trees, shrubs or fences, and locate it some distance away from livestock and other farm areas (see Figure 8.1). For more information, refer to Alberta's Livestock Mortality Burial Techniques document (Agdex 400/29-2).

**Destruction and Disposal of Dead Animals Regulations contain guidelines for burial:**

When the total weight of dead animals in a pit **does not exceed 2500 kg** the pit must follow these guidelines:

- The bottom of the pit must be at least 1m (3ft) above the seasonal high water table.
- The pit must be:
  - 100 m (328 ft) from wells, all waterways and high watermarks of lakes,
  - 25 m (82 ft) from the edge of any coulee or embankment,
  - 10 m (33 ft) from any other farm burial pit,
  - 100 m (328 ft) from the boundary of any land owned or leased by another person, unless that person has consented in writing,
  - 300 m (984 ft) from a primary highway,
  - and covered with:
    - a minimum of 1 m (3 ft) of compacted soil or
    - a wooden or metal lid that is designed to exclude scavengers and a quicklime is applied in sufficient quantities to control flies and odour.

FIGURE 8.1 MINIMUM DISTANCE SEPARATIONS FOR BURIAL PITS THAT DOES NOT EXCEED 2500 KG



When the total weight of dead animals in a pit **does not exceed 100 kg** the pit must follow these guidelines:

- The bottom of the pit must be at least 1m (3ft) above the seasonal high water table.
- The pit must be:
  - 50 m (164 ft) from wells, all waterways and high watermarks of lakes,
  - 25 m (82 ft) from the edge of any coulee or embankment,
  - 100 m (328 ft) from any residence, on land owned or leased by another person,
  - 3 m (10ft) from any other farm burial pit,
  - and covered with:
    - a minimum of 1m (3ft) of compacted soil and
    - has not been used for burial during the previous 5 year period.

### 8.5.3 Burning

The *Destruction and Disposal of Dead Animal Regulation* states a dead animal may be burned in accordance with the *Environmental Protection and Enhancement Act* in the regulations or codes of practices under that act in an open fire or an incinerator.

### 8.5.4 Composting

Composting carcasses is an effective way of disposal and can be done in a bin system designed for composting or in an open compost pile. Examples of bin designs are available in Alberta Agriculture and Forestry's *Swine Mortality Composting* and *Poultry Mortality Composting* documents (Agdex 440/29-1 and Agdex 450/29-1).

Dead animals can also be transported to a composting facility. These are Class I compost facilities as defined in the *Waste Control Regulation* (AR 192/96)

**Composting can be done on farm in a windrow or open compost pile that is:**

- 100 m (328 ft) from wells or other domestic water intakes, streams, creeks, ponds, springs, and lake high watermarks,
- 25 m (82 ft) from the edge of any coulee or embankment,



- 100 m (328 ft) from any residence,
- 100 m (328 ft) from the boundary of any land owned or leased by another person, unless that person has consented in writing,
- 300 m (984 ft) from any provincial highway
- and are covered with:
  - at least 60 cm (2 ft) of composting material and
  - designed in a manner that will exclude scavengers.

**Composting dead animals can be done on the farm in a system within a building that has:**

- An impervious floor and
- adequate drainage control to prevent the contamination of surface water or ground water.

**When one or more dead animals are composted on farm:**

- the maximum volume of the animals must not exceed 25 percent of the total composted pile and,
- material may not be removed from the pile until the animals are composted to the extent that:
  - odours are minimized,
  - compost will not contaminate water,
  - compost will not attract vectors of disease and
  - use of compost will not cause or contribute to the spread of diseases, cause scavenging or create a nuisance.

### 8.5.5 Rendering

**Dead animals must be picked up by rendering plants within 7 days of death; until then, the carcass must be stored. When storing carcasses:**

- locate the storage area close to the entrance of the farm to minimize the need for collection vehicles to enter the property,
- use an area that will minimize the spread of disease — for example, do not store the carcass near a waterway or water body or where it will be easily scavenged and
- if not picked up within 7 days, use refrigeration until the carcass is taken to a rendering facility.

### 8.5.6 Natural Disposal

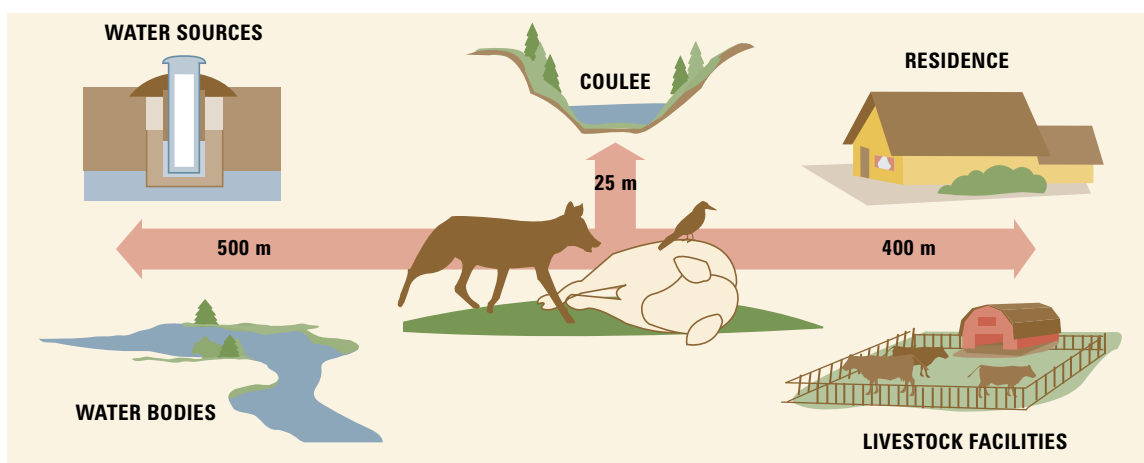
Natural disposal refers to disposal by scavenging and sites must be located well away from farm areas, water bodies and sources (see Figure 8.2). However, if the animal is known or suspected to have died from a reportable or an infectious disease or has been euthanized, natural disposal is not allowed.

**The *Destruction and Disposal of Dead Animals Regulation* summary for natural disposal states:**

- The total weight of the carcasses disposed of at any one site must not exceed 1,000 kilograms (2,200 lbs).
- There must be at least 500 m (1640 ft) between disposal sites.
- The site must be:
  - on property owned or leased by the owner of the dead animal,

- 100 m from the boundary of land owned or leased by any other person unless that person has consented in writing,
- 500 m (1,640 ft) from wells, waterways and lake high watermarks
- 25 m (82 ft) from the edge of any coulee or embankment,
- 400 m (1,312 ft) from any livestock facility, including pastures that are not owned or leased by the owner of the animal,
- 400 m (1,312 ft) from any residence,
- 400 m (1,312 ft) from any road and
- 400 m (1,312 ft) from a park, recreation area, natural area, ecological reserve, wilderness area, forest recreation area or any other land intended for recreational use.
- The site must not create a nuisance.

FIGURE 8.2 MINIMUM DISTANCE SEPARATIONS FOR NATURAL DISPOSAL



## 8.6 Pesticides

### 8.6.1 Proper Pesticide Disposal

Pesticides that are no longer usable are considered hazardous wastes and cannot be disposed of in a Class II landfill or by burning.

#### To use up and dispose of excess or unwanted pesticides:

- Return unopened or non-compromised product to the dealer for a refund.
- Offer opened and unused leftover pesticide supplies, in original containers with product labels attached, to other potential users (such as neighbours or the municipality) for use according to label directions.
- Consider using up smaller quantities for weed control, according to label directions, along fence lines and other areas difficult to access with large spray equipment.
- Contact the nearest hazardous waste depot for disposal.

### 8.6.2 Pesticide Container Disposal

Many common pesticides are now available in returnable containers that do not require rinsing as they are returned to the manufacturer to be re-filled when they are empty. There are, however, still many pesticides that are used in smaller volumes or that are not available in returnable containers.

Unrinsed containers have the potential to contaminate soil, groundwater and surface water, which can be toxic to fish and wildlife, as well as fill valuable space in landfills. Also, these containers impede the processing and recycling of other empty pesticide containers, as they have to be emptied, exposing workers to the residue. Residues can be lost to the atmosphere during storage, processing, shipping and energy recovery, or they can contaminate end products from plastic recycling processes. In addition, it is estimated that 6 to 7 percent of product can be left in unrinsed containers. This amount of material can treat ½ to 1 acre of land and can save you several dollars per container.

Pesticide containers must be manually triple-rinsed or **pressure rinsed** and dried before disposal at a pesticide container site. Currently, most producers use triple-rinsing, and in most cases, this practice leaves plastic, metal or glass pesticide containers more than 99 percent free (less than 1 ppm) of residues.

**Follow these steps for manual triple-rinsing your containers:**

1. Empty container contents into sprayer tank and drain in a vertical position for 30 seconds.
2. Add water to container to about 1/5 full.
3. Shake container thoroughly, empty into sprayer tank and drain for 30 seconds.
4. Repeat procedure two more times (it should only take about 5 minutes in total).
5. Puncture or break open triple-rinsed container so it cannot be reused. **Note:** Do not puncture unrinsed containers as pesticide from unrinsed containers is concentrated and will leak, exposing persons handling the containers and the environment to the concentrated pesticide.
6. Dispose of all plastic and metal containers at a pesticide container collection site.

Instead of using the triple-rinse procedure, producers can eliminate steps with a pressure jug rinser. Pressure rinsers direct water from a pressurized source against the inner sides of the container, which effectively washes the pesticide residue into the spray tank. Pressure rinsers also have the added advantage of rendering containers useless by automatically puncturing them. This method reduces environmental risks by ensuring jugs are rinsed automatically and reduces the risk to the producer by eliminating handling of pesticide containers.

Empty pesticide containers must be disposed of properly and in accordance with provincial regulations. Under Alberta's *Environmental Protection and Enhancement Act*, non-refillable plastic or metal pesticide containers (restricted, commercial, agricultural and industrial products) must be disposed of at a pesticide container collection site. A list of pesticide container disposal sites in Alberta and operation hours are available from municipalities, the Alberta Agriculture and Forestry Crop Protection Manual, (Agdex 606-1) or Alberta Environment and Parks.

Paper and cardboard pesticide packaging that have not been contaminated with pesticides can be directed to a recycling centre. Any cardboard contaminated due to a container rupture, accidental spill or improper handling procedure should be disposed of as a hazardous waste. Evidence of cardboard contamination should be obvious – signs of exposure to liquid, powder or granules, or a strong chemical odour. Do not burn paper bags or cardboard containers. Some pesticide container sites have bins or separate areas for collecting these outer packaging materials. Containers from topical parasiticides (e.g. pour-on compounds or powders for lice and mange) should be returned to dealers for collection and disposed through programs operated by manufacturers.

## 8.7 Treated Seed

**Practices to properly store and dispose of treated seed include the following:**

- If you are treating bulk seed on the farm, treat only as much as you need for immediate use.
- For temporary storage on the farm, place the seed in a secure, sealed container.
- If you have leftover treated seed that cannot be returned to a dealer, plant the seed at a rate not exceeding three times the normal seeding rate, or contact a regional sanitary landfill for authorization to bring the seed to the landfill for immediate burial.

## 8.8 Used Oil for Road Surfaces

Used oil can be recycled or used to control dust. Used oil applied to roadways as a dust suppressant must follow Alberta's Guidelines for the Application of Used Oil Road Surfaces, which includes the following conditions:

**These guidelines allow used oil to be applied for dust control under the following conditions:**

- The applicator must have permission from the land owner or municipality responsible for the road.
- The oil must meet certain specifications for maximum contents of things like arsenic, cadmium, lead, etc. (These components are listed in the guidelines, but fortunately most waste oil from typical diesel or gasoline engines contains less than these limits, so farmers are not obligated to send their oil in for testing).
- The application of the oil must be more than 25 m from surface water (including sloughs) or a domestic water supply.
- The application rate cannot result in visible runoff of oil beyond the traveled portion of the road.
- Application of oil is limited to two times per calendar year.

For more information about recycling used oil contact the Alberta Used Oil Management Association at [www.usedoilrecyclingab.com](http://www.usedoilrecyclingab.com) or toll-free at 1-888-922-2298.

### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

## 8.9 Legislation

Producers should be aware of the following pieces of legislation that pertain to wastes and the environmental risks associated with their storage and disposal. For more information on the legislation, refer to Chapter 12.0 of this manual.

### Federal Legislation

*Fisheries Act*

*Health of Animals Act*



**Provincial Legislation**

*Environmental Protection and Enhancement Act*

*Substance Release Regulation*

*Waste Control Regulation*

*Animal Health Act*

*Disposal of Dead Animals Regulation*

**8.10 For More Information**

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

**Alberta Agriculture & Forestry****Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- Crop Protection – the Bluebook Agdex 606-1
- Livestock Mortality Burial Techniques Agdex 400/29-2
- Livestock Mortality Management (Disposal) Agdex 400/29-1
- Poultry Mortality Composting Agdex 450/29-1
- Swine Mortality Composting Agdex 440/29-1

**Alberta Environment and Parks**

Information Centre: 310-ERSD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

- Code of Practice for Compost Facilities
- Code of Practice for Small Incinerators
- Saving the World Begins at Home
- Used Oil as Dust Suppressant

**Recycling Council of Alberta**

Phone: 1-403-843-6563

Website: [www.recycle.ab.ca](http://www.recycle.ab.ca)

**Alberta Plastics Recycling Association**

Toll-free: 1-855-939-2386

Website: <http://albertaplasticsrecycling.com>

**Alberta Used Oil Management Association**

Recycling Centre Locations: 1-888-922-2298

Website: [www.usedoilrecyclingab.com](http://www.usedoilrecyclingab.com)



# CHAPTER 9.0

## Household Wastewater Management

This chapter discusses beneficial management practices that address household wastewater management through proper installation and maintenance of a private sewage system on a farmstead.



Almost all farm homes use private sewage treatment systems, which collect, treat and dispose of treated wastewater from a single source in the same location that it is generated. The most common type of on-site sewage system is a septic system, which includes a holding tank where bacteria decompose waste products into effluent, indigestible solids and gases. The effluent is discharged on-site, while the undigested solids remain in the tank to be pumped out on a regular basis.

These systems are usually economical and reliable, but they must be properly designed and maintained to handle all the wastewater produced. The system must also treat the wastewater to prevent further surface water and groundwater contamination since it may contain bacteria, infectious viruses, household chemicals and excess nutrients such as nitrates and phosphates. Learning more about your present system can help determine if it is treating your household wastewater properly.

### 9.1 Proper Design and Siting of a Private Sewage Treatment System

To prevent potential contamination on your farmstead, you should ensure that your sewage system is designed and functioning properly so that wastewater is treated effectively. To achieve this goal, there needs to be sufficient wastewater amounts, good wastewater movement and a proper system design. These components also ensure complete distribution and reduce the incidence of freezing within the system. Steps should be taken to prevent oversaturation of disposal field systems.

It is important to look at the farmstead site to determine where potential problems could arise. A soil profile would identify unfavourable soil characteristics, high water tables and impervious layers that could impact a household wastewater treatment system design. You need to consider the location of the system as well as the potential wastewater volumes and the strength of sewage being generated to minimize any potential environmental risks.



Septic tank installation — Courtesy of Safety Services, Alberta Municipal Affairs

**When siting the sewage system on the farmstead, consider the following options:**

- direct run-on waters away from the disposal area
- discharge sewage effluent away from a water body or vegetable garden
- ensure distances from buildings, dwellings, property lines, water sources and water bodies follow what is outlined in the *Alberta Private Sewage Systems Standard of Practice* for Alberta.

## 9.2 Types of On-site Private Sewage Systems

The first step to ensuring that your sewage system is working properly is to know what type of system you have.

**On-site private sewage systems can include one or a combination of the following:**

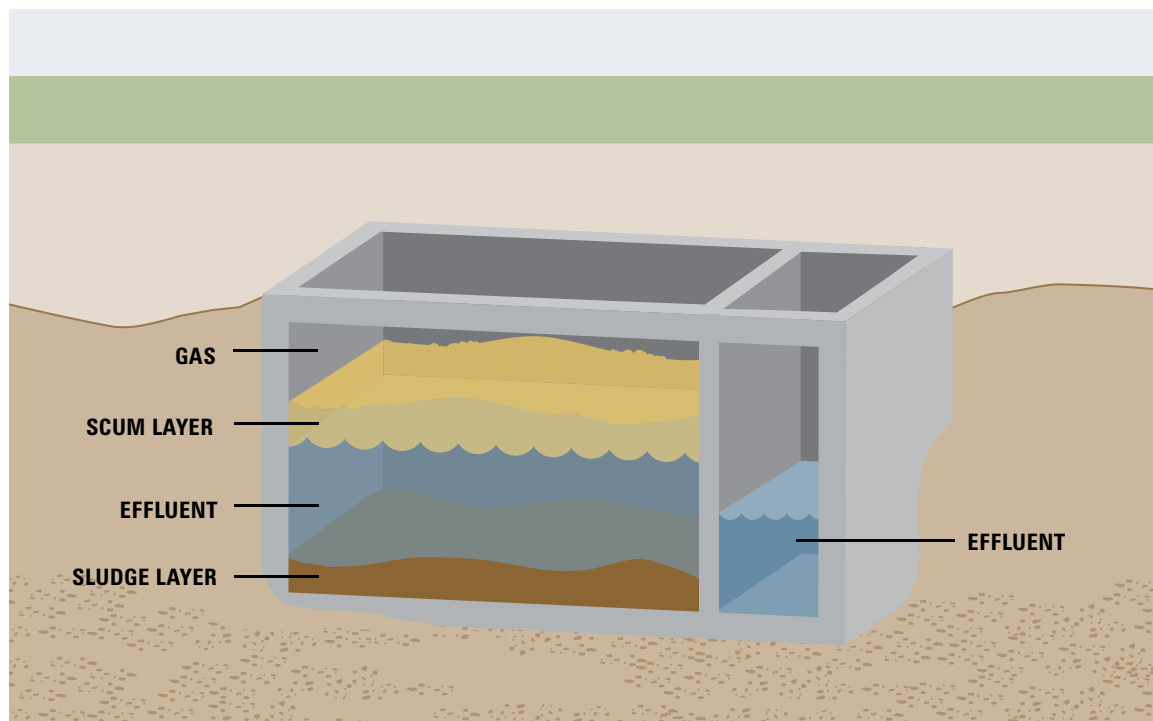
### Holding tank

A holding tank is a certified watertight receptacle for the collection and temporary storage of sewage, until it can be pumped out. Mobile equipment is used to empty the tank, and the sewage is disposed of in an acceptable manner.

### Septic tank

The septic tank is a digestion chamber comprised of two steps in which sewage is retained and effluent is discharged (see Figure 9.1). The first chamber settles out the solids producing a sludge layer, which is pumped out after a certain time period. The second chamber receives the effluent from the first chamber, which is then stored and intermittently discharged to a downstream soil based effluent treatment component.

FIGURE 9.1 SEPTIC TANK SYSTEM





### **Packaged sewage treatment plant**

A packaged sewage treatment plant is a high tech septic tank that produces a higher quality effluent than a standard septic tank. Treatment plants vary, using air introduction or attached growth media to help breakdown the material, resulting in secondary treated effluent. The effluent is discharged to the final treatment component of the disposal system. Treatment plants require annual maintenance as per the manufacturer's requirements to ensure proper operation. Maintenance may require the periodic removal of sludge depending on the type of treatment plant.

### **Sand Filters**

Sand filters receive effluent from a septic tank and provide further treatment. This additional treatment is achieved using a pressurized distribution system within the sand filter, which intermittently discharges effluent evenly over the surface of the sand. The sand provides an aerobic environment and contains bacteria that treat the effluent. Once treated, the effluent is then collected and pumped to a final treatment component.

#### **GRAVITY DISTRIBUTION VERSUS PRESSURE DISTRIBUTION OF EFFLUENT**

A gravity distribution system may not evenly distribute effluent over the infiltrative surface of the soil based treatment component. The soil may become saturated in some areas which would be unfavorable for aerobic microbes to treat the sewage and other areas may not receive any effluent at all. Pressure distribution provides a more even dispersion of effluent in a disposal field or mound, resulting in a more effective wastewater treatment and extending the life of the system.

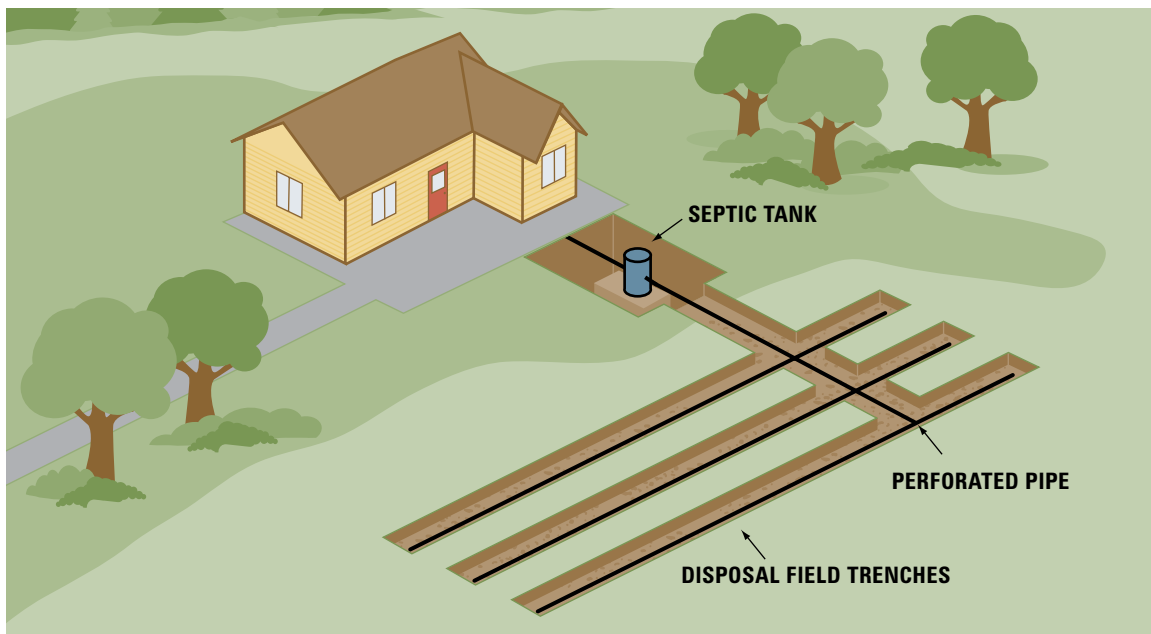
### **Disposal field**

A disposal field system is an effective means of distributing effluent evenly within a soil-covered trench containing void spaces. Microorganisms living in the soil then use oxygen in these voids to breakdown the effluent into safer components.

#### **Types of disposal fields include:**

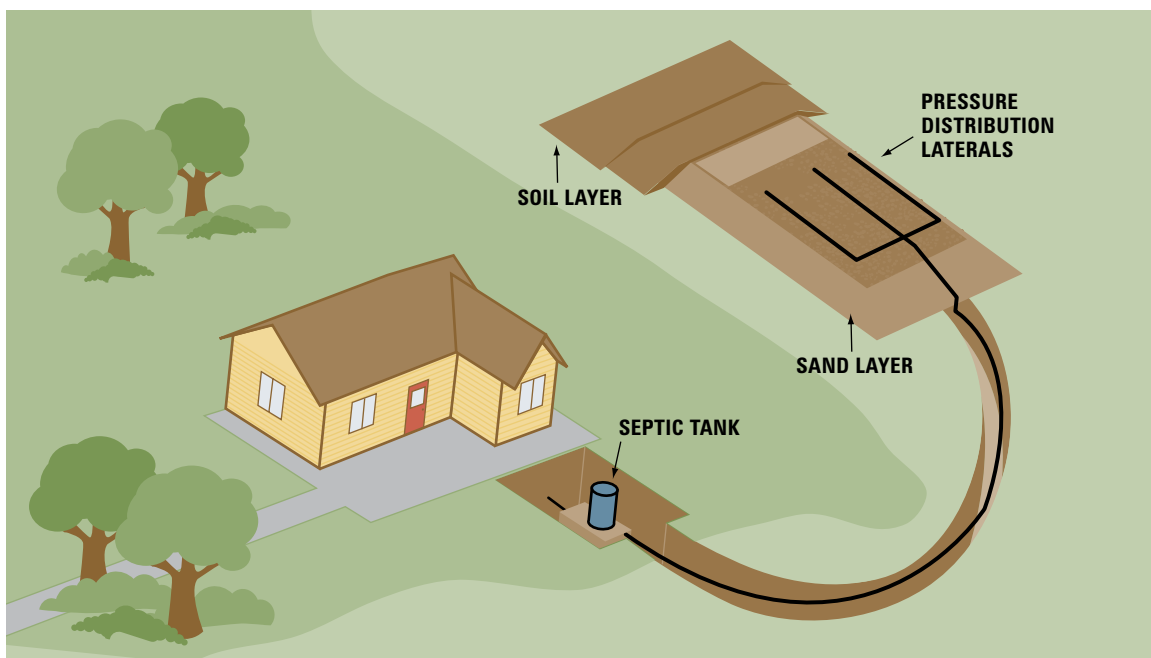
- a conventional system that uses perforated piping laid in gravel-bedded trenches to help distribute effluent in the soil (see Figure 9.2)
- a chamber system that uses perforated structures to provide void spaces for storage and movement of effluent and an interface with the exposed soil surface for infiltration(see Chapter 9.0 Title page for photo).
- a gravel substitute that is a conventional disposal field, in which gravel is replaced with an alternate media that has characteristics that provide void spaces and performance similar to gravel.

FIGURE 9.2 CONVENTIONAL DISPOSAL FIELD SYSTEM

**Treatment mounds**

Treatment mounds are built above grade to overcome limits imposed by proximity to water tables, bedrock or by highly permeable or impermeable soils (see Figure 9.3). Pressure distribution must be used to distribute effluent over a sand layer, in which aerobic bacteria exist to treat the effluent.

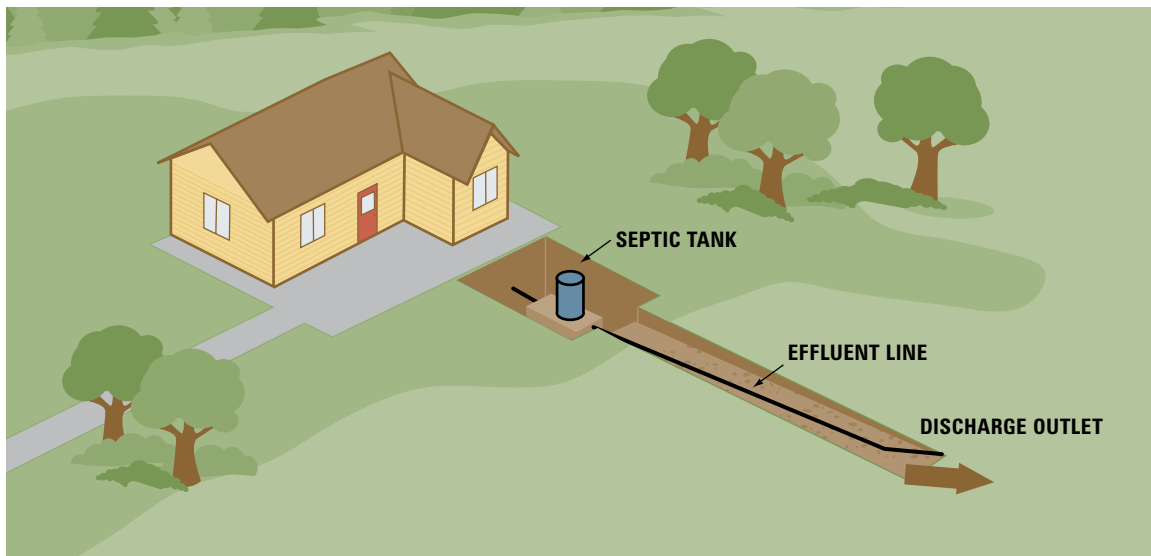
FIGURE 9.3 TREATMENT MOUND SYSTEM



### Open discharge systems

An open discharge system discharges effluent on to the ground surface, so the effluent evaporates and absorbs into the soil as a method of treatment (see Figure 9.4). The system must contain the effluent on the property and protect the soil at the outlet from erosion. Alternative designs for open discharge systems exist depending on the slope of the land and size of system components.

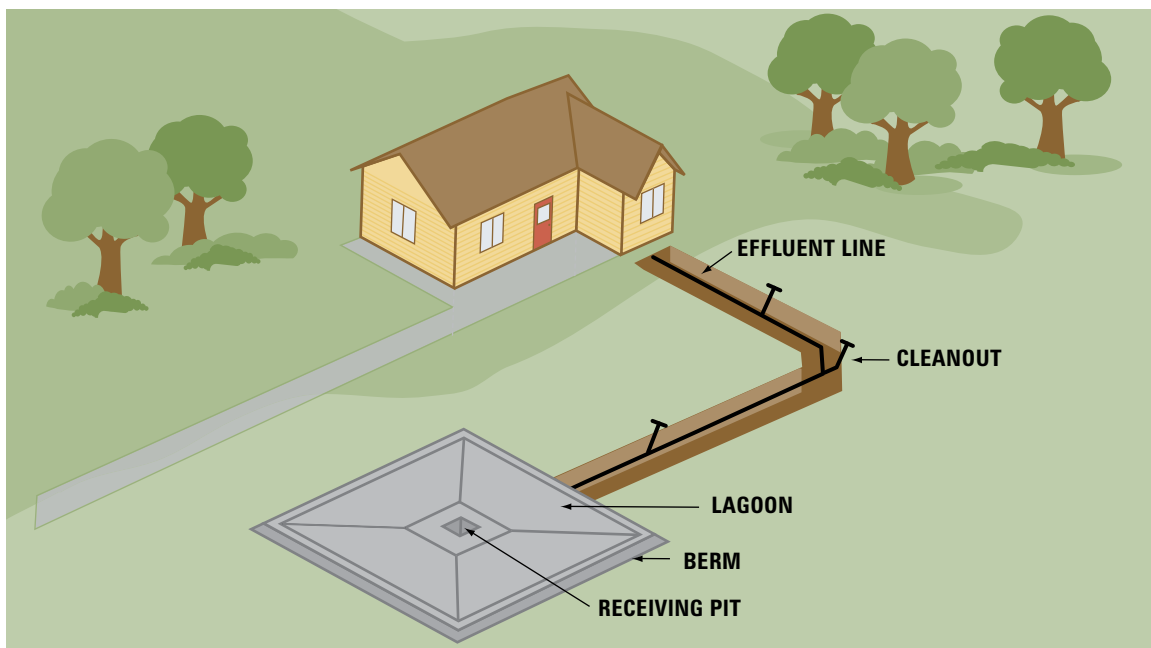
FIGURE 9.4 OPEN DISCHARGE SYSTEM



### Sewage lagoon

Sewage lagoons are shallow, constructed ponds that are lined to prevent the downward movement of effluent into the soil and groundwater (see Figure 9.5). This sewage system stabilizes effluent overtime by providing an environment that allows for evaporation and breakdown of sewage components by bacteria, sunlight and algae.

FIGURE 9.5 SEWAGE LAGOON



### Cesspools

Cesspools are covered, underground containers or pits for the temporary storage of liquid waste and sewage. They exist on older farm sites, but are not considered acceptable by today's standards. The liquid portion of the sewage is disposed of by seeping or leaching through a perforated liner into the surrounding soil, while the sludge is retained to undergo partial decomposition before occasional removal.

Over time, a bio-mat accumulates on the walls, plugging off its leaching surface making it inoperable. This result could cause a cesspool to overflow, allowing untreated effluent to pose environmental and health safety risks. Where cesspools were excavated to depths that entered water tables, the high water tables would infiltrate into the cesspool, causing them to overflow as well as wash the bio-mat away from its wall surfaces. Then as the water table receded, the poorly treated effluent would migrate into the water table and cause potential contamination to other water sources such as water wells.

The construction of cesspools is no longer permitted.

## 9.3 Wastewaters and Associated Concerns

Certain wastewaters on a farmstead need to be handled properly. Backwash from iron filters and water softeners, garborator wastes from the kitchen, grease and oils all need special attention.

### Backwash water from iron filters and water softeners

Wastewater from iron filters and water softeners should not be discharged into the septic system. These systems typically discharge a significant volume of water that needs to be accounted for in design, otherwise it may overload the system.

The iron removed from the water supply and then discharged with the backwash water can have a negative effect on the capability of the soil to absorb water.

Using sodium salts in a water softener may be harmful to a sewage disposal system. Increased sodium levels may reduce the effectiveness of the septic tank by negatively affecting microbial activity. As well, high sodium in the effluent may reduce the ability of the soil to absorb and move the effluent, especially in the presence of clay.

As the wastewater from these systems is not considered contaminated, it can be discharged on top of the ground in a location on the property that the owner considers suitable.

### Garborator Wastes

A garbage grinder (commonly known as a garborator) will increase the amount of organic matter in a septic system. This increase in organic matter results in a higher Biological Oxygen Demand (B.O.D.) on the soil treatment system, increasing the risk of system failure. With septic tanks, the grinder adds additional solids that will decrease the capacity of the tank. When garbage grinders are used, it is recommended that the septic tank size and final treatment system be increased.

### Grease and oils

Grease and oils are complex molecules that are difficult to breakdown and should not be discharged into a private sewage system because they can cause the system to plug up. To avoid this problem, minimize the use and disposal of grease and oils into the system. Consider scraping off greasy food and wiping dishes with disposable paper towels. If using large quantities, use grease traps and contact an experienced waste disposal and handling company for options.



## 9.4 Maintaining On-Farm Sewage Systems

Operating a private sewage system on a farmstead requires knowledge and skill. A good sewage system prevents damage to the environment, and it also helps to protect the health of your family and neighbours. Newer technology is allowing for rural sewage systems to provide treatment beyond the capability of older systems, allowing for a longer life of the system and reducing any environmental and health safety risks.

The key to operating a good private sewage system depends on which system you choose for the farmstead. Some of the more traditional systems use a septic tank with a disposal field. With this type of system, it is essential that it be maintained.

### 9.4.1 Septic Tank Maintenance

Solids in the septic chamber of a septic tank are broken down at a slower rate in the anaerobic environment of the tank. These solids, along with greases, soap curds and other material that float on the liquid surface (scum layer), accumulate overtime and reduce the storage capacity and retention time of the septic working chamber (refer back to Figure 9.1). Solids must then be periodically removed from the chamber and disposed of in another manner to ensure the tank functions properly.

Timely cleaning of a septic tank is important. Solids and other organic material can be carried from the septic chamber into the effluent chamber and discharged into the effluent disposal system. This situation can eventually result in system failure, as additional suspended solids and organic material will plug the system and reduce the infiltration capacity of the soil surface.

The size of the septic chamber determines the intervals between cleaning. The larger the septic chamber, the better the separation of solids from the effluent, especially during peak flows. The septic chamber should be checked each spring or early summer for accumulated sludge and scum. A septic chamber with 45 cm (18 in) of sludge should be cleaned.

Emptying the tank in the spring will allow bacterial action to resume more quickly during the warmer summer months. It is not necessary to thoroughly scrub and flush the septic chamber until it is visibly clean. The small amount of sludge that remains on the floor and walls will serve as microbial inoculants, which will allow normal operation to resume as soon as possible. Vacuum- pumped sewage hauling trucks are available commercially to empty septic tanks. This equipment is capable of doing an excellent job without spillage.

Current disposal options for solid wastewater material or septic tank contents consist of two kinds: land application and wastewater treatment plants. Where hauling distances make the delivery of the wastewater to a treatment plant not feasible, land application is the most economic and viable option. Disposal of private wastewater on agricultural land is an acceptable practice. However, disposing of municipal wastewater is regulated and must follow certain restrictions governed by Alberta Environment and Parks. Always keep records indicating where, when and how much wastewater was applied.

#### **Land applications with such wastewater should occur:**

- between April and October of each year
- on soil with a pH > 6.5
- on slopes < 5 percent
- on land with depth to water table > 2 m (7 ft)
- when wastewater can be injected or incorporated within 48 hours

**Land applications should not occur:**

- when application rates exceed 100 m<sup>3</sup>/ha
- near water sources and water bodies, dwellings, roads, public buildings, school yards, cemeteries, playgrounds, parks and campgrounds
- on ice, snow-covered or frozen ground
- near or in stream valleys or intermittent drainage areas
- on land being used for root, vegetable or fruit crops or dairy farming pasture

For more information on wastewater land application guidelines, contact Alberta Environment.

#### 9.4.2 Greywater Options

**Greywater** is wastewater from bathing, washing and laundry, but does not contain toilet wastes, food wastes, dirt or other contaminants (known as blackwater). It still has to be treated in a private septic system, but is not as high in nutrients or pathogens as typical residential strength wastewater. Bacteria in a septic field do need nutrients to survive, so greywater itself may not provide enough nourishment for them to keep the septic field healthy and active.

There are other disposal options for treated greywater when it is separated from blackwater due to the low presence of pathogens. Thus, treated greywater can be used for irrigating, but only on non-food plants since there is a chance of contaminating plants used for food. It can also be discharged below ground in a drip irrigation system where soil bacteria will filter any pathogens and nutrients out of the water. Regardless of the disposal method, separation distances for greywater from property edges, wells, water sources, watercourses and buildings must be met and all runoff should be contained on the property.

#### EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

### 9.5 Legislation

Producers should be aware of the following pieces of legislation that pertain to household wastewater management. For more information on the legislation, refer to Chapter 12.0 of this manual.

#### Provincial Legislation

*Safety Codes Act*

*Private Sewage Disposal Systems Regulation*

## 9.6 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### **Alberta Environment and Parks**

Information Centre: 310-ERSD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

- Guidelines for the Application of Municipal Wastewater Sludges to Agricultural Lands March 2001

### **Alberta Municipal Affairs**

Community & Technical Support: 1-866-421-6929

Website: [www.alberta.ca/municipal-affairs.aspx](http://www.alberta.ca/municipal-affairs.aspx)

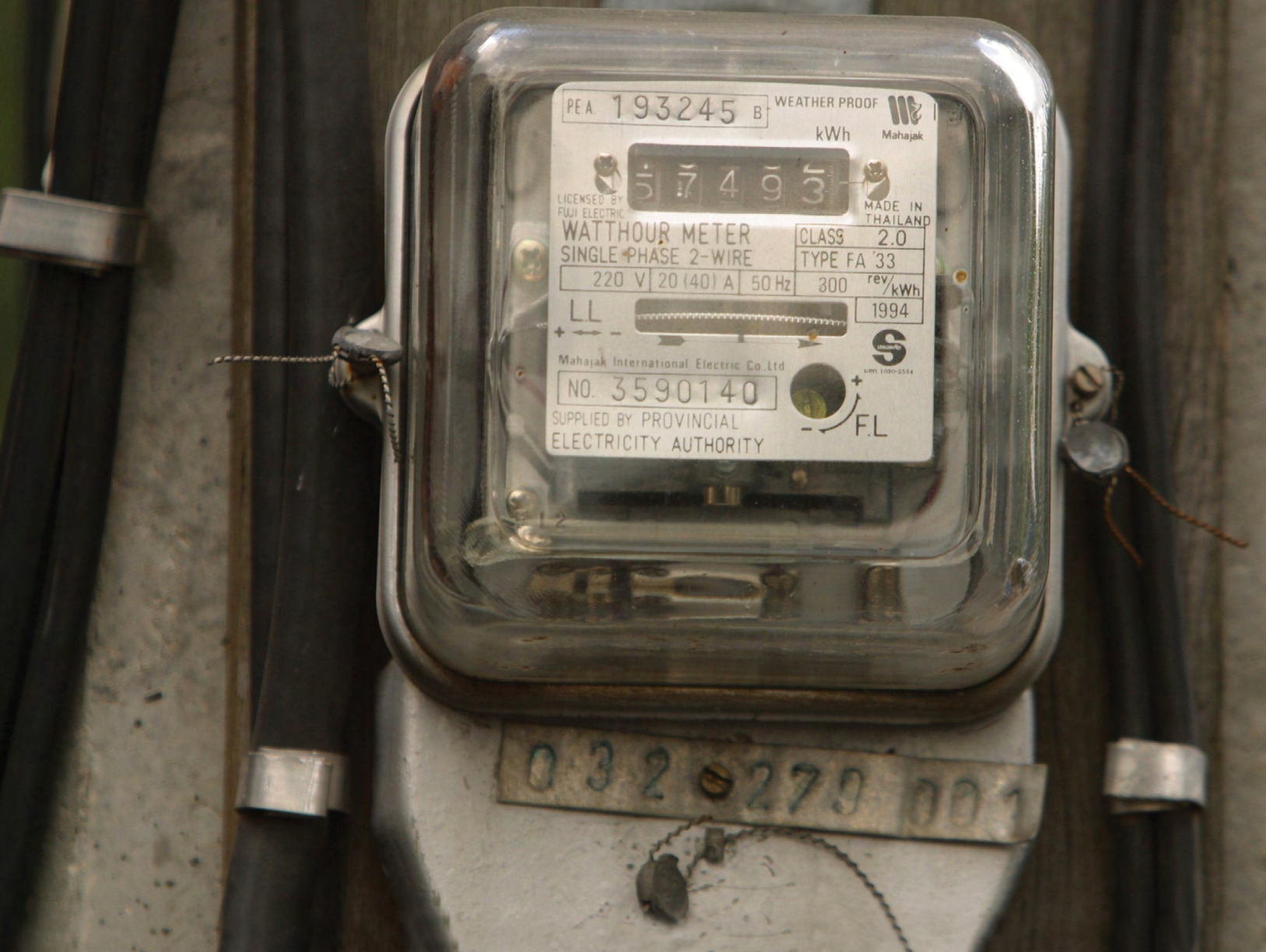
Publications:

- Alberta Private Sewage Systems Standards of Practice Manual

### **Alberta Onsite Wastewater Management Association**

Toll-free: 877-489-7471

Website: [www.aowma.com](http://www.aowma.com)



# CHAPTER 10.0

## Energy Efficiency

This chapter discusses beneficial management practices that address energy efficiency on your farmstead.



Energy costs can be a significant part of a farmstead's total operating budget, however you can manage and control some of these energy costs. The burning of fossil fuels contributes to air pollution and greenhouse gas emissions. By improving energy use on your farm, you can help minimize or reduce your financial costs and environmental risks.

## 10.1 On-Farm Energy Audit

The purpose of an energy assessment is to determine what energy costs are associated with your home and farm, including a breakdown where the energy is being used. The first step is to look at the cost and consumption rate of electricity, natural gas, gasoline, diesel and other energy sources, from which a base cost assessment can be developed.

The next step in the assessment is finding where the energy is being used. When looking at operation costs and efficiency, it is necessary to conduct on-farm inspections of all buildings, doors, lights, windows, and equipment. Insulation levels, the hours the lights are on, ventilation settings and age of equipment also need to be taken into consideration when conducting the walk-through. This knowledge will give you a better understanding of energy use and loss on your farm.

**Some important questions to ask when looking for energy problems and possible solutions include:**

- Have buildings and equipment been regularly maintained?
- Can sealing of windows and doors be improved or should they be replaced?
- Should insulation be added?
- Can operating temperature be reduced?
- Could automated controls help save energy?
- Does equipment need to run as long?
- Can more efficient equipment be installed?

## 10.2 Water Heating, including Livestock Water

Water heating on the farm can be a significant energy load, whether it be for the home, for keeping livestock waterers from freezing or for cleaning. Strategies for heating water most efficiently, include using high efficiency equipment, keeping heated water well-insulated and pre-heating with any available waste heat.

Water heaters are rated for energy performance by their energy factor (EF), with more efficient heaters earning a higher EF. Tankless water heaters generally score higher for EF than do storage tank water heaters because of standby losses, which are heat losses that occur while heated water sits in storage.

Insulation will reduce energy losses wherever heated water is on stand-by; not only in a storage tank, but also in pipes and the equipment where the heated water is ultimately used. For livestock waterers, insulated walls will be helped by covering the water surface in the drinking bowl, often with something that the animal can push out of the way when they want to access the water.

Whenever there are water heating processes occurring near a cooling process, the waste heat from the cooling can be used as pre-heat for the heating. Dairy parlours are a common example of this. As the milk is cooled down for storage, the removed heat can be used to pre-heat wash water using plate-cooler style heat exchangers.

## Tank-less Hot Water Heater Case Study

A 90 cow dairy in Southern Alberta milks twice daily producing on average 5000 liters every 2 days. A wash down of the milking parlor occurs after each milking period and the storage tank is washed after every pick up. A washing machine and a sink are used for general cleanup. The water comes from a deep well with a culvert at 24 feet.

Natural gas, inlet and outlet water flow, pressure and temperature were monitored over 5 months before and after the switch from the tanked hot water heater to the tank-less.

### Results:

- The natural gas consumption of the tank-less hot water heater decreased by 60% compared to tanked heater.
- The outlet temperature from the tank-less heating system was 13°F higher than that of the tanked system. Water temperature can be managed with manual settings on the heaters and the producer wanted a higher outlet temperature with the new system. The hot water tank was set to its maximum of 180 °F but only achieved a temperature of 167 °F. The tank-less system was also set to its maximum at 185 °F but achieved an outlet temperature of 180 °F.
- The water consumption and inlet pressure stayed consistent throughout the study.
- A slight increase in natural gas consumption with cooler outdoor air temperature was measured for both the tanked and tank-less systems.
- The producer will be saving approximately 7600 cubic feet, or 8 GJ of natural gas per month.

This case study found a 60% decrease in natural gas consumption. Since the cost of natural gas is low in Alberta this system is not yet economically feasible for a retrofit. With proper maintenance, the tank-less hot water heaters are predicted to last 20 years which is comparable to a typical tanked hot water heater. They are subject to corrosion, therefore some monitoring and maintenance is required.

## 10.3 Space Heating

Space heating through winter in a cold climate is of course very energy intensive. You can optimize the efficiency of the heating system by choosing an appropriate system, getting high efficiency version of the heaters, and ensuring proper operation once installed.

For smaller buildings like homes, offices and some shops, high efficiency furnaces can be an economical choice. For larger buildings or if zone control is desired, hydronic heating using high efficiency boilers are very efficient. For spaces with overhead doors like shops, radiant heaters direct the heat where it is required and can lower energy costs by preventing the loss of heated air every time a door is opened.

For boilers and furnaces, condensing and modulating models have allowed seasonal fuel usage efficiencies of 95% and higher. Condensing models are set up so that the flue gas gives up its heat before being exhausted, to the point that its moisture condenses and drains away. Modulating models are designed to match the burner intensity to the required heating load, rather than have the burner turn on and off a lot during low-load periods.

A maintenance schedule should be followed for any heating system, ideally including logs of fuel usage, operating times, and key temperature points. Combustion efficiency should be regulated and maintained at optimum.

## 10.4 Control Systems

Recent advances in computerized control systems allow for new levels of efficiency optimization. Multiple systems, like heating, ventilation and lighting can be monitored, analyzed and adjusted as a single system. The risk of one system fighting another, like having heating and cooling both on at the same time is greatly reduced. Inputs coming from numerous sensors, covering many parameters, can be collected and analyzed nearly continuously, as compared to once or twice yearly in a manually controlled approach.

Important consideration for a control system are that sensors are located in a representative place for what they are monitoring. For example, temperature sensors in livestock barns should be at animal level, not in sunlight, air streams or by radiant heat sources.

For the small amount of electrical energy required to run the sensors and controls, the savings they are associated with, represent an excellent return.

## 10.5 Envelope

Buildings will benefit from tight construction with minimal air and vapour penetration. In houses, offices and shops, it will prevent drafts and cold spots, and it will also help in preventing damage from condensation and mold. In highly ventilated buildings like livestock barns, even though air is being exchanged at a very high rate, good air sealing is still desirable because it keeps air moving through inlets in accordance with system design. This ensures proper air flow rates and proper air mixing.

Insulating buildings to recommended levels by using >R23 insulation for walls and >R31 for ceilings is helpful. Tight-fitting doors and windows that are sealed with caulking and weather stripping help decrease energy loss from a building. When it comes to windows, triple-pane, argon-filled are among the most efficient versions, but not having a window will save the most.

## 10.6 Motors

Keep a list of all electric motors in use, and record the preventative maintenance measure performed on each to be sure they are checked, cleaned and lubricated regularly. Also, record what motor should be purchased if a replacement is needed; by planning ahead, considerations like energy efficiency can be taken into account.

Whenever possible, use electricity outside of peak demand times (6:30 to 9:00 am and 5:00 to 9:00 pm) and avoid starting and running large motors simultaneously. This decreases the load on the community's electricity system and decreases overall electricity costs.

## 10.7 Ventilation

Ventilation is a major power load in livestock barns, where it contributes to controlling moisture, carbon dioxide, ammonia and cooling. They run year-round and can be the operation's largest consumer of energy. Areas where energy efficiency can be influenced include fan selection, controllers and regular maintenance.

When selecting a fan, the efficiency is rated in terms of how many cubic feet of air it can deliver, for every watt of power that it draws; cubic feet per minute per watt or CFM/W. The higher the CFM/W, the more efficient the fan. The University of Illinois's Bioenvironmental and Structural

Systems Laboratory (BESS Lab) publishes agricultural fan tests on their website [www.bess.illinois.edu/index2.htm](http://www.bess.illinois.edu/index2.htm). When deciding on fans, this is an excellent resource for comparing a wide variety of makes and models. For models not tested by BESS, consult the manufacturer spec sheets for efficiency ratings.

Fan efficiency can also benefit from the variable speed drives (VSD) if they operate at one speed sometimes, and other speeds at other times. A VSD will vary the speed of a motor to match the required load. For fans, this adds up to big energy savings because power varies with the cube of flow. So if the VSD drops the fan speed drops to one-half, the power requirements will drop to the cube of one-half, or one-eighth.

Regular maintenance and cleaning can have dramatic effects on fan performance and efficiency. Dust build-up on fan blades, fan belts that are too loose, and dirty motors can all substantially decrease energy efficiency for fans.

## 10.8 Lighting

The type of lighting you use depends on the application and environment. Consider how much light is needed, duration of lighting, type of environment (indoors, outdoors, temperature, moisture, air particulates), painted surfaces, etc. to determine the most efficient lighting system for each situation.

Colour temperature is a measure of warmth or coolness of the colour of lighting and is commonly expressed on the Kelvin scale. A high colour temperature (5,500 – 6,500 K) is blue-white and a low colour temperature (2,000 – 3,000 K) is orange-red.

Light emitting diodes (LEDs) have been around for decades and are now becoming a norm for commercial and residential lighting. Compared to other lighting options LEDs on average have a longer rated life and a higher lumen output per watt consumed, making them one of the most energy efficient lighting options on the market. They still have a higher initial cost but due to their longer rated life and high efficacy the payback period is reasonable. The difficulty with LEDs is they have heat dissipation requirements so they should not be mounted in air tight fixtures.

LEDs and other lighting options can be manufactured targeting a specific wavelength or colour temperature in order to have effects on production, most commonly in greenhouses and poultry production. If you choose a lighting option claiming effects on production, confirm they have been properly tested and a good warranty is in place.

Consider a dairy parlor with High Pressure Sodium (HPS) lamp fixtures rated at 400 watts. With the ballast each fixture draws about 465 watts with an initial rated lumen output of 55,000 and a rated life of 24,000 hours. This can be replaced by a 400 watt induction fixture, a 374 watt 6 lamp T5 fluorescent fixture, or a 258 watt LED fixture. Table 4 shows the comparison of each choice assuming the cost of electricity at \$0.10 per kWh and an operating time of 12 hours a day.

Fixture	Watts	Life (hours)	Operating Cost 1 year	Operating Cost 5 year
HPS	465	24,000	\$ 198.65	\$ 1,393.24*
Induction	400	100,000	\$ 170.88	\$ 854.40
6 Lamp T5	374	10,000	\$ 159.77	\$ 998.86*
LED	258	60,000	\$ 110.22	\$ 551.09

\*Includes replacement cost



Newer technologies have a higher initial cost and may not be as reliable as established lighting options. It is important to have a good warranty agreement. Because of the low draw of an LED fixture and the long life of an induction, both are a good choice for high bay dairy barn lighting.

Every Colour Rendering Index (CRI) is the ability of a light source to represent colour, based on a 0-100 scale. The higher the CRI, the closer to natural light the colours appear.

Watt (W) is the amount of electricity a light bulb uses to produce light and is not an indication of brightness.

Ballasts in fluorescent lights are used to convert line current into the proper form for the light to work. Ballasts can be either electric or magnetic. Magnetic ballasts are the older style and have a buzz noise to them. They are much lighter than electric ballasts, and the bulb lights up almost immediately with no flickering. Electric ballasts are more costly but are more energy efficient.

TABLE 10.1 DIFFERENT TYPES OF LIGHT AND EFFICIENCIES

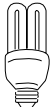

TECHNOLOGY	LAMP TYPE	EFFICACY (LUMENS PER WATT)	AVERAGE LIFE (HRS)	COLOUR TEMP. (K)	INSTANT ON	WATTAGE RANGE	COMMON APPLICATIONS
<b>Light Emitting Diodes (LEDs)</b>  	<b>LED – High bay fixture</b>	50 – 150	30,000 – 100,000	2,000- 6,500	Yes	100 – 1,000	High Bay Indoor (20 to 40 foot ceilings)
	<b>LED – Low bay fixture</b>	50 – 150	30,000 – 100,000	2,000- 6,500	Yes	50 – 100	Low Bay Indoor (5 to 25 foot ceilings)
	<b>LED – Bulbs</b>	50 – 120	30,000 – 100,000	2,000- 6,500	Yes	4.5 – 50	Indoor ~10 foot ceiling and yard lighting
	<b>LED – Outdoor Fixture</b>	50 – 150	30,000 – 100,000	2,000- 6,500	Yes	30 – 150	Yard lighting
<b>Fluorescents</b>    	<b>T-5 Fluorescent</b>	85 – 105	20,000- 24,000	3,000- 5,500	Yes*	24 – 80	High or low bay
	<b>T-8 Fluorescent</b>	76 – 100	15,000 – 20,000	3,000- 5,000	Yes*	25 – 59	High or low bay
	<b>T-12 Fluorescent</b>	62 – 80	9,000 – 12,000	3,000- 5,000	Yes*	30 – 75	Phased out
	<b>Compact Fluorescent</b>	45 – 55	6,000 – 10,000	2,700- 5,000	Yes*	4 – 150	Indoor ~10 foot ceiling
	<b>Induction</b>	80	60,000- 100,000	4,000- 6,500	Yes*	40 – 400	High bay

TABLE 10.1 (CONTINUED) DIFFERENT TYPES OF LIGHT AND EFFICIENCIES

<b>Other</b> 	<b>High Pressure Sodium (HPS)</b>	66 – 90	24,000	1,900-2,100	No	35 – 1,000	High/low bay and outdoor
	<b>Metal Halide</b>	60 – 94	7,500-20,000	3,000-4,300	No	70 – 1,000	Phasing out
	<b>Halogen</b>	12 – 21	2,000 – 6,000	3,000	Yes	45 – 500	Indoor ~10 foot ceiling
	<b>Incandescent</b>	7 – 20	750 – 1,000	2,800	Yes	25 – 200	Phased out

## 10.9 Tractors

A significant energy load on most farms is the diesel fuel used in tractors and other self-propelled equipment. While diesel fuel usage is a necessity for farm operations, there are some simple, common-sense ways to optimize use of that diesel fuel.

The simplest way to save fuel is not to start the tractor. A careful review of current practices can reveal alternative ways to complete an operation or ways to combine operations, putting less hours on the tractor and thus reducing fuel consumption. For example, studies have shown that moving from conventional tillage to direct seeding commonly results in a \$4 to \$5 per acre saving in fuel costs. Another aspect of this same idea is to avoid excessive idling. Today's turbocharged diesel engines start easily and do not need long periods of idling. In cold weather, using a block heater, oil heater and/or fuel tank heater are alternatives to long idling times.

Another potentially large efficiency gain can come from upgrading older tractors to newer models. Manufacturers are really emphasizing fuel efficiency, with improvements every year. While investing in a new tractor is not feasible for everyone, it is an option that could lead to significant reductions in fuel consumption.

The next concept is consider matching the tractor to the load. Select the proper machine for the proper task, so the tractor is operating at its full rate load. This helps to prolong engine life and the life of the equipment itself. A diesel engine operates most efficiently when it is at or close to its maximum load. However, it is not always feasible to own the right sized tractor for every load.

In cases where the load requires less than 70% of the tractor's rated power, fuel can be saved by using a practice called Gear Up, Throttle Back (GUTB). This involves shifting to a higher gear and slowing the engine RPM's to maintain a desired speed, which loads the engine and brings it back into the "sweet spot" of highest efficiency. It is estimated that a farmer with an annual fuel bill of \$2000 could save \$400 per year by shifting up and reducing engine speed when doing light work. Using the gear-speed ratio recommended in the tractor user's manual helps prevent unnecessary repairs. For example, if a load on the tractor reduces the engine speed to less than half of its original setting, cylinder wall scarring may occur due to improper lubrication. Infinitely

Variable Transmission (IVT) and Continuously Variable Transmission (CVT) equipped tractors are automatic high precision versions of this GUTB techniques.

**For all tractors, whether old or new, several factors can significantly affect efficiency.**

- Understand and adjust the total weight and weight distribution to match the load. Ideally this should be adjusted each time the load changes, but often that is not practical.
- Set the weight and distribution for the typical load, rather than the maximum load, to save fuel.
- Set the tire pressures correctly for the type of tire and the weight it is carrying. For best efficiency, tires should be inflated to the lowest pressure allowed by the manufacturer for the load the tire is carrying.
- Monitor the slip and the operating load, and keep them at acceptable levels.
- Use the correct fuel (summer or winter diesel) for the season.
- Perform regular maintenance. Regularly scheduled maintenance helps reduce wear and tear, while poor maintenance schedules can reduce the life of an engine by one-quarter to one-half.

## 10.10 Shelterbelts

Energy conservation is a growing public concern. Shelterbelts can provide a reduction in energy consumption because the rows of trees and shrubs around the perimeter of a farmstead provide additional protection for farmyards or livestock facilities from adverse weather conditions.

Shelterbelts reduce wind speeds, resulting in lowered heating and maintenance costs. Therefore, planting new shelterbelts or improving existing ones can produce economic benefits for the farm.

Research from Agriculture and Agri-Food Canada, indicates a typical farmhouse can reduce its heating costs by up to 30 percent with a correctly constructed shelterbelt. The optimal design for a windbreak of this type depends on the farm location and the site.

Shelterbelts are most effective when planted across prevailing wind directions. For increased sheltering effects, plant shelterbelts closer together; for maximum wind erosion control, plant the rows less than 200 m (660 ft.) apart.

**Besides reducing energy losses, shelterbelts also provide other benefits on the farm:**

- increase aesthetics and property value
- control snow drifting by trapping snow
- decrease evaporation and improve water absorption
- increase soil moisture
- reduce wind and water erosion
- provide dust, odour and noise barriers
- store carbon
- provide wildlife habitat and biodiversity



Shelterbelts provide additional protection from windy conditions, resulting in lower heat costs —  
*Courtesy of AAFC*

## 10.11 Emerging Technology

New ideas are continuously coming to market, and some of them are game-changers. Keeping up-to-date with the latest developments in energy efficiency is a good way to position yourself for a competitive advantage. An example of a technology to watch is the Heat Recovery Ventilator (HRV). For livestock barns with high heating requirements and high ventilation requirements, it can seem like you are throwing money out the window when all that expensively heated air is exhausted to the outside. An HRV is designed to strip out the heat from the air before it leaves, and transfer it to incoming fresh air. Savings can be in the neighbourhood of 50% of an operation's heating costs. Variations on this design have come and gone over the years, with dust fouling and ice build-up harming performance. Latest designs are scaled up, with wash and thaw cycles, and computerized control systems that may translate to widespread adoption.

## 10.12 Renewable and Alternative Energy Sources

Renewable energy resources are non-fossil based resources that are renewable in relatively short periods of time, such as daily or annually. This would include technologies such as wind, solar, geothermal, small hydro-based power sources, and biomass-based products such as wood, straw, grasses, manure, ethanol, or biodiesel fuel.

The term “alternative energy resource” is often applied to a non-renewable (fossil-fuel based) resource that produces energy using a method that has a lower Greenhouse Gas (GHG) intensity or Carbon Emission intensity that would be achieved with conventional energy production.

When considering renewable and alternative energy, you first want to reduce your energy consumption. It is easier and less expensive to save a watt than to produce a watt. By reducing your energy consumption first, you may be able to decrease the system capacity of any renewable or alternative energy system that you install.



### 10.13 Building and Energy Codes in Alberta

The *Safety Codes Act (SCA)* came into effect in 1994 and established Alberta's safety codes system, which promotes and enforces the safe construction, operation, and maintenance of anything, process, or activity to which the SCA applies.

Alberta has adopted the *National Energy Code for Buildings (NECB) 2011* edition as well as the energy efficiency requirement for housing and small building under section 9.36 of the *2014 Alberta Building Code (ABC)*. These codes are mandatory and apply to all buildings in Alberta as of November 1, 2016.

In Alberta, the *Alberta Building Code 2014 (ABC 2014)* and the *NECB* do not apply to a building that meets the following conditions:

- A building of low human occupancy associated with the operation of the farm or acreage on which it is located is exempt from the *Alberta Building Code*, where the building is used for the:
  - housing of livestock,
  - storage or maintenance of equipment; or
  - storage of materials or produce.

The *National Farm Building Code (1995)* may be used for some general design guidance where the ABC does not apply.

The local authority having jurisdiction, issuing permits and requirements for inspections under the *Safety Codes Act* will be able to provide some guidance and advice on safety codes that may apply to certain building projects. It is still recommended to contact the insurance underwriter for the farm operation to determine how the availability, exclusions and cost of insurance may affect the choice of what codes apply to a new building, even if not required.

- Under the appendix guide of the *ABC 2014*, farm and acreage buildings include, but are not limited to,
  - Produce storage facilities, livestock and poultry housing, milking centres, manure storage facilities, grain bins, silos, feed preparation centres, farm workshops, and horse riding, exercise and training facilities not used by the public.
  - Farm buildings may be classed as low or high human occupancy, depending on the occupant load.
- Residential buildings (overnight accommodation) such as houses are not exempt from the *ABC 2014*, which includes 9.36 energy efficiency for housing and small buildings.

### 10.14 Legislation

Producers should be aware of the following pieces of legislation that pertain to the safe construction, operation, and maintenance of buildings as well as the energy efficiency requirement for housing and small buildings. For more information on legislation, refer to Chapter 12.0 of this manual.

#### Federal Legislation

*National Farm Building Code*

*National Energy Code for Buildings*

#### Provincial Legislation

*Alberta Safety Codes Act*

## 10.15 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

### Alberta Agriculture & Forestry

#### Ag-Info Centre: 310-FARM (3276)

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Publications: 1-780-427-0391

- First Steps to Energy Management: Save Time and Money Agdex 818-2
- Shelterbelts in Livestock Farms in Alberta Agdex 400/092-1
- Shelterbelts for Livestock Farms in Alberta: Planning, Planting and Maintenance Agdex 400/092-2
- Shelterbelts for Livestock Farms in Alberta: Shelterbelt Planning Workbook Agdex 400/092-3
- Renewable Energy in Alberta Agdex 817-15

### Agriculture and Agri-Food Canada

Website: [www.agr.gc.ca](http://www.agr.gc.ca)

- Shelterbelt Planning and Establishment
- Livestock Watering

### Natural Resources Canada

Website: [www.nrcan.gc.ca](http://www.nrcan.gc.ca)

Publications:

- Heating your Building with Solar Energy
- Solar Water Heating Systems – A Buyer's Guide
- Stand Alone Wind Energy Systems – A Buyer's Guide

### Natural Resources Canada – Energy Efficiency

Website: [www.nrcan.gc.ca/energy/efficiency](http://www.nrcan.gc.ca/energy/efficiency)





# CHAPTER 11.0

## **Nuisance**

This chapter discusses beneficial management practices that address nuisance concerns, such as dust, odour and noise, on the farm.



As agriculture and other land uses continue to compete for space in Alberta, nuisance conflicts will increase. Significant nuisances associated with farming operations include dust, smoke, odour and noise. Rural residents should consider how to best deal with and minimize these nuisances.

### 11.1 Dust and Smoke

Dust and smoke can be a concern for both rural residents and agricultural producers. Dust from traffic activities, whether from farming operations or road travel, and smoke from burning farm wastes can potentially create a nuisance for your neighbours. Practices to minimize or eliminate these nuisances will help lessen the conflicts that can occur. For more information regarding proper burning of debris, refer to section 8.1 of Chapter 8.

**The following BMPs can be used to minimize or eliminate dust as a nuisance:**

- Reduce speed when driving near farmsteads or country residential homes and use the least travelled route during times of heavy traffic volumes.
- Inform neighbours when and for how long farm-related traffic volumes are going to increase during busy periods.
- Be aware of the effect heavy traffic may have on your neighbours and if possible adjust your road travel accordingly. This practice may mean a reduction in farm-related traffic in morning, at night and on weekends.
- Wet down gravel or dirt roads with water or oil during times of heavy traffic. (For more information on applying oil to your roadways in accordance with regulations refer to Chapter 8.0)
- Pave roadways in front of yard if possible.
- Use shelterbelts or windbreaks to reduce dust movement.
- Clean or remove excess manure from corrals as dry weather approaches.
- Reduce or eliminate tillage in nearby fields to prevent dust from wind erosion.



Wetting down dirt or gravel roads helps control dust around the farmstead — *Courtesy of AAFC*

**The following BMPs can be used to minimize or eliminate smoke as a nuisance:**

- Consider alternative disposal methods for green material and other wastes that may produce lots of smoke.
- Notify the fire department of your activities and have firefighting and safety equipment available on-site.
- Obtain a burning permit when required and follow the conditions of the permit.
- Be aware of the effect smoke may have on your neighbours; consider not burning at all or if possible adjust your burning schedule accordingly. This practice may mean not burning in morning, at night and on weekends.
- Inform neighbours when and for how long smoke-producing activities are going to occur.
- Only burn when weather and wind conditions allow more air movement to disperse the smoke.
- Ensure smoke does not drift on to roadways or into neighbours' yards by using proper containment units and providing smoke barriers.
- Ensure the fire is supervised and contained by providing a fuel-free buffer area.

## 11.2 Odour

Odours from farming practices, such as livestock production and manure storage and handling, can be major nuisances for nearby residences. Although it is very difficult to quantify the effects odours have on people, it is very important to be aware of the nuisance as it can potentially create conflicts among neighbours.

**The following BMPs related to livestock production and manure storage and handling could be used to minimize or prevent odour from becoming a nuisance and causing conflicts:**

- Locate manure or compost storages a minimum distance of 150 m (492 ft) from neighbouring residences.
- Use lagoon covers or natural manure crusts to reduce odours released into the air during the warm spring, summer and fall seasons.
- Tell neighbours or use signs to notify neighbours in advance when and how long activities that release odour from the farm will occur.
- Time manure lagoon agitation just prior to spreading and other odour generating activities on the farm to minimize lengthy exposure of neighbours to the odour.
- Alter spreading times to avoid spreading on weekends, evenings and holidays to minimize odour contact with neighbours.
- If possible, when spreading manure, select fields where the wind cannot carry odour towards neighbouring residences or spread manure when the wind is blowing away from your neighbours.
- If possible, spread manure in the late morning to early afternoon when odour disperses quickly and avoid spreading on hot, humid days when there is little or no air movement.
- Apply liquid manure as close to the ground as possible to minimize the release of odour by lowering the spreader deflection angle on liquid broadcasters.
- Avoid applying high rates of manure and where applicable, always apply below the plant canopy.
- Incorporate manure as quickly as possible after broadcasting or use a manure injection system to apply manure directly into the ground.

**Other BMPs to avoid odour nuisances and conflicts associated with other practices on the farm include:**

- Ensure the silage pits, mortality composting or other sites on the farm where odour is released are located at adequate distances from neighbours.
- Dispose of farm waste at designated waste management facilities.
- Use shelterbelts to prevent the wind from carrying odour to neighbouring residences.

### **11.3 Noise**

Another nuisance associated with farming operations is noise. Many rural areas now have more non-agricultural landowners than before, and noise foreign to them from agricultural practices may become a nuisance. These noise concerns often relate to the volume, duration and/or timing of farming operations.

**The following BMPs could be used to minimize or prevent noise as a nuisance and resolve conflicts:**

- Advise neighbours in advance when noisy activities, such as calving or weaning occurs, and when planning to conduct loud operations, such as harvesting and grain drying.
- Time noisy activities, such as moving cattle or operating loud equipment, during the week and midday as opposed to weekends and evenings.
- Confine activities to areas remote from neighbours if possible.
- Use shelterbelts and windbreaks as noise barriers.
- Reduce engine noise by gearing up and throttling down.
- Prevent noise problems before they develop such as maintaining and repairing field equipment, machinery and vehicles.
- Avoid prolonged periods of idling equipment and vehicles near neighbours.
- Replace loud equipment with more efficient and quieter equipment.
- Locate loud building equipment, such as grain dryer or ventilation fans, on the opposite side of buildings away from neighbours.





Shelterbelts can help reduce dust, smoke, odour and noise concerns — *Courtesy of AF*

## 11.4 Preventing, Managing and Resolving Conflict

Conflict is a struggle between two or more people because of a real or perceived difference in needs or values.

**Properly managed conflict can be productive because it can:**

- encourage people to examine issues more carefully
- deepen our understanding of problems
- open the door to new ideas and alternative solutions
- help foresee the consequences of proposed actions
- enable people to take risks and solve problems

Learning the skills necessary to prevent, manage and resolve conflict is important in today's society. The most important thing producers can do to reduce the risk of conflict associated with nuisances is to ensure communication with neighbours is open, honest and thorough.

**To communicate with your neighbour effectively:**

- take the matter seriously, listen to and acknowledge concerns
- be diplomatic and ask questions to identify the real issues
- apologize, admit mistakes, and when others make mistakes, help them save face
- shift the emphasis to mutually acceptable solutions and offer to look into the matter
- promptly respond to complainants with information they need to relieve their concerns
- take responsibility and steps to mitigate damage or eliminate problems
- stay on top of on-going problems, while keeping neighbours informed of on-going progress on the farm





Host a tour for your neighbours to help them understand your operation — *Courtesy of AF*

#### 11.4.1 Be a Good Neighbour

Being a good neighbour helps to build trust and understanding when problems arise.

**Practices to strengthen your relationship with your neighbours include:**

- getting to know them and letting them get to know you and your farming operation
- being friendly and helpful to neighbours in need
- getting involved in the community by supporting local charities and community groups, such as sports teams and youth groups
- supporting local businesses and hiring local youths
- hosting a farm tour, picnic/barbecue or potluck to generate goodwill and provide an opportunity for neighbours to ask questions about your operation in a relaxed atmosphere

#### 11.5 Role of the Farmers' Advocate

The Alberta Farmers' Advocate Office (FAO) provides dispute resolution services to rural Albertans on a broad range of issues.

When issues related to agriculture nuisance arise, the FAO may provide information, advice or dispute resolution services as appropriate. The FAO also oversees Part 1 (Nuisance) of the *Agricultural Operations Practices Act* (See Chapter 12.0).

More information on the work of the FAO is available at [www.farmersadvocate.gov.ab.ca](http://www.farmersadvocate.gov.ab.ca). Please call 310-FARM (3267) or email [farmers.advocate@gov.ab.ca](mailto:farmers.advocate@gov.ab.ca) if you have any questions.

## 11.6 Legislation

Producers should be aware of the following pieces of legislation that pertain to nuisance issues. For more information on legislation, refer to Chapter 12.0 of this manual.

### Provincial Legislation

*Agricultural Operation Practices Act*

*Environmental Protection and Enhancement Act - Substance Release Regulation*

## 11.7 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

### Alberta Agriculture & Forestry

#### Ag-Info Centre: 310-FARM (3276)

Website: <https://www.alberta.ca/agriculture-and-forestry.aspx>

Publications: 1-780-427-0391

- Agricultural Operation Practices Act (AOPA) – Reference Guide Agdex 096-1
- Agricultural Operation Practices Act – Practice Review Committee – Practices and Procedures
- Odour Management Plan for Alberta Livestock Producers Agdex 092-1
- Shelterbelts in Livestock Farms in Alberta Agdex 400/092-1
- Shelterbelts for Livestock Farms in Alberta: Planning, Planting and Maintenance Agdex 400/092-2
- Shelterbelts for Livestock Farms in Alberta: Shelterbelt Planning Workbook Agdex 400/092-3

### Farmers' Advocate Office:

Office: 780-427-2433

Website: [www.alberta.ca/about-the-farmers-advocate-office.aspx](http://www.alberta.ca/about-the-farmers-advocate-office.aspx)





# CHAPTER 12.0

## Legislation

This chapter provides an overview of the legislation that pertains to environmental risks on a farmstead.



A number of provincial and federal government acts relate to potential environmental effects of agricultural practices and provide a foundation to ensure that agriculture is operating in a sound and responsible manner.

Your operation must meet the legal requirements described in the acts and regulations. This manual is aimed at producers who are striving for excellence in farmstead stewardship. Therefore, many of the practices described in the previous chapters go beyond the basic legal requirements to help you reach your goals for an environmentally and economically successful operation.

#### LEGAL REQUIREMENTS

The information in this chapter is provided for general information only. It is not intended as legal advice. Refer to the acts and regulations, and consult a lawyer for legal advice on specific legal rights and requirements. More information on the environmental requirements under these acts can be obtained from government departments and agencies, consultants and lawyers.

## 12.1 Federal Legislation

### 12.1.1 *Fisheries Act* – Fisheries Protection and Pollution Prevention

#### Deleterious Substance

The *Fisheries Act* contains two key provisions on conservation and protection of fish habitat essential to sustaining freshwater and marine fish species. The Department of Fisheries and Oceans administers section 35, the key habitat protection provision, prohibiting any work or undertaking that would cause the harmful alteration, disruption or destruction of fish habitat. Environment and Climate Change Canada administers section 36, the key pollution prevention provision, prohibiting the deposit of deleterious substances into waters frequented by fish, unless authorized by regulations under the *Fisheries Act* or other federal legislation. A deleterious substance can be any substance that, if added to any water, would degrade or alter its quality such that it could be harmful to fish, fish habitat or the use of fish by people.



Fish Habitat is protected by the Fisheries Act — Courtesy of AF

### 12.1.2 *Pest Control Products Act*

The *Pest Control Products Act* specifies the responsibilities of the Pest Management Regulatory Agency (PMRA) of Health Canada for registration of pesticides for use in Canada.

In terms of user responsibility, as stated on the product label, anyone using a pest control product has the responsibility to read the label and follow the directions.

### 12.1.3 *Transportation of Dangerous Goods Act*

The Alberta Transportation - Safety and Compliance Services Branch is responsible for the compliance and enforcement of the *Provincial Dangerous Goods Transportation and Handling Act and Dangerous Goods Transportation and Handling Regulation* as well as the Federal Transportation of *Dangerous Goods Regulation* which has been adopted by Alberta. Both regulations set safety standards and shipping requirements for thousands of dangerous goods, in addition to providing a means of communicating the nature and level of danger associated with various chemicals and other products.

## 12.2 Provincial Legislation

### 12.2.1 *Water Act*

The *Water Act*, administered by Alberta Environment and Parks, supports and promotes the conservation and management of water, through the use and allocation of water in Alberta. It requires the establishment of a water management framework and sets out requirements for the preparation of water management plans. The Act addresses: Albertans' rights to divert water and describes the priority of water rights among users; the types of instruments available for diversion and use of water and the associated processes for decision-making; and the range of enforcement measures available to ensure the goals of the Act are met.

### 12.2.2 *Environmental Protection and Enhancement Act*

The purpose of the *Environmental Protection and Enhancement Act* (EPEA), administered by Alberta Environment and Parks. This Act is the primary act in Alberta managing the regulatory requirements for air, water, land, and biodiversity. The Act supports and promotes the protection, enhancement and wise use of the environment by designating proposed activities for which an approval or registration is required.

#### *Pesticide Sales, Handling, Use and Application Regulation*

The regulation provides requirements for the sales, use and handling of pesticides. Requirements include registrations of businesses offering application services, insurance requirements, dispenser requirements, protection of water, fumigation, restrictions on sales and storage, and specific guidance on the disposal of pesticide waste.

#### *Release Reporting Regulation*

The regulation provides rules, provisions and stipulations related to environmental monitoring in the event of a release. This includes who, when and how reporting is to be completed. Reporting must include the location and time of release, the circumstances leading up to the release, and the type and quantity of the substance released.

“To report a release, call 1-800-222-6514.”

### *Waste Control Regulation*

This regulation covers various types of wastes such as hazardous wastes and hazardous recyclables, and sets out requirements for handling, storing and disposing of such materials.

### *Substance Release Regulation*

This regulation includes a list of materials that are illegal to burn such as plastic, rubber, used oil and containers that held pesticides or other chemicals.

#### **12.2.3 *Animal Health Act***

The *Animal Health Act* enables the province to respond to animal diseases affecting animal health, public health, and food safety. The Act and its regulations are designed to control the spread of disease through inspections and surveillance, treatments, biosecurity measures, and control zones. The roles and duties of the Chief Provincial Veterinarian (CPV) of Alberta and inspectors are outlined. The Act requires an owner of an animal or authorized person to advise the CPV of suspected or confirmed reportable and notifiable diseases within 24 hours.

### *Disposal of Dead Animals Regulation*

The *Disposal of Dead Animals Regulation*, under the *Animal Health Act*, describes the duty of owners to dispose of a dead animal within a specified time period in a prescribed manner and allowable location. Wildlife or controlled animals that fall under the *Wildlife Act* are exempt unless the animals are held in captivity under *Wildlife Act* permits or taken to a meat processing facility. Offences related to, and penalties for, contravention of the Regulation are described.

#### **12.2.4 *Safety Codes Act***

The *Safety Codes Act* establishes a unifying framework for the administration of ten safety disciplines which each have their own safety codes and standards.

### *Private Sewage Disposal Systems Regulation*

This regulation establishes certification requirements for private sewage equipment, adopts the Alberta Private Sewage Systems Standard of Practice 2015, and specifies the types of systems for which this applies.

#### **12.2.5 *Agricultural Operation Practices Act***

As Alberta's *Agricultural Operation Practices Act* (AOPA) and its associated regulations apply to all agricultural operations in Alberta. The purpose of the Act is to ensure that the province's livestock industry can grow to meet the opportunities presented by local and world markets in an environmentally sustainable manner.

Part 1 of the Act defines how nuisance issues such as odour, dust, noise and smoke resulting from agricultural activities are addressed. Part 2 of the Act defines siting and construction standards for manure storage and collection facilities, addresses the application and management of manure to agricultural land and ensures environmental protection through approval and compliance processes. These requirements are designed to prevent water contamination, protect the soil, and reduce nuisance impacts to neighbours. They apply to all agricultural operations that spread manure.

The Natural Resources Conservation Board is responsible for enforcing AOPA and its regulations. Alberta Agriculture and Forestry is responsible for developing and updating the AOPA legislation.

### 12.2.6 *Soil Conservation Act*

The *Soil Conservation Act*, describes the requirement for landholders to prevent soil loss or deterioration from taking place or to stop loss or deterioration from continuing. The Act delegates authority to local municipalities and outlines the powers and duties of the designated officers. It also outlines the process, procedures and governance for appeals under the Act. Offences related to, and penalties for, contravention of the Act are described.



Landholders are required to actively prevent soil degradation — *Courtesy of AF*

### 12.2.7 *Weed Control Act*

The *Weed Control Act* enables the Minister's authority to declare noxious or prohibited noxious weeds that present significant economic, social or ecological risks. The duties of individuals, local authorities, municipalities, and the Crown related to the prevention, control, and destruction of weeds are described in the Act. It outlines the appointment and powers of inspectors who enforce the Act and the operational requirements of seed cleaning facilities. Offences related to, and penalties for, contravention of the Act are described.

#### *Weed Control Regulation*

The *Weed Control Regulation* provides the list of prohibited noxious weeds and noxious weeds. It describes seed cleaning facility licensing procedures as well as the requirements of the appeal process for inspector's notices, local authority's notices, and debt recovery notices.



### 12.2.8 *Agricultural Pests Act*

The *Agricultural Pests Act* provides authority for the Minister of Alberta Agriculture and Forestry to declare as a pest or nuisance any animal, bird, insect, plant or disease that is destroying, harming or likely to destroy or harm any land, livestock or property in all or part of Alberta. The legislation enables inspectors and local authorities to deal with native and introduced pests and nuisances which affect agricultural production.

#### *Pest and Nuisance Control Regulation*

The Pest and Nuisance Control Regulation, under the *Agricultural Pests Act*, provides a list of declared pests and nuisances in Alberta. The Regulation restricts the importation, purchase, sale, disposal, transportation, transplanting, or distribution of an infested item or pest and outlines the exceptions and Minister's authority to declare a quarantine. The Regulation describes the permit process for some pests including rats, and control of nuisances including coyotes and skunks.

## 12.3 For More Information

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000.**

#### **Alberta Government Queen's Printer**

Telephone: 1-780-427-2711

Website: [www.qp.alberta.ca](http://www.qp.alberta.ca)

#### **Alberta Agriculture & Forestry**

##### **Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

Resources:

- Agricultural Operation Practices Acts and Regulations

#### **Alberta Environment & Parks**

Information Centre: 310-ESRD (3773)

Website: [www.alberta.ca/environment-and-parks.aspx](http://www.alberta.ca/environment-and-parks.aspx)

Resources:

- Water Act Guidelines
- Pesticide Management
- Reporting Spills and Releases
- Hazardous Waste

#### **Alberta Municipal Affairs**

Community & Technical Support: 1-866-421-6929

Website: [www.alberta.ca/municipal-affairs.aspx](http://www.alberta.ca/municipal-affairs.aspx)

Resources:

- Safety Codes

### **Alberta Transportation**

The Co-ordination and Information Centre – 1-800-272-9600 (toll-free)

Website: [www.alberta.ca/transportation.aspx](http://www.alberta.ca/transportation.aspx)

Resources:

- Transportation of Dangerous Goods

### **Natural Resources Conservation Board**

Telephone: 1-866-383-6722 (Toll Free)

Website: [www.nrcb.ca](http://www.nrcb.ca)

### **Environmental Law Centre**

Telephone: 1-800-661-4238 (Toll Free)

Website: [www.elc.ab.ca](http://www.elc.ab.ca)

## Appendix - Emergency Plan

### Emergency Planning, Clean-up and Handling Procedures

Every farmstead needs an emergency plan that outlines the location and identification of hazardous materials, emergency equipment, telephone numbers and necessary clean-up methods. Such a plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protecting those living on the site and in the surrounding community.

### Rural Emergency Plan

A Rural Emergency Plan (REP) is a tool created by farmers and those on the front lines of emergency response, the REP is a personalized, easy-to-use tool for rural landowners to prepare for personal and environmental safety emergencies on their farms, ranches or acreages. It's also a way to let emergency responders know critically important information about rural properties so they can respond to emergencies quickly, effectively and safely.

Basically, an REP is an emergency response map that each participant fills out for their own location. It is stored in a simple PVC tube holder typically mounted on the main power pole or other central area where it can be easily identified and accessed by emergency personnel. The REP typically includes:

- map of the farmstead, including the locations of all hazardous substances and emergency
- equipment supplies
- A “runoff map” of the property
- Emergency phone numbers
- A Rural Emergency Plan checklist
- Other key information emergency personnel might need to make fast and effective decisions

For more information on the Rural Emergency Plan go to [www.ruralemergencyplan.com](http://www.ruralemergencyplan.com)

### Spills

In the case of spills with hazardous sources such as pesticides, fuel, fertilizer, or livestock manure, those living and working on the farmstead need to be responsible for minimizing environmental and safety risks by following these steps:

1. Isolating the affected area
2. Gear up with protective clothing
3. Ventilating the area
4. Stopping further leaks
5. Containing the spill area
6. Reporting the spill
7. Cleaning the spill
8. Decontaminating the spill area
9. Disposing and reclaiming the waste

**24-hour Response Line**

**To report a spill call 1-800-222-6514**

To ensure human health and safety, protect the environment and prevent a more extensive problem, report all spills (immediately if entering or threatening a water body or source). Reporting a spill provides information if clean-up is required. It also provides a record in case the incident is reported by someone else and leads to an investigation that may result in costly sample taking and associated chemical analyses to determine what has been spilled.

In the case of a non-hazardous, accidental spill, it is always a good idea to carry a supply of fresh water and a clean pair of gloves to wear when cleaning up. First, it is important to read any product labels or contact the manufacturer for advice on clean-up procedures (most products have a 1-800 customer service number on the label). Disposing of all absorbent materials must be done in an approved landfill. If the spill is large, evacuate the area and notify Alberta Environment through their Emergency Response Centre at **1-800-222-6514**.

### **Emergency Preparedness for Farm Animals**

From barn fires to hazardous materials spills to natural disasters, emergency situations often call for special measures to shelter, care for or transport farm pets, livestock, and poultry. Safeguard your animals, your property and your business by taking precautions now, no matter what the risks are in your area.

There are three steps to getting your farm and its animals prepared for major emergencies.

1. Know the risks – some of the more common risk to farm animals are:
  - Overland flooding of creeks, rivers or canals
  - Fires – structure, wildfires and grass fires
  - Spills or releases of dangerous goods, chemicals or hazardous materials.
2. Make an Emergency Plan - When developing your plan, there are three main options to consider for how you can respond to emergency events: shelter-in-place, evacuate family and animals, and evacuate family but not the animals.
3. Build a Farm Emergency Kit

For more information on **Emergency Preparedness for Farm Animals** go to [www.aema.alberta.ca](http://www.aema.alberta.ca)

### **Stay Informed**

Sign-up for alerts at Alberta Emergency Alert to receive current information about disasters or emergencies impacting your community.

For more information on emergency preparedness, visit [GetPrepared.ca](http://GetPrepared.ca)



**For More Information:**

**All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000**

**Alberta Agriculture and Forestry****Ag-Info Centre: 310-FARM (3276)**

Website: [www.alberta.ca/agriculture-and-forestry.aspx](http://www.alberta.ca/agriculture-and-forestry.aspx)

- Alberta Farm Safety Program
- FarmSafe Alberta

Publications:

- Handling Pesticides: Are You Protected?

**Alberta Emergency Management Agency**

[www.aema.alberta.ca](http://www.aema.alberta.ca)

Phone: 780-422-9000

Provincial Operations Centre (24 hours) – 1-866-618-2362

**Alberta Wildfire**

Publications:

- FireSmart Homeowners Manual: FireSmart Begins at Home
- Brush Piles and Windrows: Safe Burning Practices

To report a Wildfire: 310-FIRE (3473)

Website: [wildfire.alberta.ca](http://wildfire.alberta.ca)

## Glossary of Terms

**Abandoned well**

An unused well, left unattended and not maintained for future use.

**Application rate**

The recommended amount of fertilizer, manure or pesticide applied to a specific area; for example, 1 kg per hectare (0.9 lb per acre).

**Aquifer**

A geologic formation or stratum that yields significant quantities of water. Aquifers are the source of water for wells and springs.

**Backflow**

The unwanted, reverse flow of liquids into a piping system. Ensures one-way flow.

**Beneficial Management Practice (BMPs)**

Any agricultural management practice that mitigates or minimizes negative effects and risks to the environment by maintaining or improving water, land and air quality and biodiversity.

**Bioconcentration**

Accumulation of a substance in the tissue of an organism.

**Biodiversity**

Biological diversity: the variety of living organisms, **ecosystems** and ecological processes.

**Biomagnification**

A cumulative increase in the concentration and toxicity of a persistent substance in successively higher levels of the food chain.

**Biosecurity**

Any action or practice involving precautions to reduce the risk of introducing diseases to a farm site or region where they do not already exist and reduces the spread within the farm site or region.

**Bollards**

Barriers constructed of a sturdy material, such as steel piping filled with cement, set up close to facilities such as fuel tanks or buildings to guard against collision damage.

**Buffer zone**

An area of land adjacent to a water body or sensitive area such as a riparian area that is developed or conserved to reduce erosion, intercept pollutants and provide wildlife habitat. The buffer zone is undisturbed or left in permanent vegetation.

**Closed handling system**

A system for transferring fertilizers or other chemicals directly from the storage container to the applicator equipment, so humans and the environment are never exposed to the chemicals.

**Constructed wetland**

A man-made wetland system constructed to capture and treat agricultural wastewater including runoff that relies on physical, chemical and biological processes to treat the wastewater.

**Contamination**

The alteration of a material by the introduction of a chemical or other substance that makes the material unfit for a specified use.

**Cross connection**

A direct arrangement of piping that allows the potable water supply to be connected to a source that contains a contaminant. For example, a garden hose with the end submerged in a stock tank, laundry tub or sprayer tank or a pasture pipeline system with submerged float valves.

**Cryptosporidium**

A single-celled, microscopic parasite that lives in the intestines of humans and animals. The dormant form is excreted in the stool of infected animals and humans and presents health risks.

**Ecological processes**

The relations of organisms to one another and to their physical surroundings or continuous action or series of actions strongly influenced by one or more ecosystems.

**Ecosystem**

A system of living organisms interacting with each other and their environment, linked together by energy flows and material cycling.

**Escherichia coli (E.coli)**

E. coli are bacteria found in the intestines of humans and warm-blooded animals, and are necessary for a number of important functions, including digestion. However, different strains present a health risk, such as E. coli O157:H7, produce powerful toxins causing severe illnesses such as bloody diarrhea, fever, vomiting and kidney failure.

**Gearing Up Throttling Back (GUTB)**

A driving technique used to improve tractor fuel efficiency and reduce noise level. The driver reduces the engine speed and shifts up a gear to maintain the same ground speed.

**Giardia**

A single-celled, microscopic parasite that lives in the intestines of humans and animals. The dormant form is excreted in the stool of infected animals and humans, presenting health risks.

**Greenhouse gases**

Water vapour, carbon dioxide, ozone, methane, nitrous oxide and chlorofluorocarbons that contribute to the greenhouse effect trapping heat in the earth's atmosphere.

**Greywater**

The relatively clean wastewater that does not contain human or animal wastes, but wastes from water used in tubs, sinks or washing machines.

**Groundwater**

Water found below the ground surface. This water is free to move by gravity, soaking into the ground from wetlands, lakes or precipitation. The upper surface of the groundwater forms the water table.

**Habitat**

The environment in which a plant or animal lives.

**Hazard**

A source of contamination that has the potential to cause a negative effect.

**Impermeable**

Restricted movement of liquids, gases or odour through a given material.

**Infiltration**

The downward movement of water through cracks, joints and pores in soil and rock.

**Leaching**

The downward movement of water carrying dissolved or suspended substances through the soil profile.

**Minimum Distance Separation (MDS)**

The absolute minimum distance established as a setback or buffer to reduce nuisances and environmental risks between sources of contamination or hazards such as sewage or manure storage facilities and any receptors such as adjacent land, residences, water bodies or water sources.

**Nuisance**

Any activity that arises from unreasonable, unwarranted or unlawful use of a person's own property causing obstruction or injury to another person or the public. The activity creates smoke, odour, noise or vibration resulting in annoyance, inconvenience, discomfort and/or damage as well as interferes with the reasonable and comfortable use of a person's property.

**Nutrient**

An element essential for plant or animal growth. Major nutrients include nitrogen, phosphorus, carbon, oxygen, sulphur and potassium.

**Organic Matter**

Comprised primarily of plant residues at various stages of decomposition.

**Pathway**

A pathway describes how a hazard travels from a source to a receptor. Pathways can be water, air, soil, human, animal or any combination.

**Pitless Adaptor**

A mechanical device used to provide frost-free, sanitary well connections that are designed to replace pump houses and well pits.



**Pressure rinse**

A method to rinse pesticide containers properly. Water is sprayed under high pressure against all inside surfaces of the container, and the rinsate is added to the sprayed tank.

**Receptor**

A receptor is something that has the potential to be affected, usually in an adverse way, by a given hazard.

**Rinsate**

Wastewater from cleaning the inside of product containers or chemical application equipment.

**Riparian area**

Riparian areas are lands adjacent to surface water bodies where the soil and vegetation are strongly influenced by water. Riparian areas stay greener longer and produce more forage than uplands, partly due to soils and mostly due to an elevated water table.

**Runoff**

Water that moves across the land as overland flow or that moves laterally in an unsaturated zone as interflow or subsurface flow.

**Run-on**

Water that flows onto a given area.

**Secondary containment**

Any structure, such as a dike, built around a chemical storage area to hold 110 percent of its maximum volume.

**Seepage**

Seepage is the slow movement of water through the soil from a large undefined area into or out of a surface or subsurface water body. In contrast, a spring is where water emerges from a defined location.

**Stewardship**

Stewardship can be defined as an individual's responsibility to manage resources and to ensure resources are sustained or enhanced for future generations.

**Surface water**

All water found on the ground surface, such as lakes, ponds, sloughs, wetlands, dugouts, rivers, creeks, temporary streams, canals and drainage ditches.

**Sustainable**

Practices that provide a flow of goods and or services over a long period of time without degrading the environment or lowering productivity.

**ULC and CSA approved**

Tested and approved for safety by the Underwriters' Laboratories of Canada (ULC) and the Canadian Standards Association (CSA). Some items, such as chemical storage containers, must have ULC approval.

**Vegetative filter strip**

Vegetation planted along or around a sensitive area to slow down the movement of water to help settle out solids, and filter contaminants by providing oxygen to microbes that transform contaminants into less harmful forms.

**Water body**

Any location where water flows or is present. Water bodies include lakes, wetlands, aquifers, rivers and sloughs.

**Water source**

A developed or natural structure containing raw or potable water that is used for a specific purpose.

**Water table**

Upper level of the soil zone, where all spaces between the soil particles are filled with water and the soil is saturated.

**Waterway**

A low path where surface water collects and flows.

**Well cap**

A commercially manufactured device used to cover the top of a well casing. This cap prevents surface water, solid material or other substances from entering the well through the top of the well casing.

**Well casing**

Steel pipe, plastic pipe or concrete tile installed as a lining when a well is constructed. A casing serves to strengthen the well bore hole, so it does not collapse. It also prevents contaminants from entering a well and allows placement of a pump or pumping equipment.

**Well pit**

Lined, shallow excavation constructed around the top of the well casing of a drilled well. It is no longer legal to construct a well pit in Alberta.

