Environmental Issues

When burned, hospital waste and medical/infectious waste can emit various air pollutants, including hydrochloric acid, dioxin/furan, and the toxic metals lead, cadmium, and mercury. However, 85-90% of hospital waste is not infectious. Perhaps the greatest environmental impact medical facilities have on the waste stream is the large volume of waste they generate. These facilities commonly use disposable items, most of which may be necessary to control infection. Nonetheless, medical facilities should examine the opportunities for source reduction, reuse, and recycling of all their waste streams.

Economic Issues

Following the adoption of stricter air emission rules, all but two medical auto-claves in Montana have ceased operation due to the cost of environmental compliance. The remaining two incinerators handle only their own waste. Two other medical facilities autoclave and landfill their own waste. The remainder of medical waste generated in Montana is stored and transported to the one commercial autoclave, located in Butte.

Waste Tires

EPA estimates that the U.S. generates approximately 290 million waste tires per year, or approximately one tire per person per year (https://archive.epa.gov/epawaste/conserve/materials/tires/web/html/faq.html). Although DEQ does not track tire disposal rates specific to Montana, tire dealers estimate a replacement rate of 0.75 tires per person per year. Even using conservative estimates, Montana generates approximately 783,000 waste tires per year, based on Montana's current population of just over a million people (per the 2017 Census figures).

Management

Scrap tires present unique recycling and disposal challenges because they are heavy, bulky, and made from a variety of materials. Quantity matters in economy of scale, and commercial scrap tire processing operations need 2-3 million tires a year to be efficient. Unfortunately, developing alternative uses for waste tires in Montana has lagged due to the low production of waste tires and lack of local recycling facilities. Montana does have a few success stories from civil engineering projects using scrap tires. The Yellowstone Park Service, The Micheline Corporation, and KB Industries used a product called Flexipave (https://yellowstoneinsider.com/tag/kbi-flexi-pave/) to replace asphalt paths within Yellowstone Park, which uses one tire for every three-square feet.

Retreading also saves millions of scrap tires from being disposed of each year. According to the Rubber Manufactures Association, nationally, 85% of the scrap tires have markets: 45% of tires are used for Tire Derived Fuel (TDF), 3% are exported, 10% are ground rubber, 19% are used in civil engineering projects, 4% is diverted, 10% is unknown, and 9% is landfilled.

Montana has three licensed tire landfills in the state and collectively these three bring in a total of 17 thousand tons of tires annually. The top market categories for scrap tires nationally are still TDF, Ground Rubber, and Civil Engineering Applications. Currently, there no TDF facilities in Montana. The need for more viable markets remains.

Environmental Issues

Piles of waste tires pose health threats. Disease carrying pests such as rodents may live in and among the tires, while mosquitoes will breed in the stagnant water that collects inside them. Several varieties of mosquitoes can carry deadly diseases, including West Nile, Zika, yellow fever, encephalitis, dengue, and malaria. Short of removing the piles, mosquito control and eradication programs are difficult.

Open and uncontrolled burning of waste tires may also pose a risk to human health and the environment. Chemical composition tests on waste rubber show that it contains numerous toxic and hazardous pollutants. Because open, uncontrolled tire fires are difficult to extinguish, large amounts of toxins may be released into the air, soil, and groundwater.

Tires occupy a large space in landfills. They are not easily compressed and nearly 75% of the space occupied by a whole waste tire is dead space.

Economic Issues

Although the recycling or reuse of waste tires is a business opportunity, it is one that is still in the development stage in Montana. The costs associated with it are generally too onerous for a company without some type of government assistance. Any business interested in starting a waste tire reuse/recycle program should evaluate the following issues:

- The number of waste tires available within a 200-mile radius
- The types of tires available — passenger tires, light truck, etc.
- The amount that can be charged to collect the tires
- Potential customers for the recycled material
- The ultimate end-market — such as landscaping material, playground cover, or engineering-grade powders
- Tire composition is changing and making crumb rubber specifications hard to meet
- The tax credit for TDF has expired
- Health concerns for ground rubber has slowed the market

Waste Carpet

Carpets are manufactured to withstand years of wear and are difficult to manage as scrap. Because carpets consume large amounts of petroleum-based materials, industry efforts are leading the way in carpet recycling. Carpet recycling began in Georgia, when Interface Carpet started to decrease its use of nonrenewable fuels and increase sustainability. It grew into an industry-wide effort through the Memorandum of Understanding (MOU) for Carpet Stewardship, a voluntary agreement among EPA, industry, non-governmental organizations (NGOs), and state governments. The MOU set a national goal to divert 40% of scrap carpet by 2012 through reuse, recycling, cement kilns, and waste-to-energy. A third-party organization, Carpet America Recovery Effort (CARE), was established to coordinate efforts. The market for scrap carpet is driven by industry in recognition of the material's value as a recycled commodity and, in some cases, an alternative fuel for the recycling operations.

According to the 2016 CARE Annual Survey Results of the U.S. Carpet Recycling Industry, the recovery rate of post-consumer carpet in the U.S. was 14% — down 1% from 2015. The materials flows were as follows:

- Recycled Output (reuse plus recycle) — 33%
- Waste-to-Energy — 11%
- CAAF and kiln output — 18%
- Resin and molding applications — 72%, up from 65% in 2015
- Carpet face fiber — 3% of recycled output, down from 13% in 2015
- Carpet backing — 8%
- Other applications — 18%

Management

Currently, Montana does not have well-established carpet recycling activities, and most waste carpet is generally transported and disposed of in a municipal landfill. One known carpet recycling program available to Montana consumers is offered by Pierce Flooring and Design, a regional retailer with eight stores in the state. A semi-trailer is located at each store to provide temporary storage and final transport of the used carpet to an out-of-state recycling processor. Pierce generally ships to a processor located in either Washington or California. Pierce pays the freight charges and the processor fees to accept the scrap material. Pierce staff state that the recycling program is a budget item and does not generate revenue for the retailer. However, the company saves money on landfill tipping fees and expects the program to become cost-neutral as it matures.

Environmental Issues

Carpet manufacturing is an energy-intensive process that creates a petroleum-based final product. Scrap carpet can be recycled into commodity-grade resins and fibers, which then have market value. Scrap carpet in landfills is somewhat difficult to manage due to its weight and bulkiness.

Economic/Social Issues

There are collection and consolidation activities for carpet in Montana, but there are no processors. Processors for carpet are paid to accept the material and separate the carpet into padding, backing, and other materials, which are sold back to industry. More retailers could participate, but the cost of transportation to processors and recyclers is high, while landfill tipping fees are relatively low in Montana, making it difficult for recycling to be an economic alternative. Additionally, consumer trends in homebuilding and renovation appear to be shifting towards other flooring options, making it difficult to estimate future markets.

Construction and Demolition Waste (C&D)

Construction and demolition (C&D) waste consists of the waste generated during construction, renovation, and demolition projects. C&D waste often contains bulky and heavy materials, including concrete, wood, asphalt, gypsum, metal, brick, and plastic, as well as salvaged building components such as doors, windows, and plumbing fixtures. Demolition and renovation represents most C&D waste — approximately 90%, with the remaining 10% generated by new construction. EPA estimates that the commercial and residential building sectors produce 61% and 39% of C&D waste, respectively (https://www.epa.gov/smm/sustainable-management-construction-and-demolition-materials).

In the U.S., estimated C&D debris generated during demolition of a single-family house is 111 pounds per square foot of dwelling. While most of the debris from new construction is wood, most demolition debris is concrete.

C&D Debris Generation by Material and Activity (million tons)

	Waste During Construction	Demolition Debris	Total C&D Debris
Concrete	23.1	358.7	381.8
Wood Products	2.8	36.1	38.9
Drywall and Plasters	2.5	10.5	13.0
Steel	0	4.5	4.5
Brick & Clay Tile	0.3	11.9	12.2
Asphalt Shingles	0.9	12.6	13.5
Asphalt Concrete	0	83.9	83.9
Total	**29.6**	**505.1**	**547.8**

Figure 2: Advancing Sustainable Materials Management: 2015 Fact Sheet

Management

It is uncertain how much of Montana's C&D debris is disposed of with municipal solid waste. Significant quantities of building material, particularly renovation scraps, are discarded in the municipal waste stream. C&D waste can be discarded in Class II or IV landfills, and although Montana has two licensed Class IV C&D landfills in operation, most C&D waste is discarded at Class II landfills. Operators may separate C&D waste from the rest of the waste stream, but they are not required to do so.

Non-friable asbestos waste such as cement asbestos siding, floor tile, linoleum, and asphalt roofing, can be disposed of as construction demolition waste if it remains intact. Non-friable asbestos waste should not be compacted or treated using waste minimization techniques. Additional information on asbestos waste can be found in the next section.

Environmental Issues

Demolition debris may contain hazardous components. Lead is present in solder, flashing, and some old paint. Treated wood contains chromium, copper, arsenic, mercury, barium, and cadmium. Drywall and plaster consist of gypsum, which contains high levels of sulfate. Asphalt, roofing tar, and tarpaper contain leachable petroleum products. All these products are commonly found in C&D waste and have the potential to contaminate the water supply if disposed of improperly. In properly sited, designed, and operated landfills, C&D waste likely does not pose a significant threat to ground water. DEQ interprets the solid waste laws to prohibit unlicensed on-site disposal of C&D waste on private land.

Economic Issues

The most significant contributing factor in the amount of C&D waste that ends up in landfills is the high cost of material separation. Time and space to separate the wastes, the lack of demand for the materials, and the ease/low cost of landfilling are all deterrents to recycling and reuse.

There are potential cost savings for recycling and reuse, however. Overall project expenses can be reduced through avoided purchase and disposal costs, and on-site reuse can reduce transportation costs. Additionally, there is a tax benefit to donating recovered materials to qualified 501(c)(3) charities.

Asbestos Waste

State rules and federal asbestos regulations specifically exempt most residential dwellings from asbestos rule applicability but do require that Regulated Asbestos-Containing Material (RACM) be removed from public and commercial buildings prior to demolition. The impact or removal of RACM during demolition or renovation activities in public and commercial buildings is strictly regulated. RACM is defined in Montana Asbestos rules and EPA regulations as materials that contain more than 1% asbestos and are either classified as friable or may become friable during demolition or renovation activities. Friable means that the asbestos can be crumbled or reduced to powder by hand pressure. Montana Solid Waste rules identifies asbestos contaminated wastes as any waste material impacted by asbestos.

Management

Before demolition or renovation of a public or commercial building, a trained and DEQ-accredited asbestos inspector must conduct an asbestos inspection. Title 40, part 61, subpart M, of the Code of Federal Regulations (CFR) is the asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation. This regulation, together with ARM 17.74.3-4, governs building demolitions, renovations, active and inactive asbestos landfills, and other sources of asbestos emissions.

An asbestos abatement project permit from DEQ is required if ten or more square feet, or three or more linear or cubic feet of friable or potentially friable ACMs are abated, transported, or disposed of. Only trained and accredited asbestos abatement contractors can perform asbestos activities or handle RACM. RACM can be disposed of only at state-licensed Class II or IV landfills and is regulated under both the ARM and NESHAP regulations.

Disposal site operators are required to provide information on how they will comply with asbestos waste disposal standards during the licensing process. Information includes a description of the waste disposal site, a description of the method to be used to comply with the asbestos NESHAP if warranted, and methods to be used to prevent asbestos emissions. Disposal site operators are also required to retain copies of the waste shipment record (WSR) which must accompany the waste from generator to disposal site and to document specific cells where waste has been deposited.

Environmental Issues

Since the early 1970s, EPA and OSHA have been concerned about the potential health hazards relating to the generation, handling, and disposal of asbestos waste. Serious respiratory diseases and cancers, such as asbestosis and mesothelioma, can appear several years or even decades after asbestos inhalation exposure. Renovation and demolition of asbestos-containing properties pose significant health hazards to construction, transportation, and waste disposal workers as well as persons who might be exposed in their home or workplace.

Economic Issues

The removal and disposal of asbestos-containing materials from public and commercial properties may involve the services of numerous specialties at significant cost. Handling, transportation, and disposal of RACM must be performed in accordance with federal, state, and local rules and regulations.

Electronic Waste

E- Waste

Innovations in technology have led to increased use of electronics, which in turn has increased e-waste being generated when the electronic products reach the end of their useful life. E-waste includes phones, computers, business equipment, entertainment and communications equipment, and thousands of other products used in homes and businesses today. E-waste contains plastic, toxic chemicals, heavy and rare earth metals, and can contribute to pollution if not properly managed.

Montana successfully diverted nearly 1 million pounds of e-waste from waste streams in 2017. This equates to a statewide collection rate averaging one pound per capita. Global E-Waste Monitor 2017 reports 49.2 million tons of e-waste was generated in 2016, an increase of 3.3 tons, or 8%, from 2014. E-waste generated globally is projected to grow at about 3-4% per year, reaching more than 57.5 million tons by 2021.

Manufacturers of mobile devices already offer direct recycling exchange programs for customers. E-waste value depends largely on disassembly labor, material separation, and downstream efficiency.

Management

The number of unwanted electronics generated by the desire or need for technical upgrades is growing, and there is a good reuse market for these products. For example, markets for used cell phones are very strong, offering fundraising opportunities for Montana schools and other organizations. Cellular telephone companies gladly accept back any scrap cell phone, regardless of the brand.

Due to the rare earth metals, gold, and other recoverable metals found within most products, recycling opportunities for e-waste have grown substantially. Even products such as televisions and computer monitors, which contain fewer valuable metals, can be recycled. Many electronics can be recycled for free or for very little cost, but other equipment carries a recycling fee. Electronic recycling is one of the fastest areas of growth within the scrap recovery industry.

There are no processors of e-waste in Montana, but several recycling businesses collect, consolidate, and prepare e-waste for shipment to processors elsewhere. These e-waste "recyclers" are licensed by DEQ as solid waste systems. DEQ began to partner with communities in 2006 to organize electronics collection events. Several communities now offer events annually or have started permanent collection programs. Montana citizens have recycled nearly 3 million pounds of e-waste since 2006. EPA estimates that electronics make up nearly 2% of the municipal waste stream and the volume of electronics in the waste stream will greatly increase as personal electronic use continues to expand. EPA estimates that more than 80% of electronics are disposed of in landfills across the U.S. Most of the electronic waste in Montana is landfilled, partly because access to e-waste recycling is limited to annual events, and because access to retail programs may require transporting the e-waste long distances to stores. A handful of municipal and private solid waste companies offer year-round recycling opportunities (http://www.epa.gov/waste/conserve/materials/ecycling/index.htm).

Environmental Issues

Although small amounts of heavy metals may be used in each electronic product, the volume of e-waste in landfills raises concerns about potential leaching and cumulative effects. Mercury, lead, cadmium, and PCBs can leach when circuit breakers, cathode ray tubes, and monitors are exposed to acidic water, as can happen in landfills. EPA states that 80% of the recycling operations in the U.S. operate within the confines of national and international laws regarding the shipment of hazardous waste. As a regulator of the e-waste industry, EPA has issued enforcement actions and fines to a small number of e-waste recyclers caught in violation of federal law

and international laws and treaties. Working with industry watchdogs and trade organizations, EPA is addressing the illegal export of e-waste to countries with primitive recycling practices and lax environmental protections.

Economic Issues

The electronics recycling industry has been growing rapidly, and companies are now merging and consolidating operations, as well as developing methods of recycling hard-to-handle materials (e.g., cathode ray tubes that were used in older televisions and monitors). These activities are expected to lower recycling service fees but may not eliminate them. Import bans may also slow the recycling rates as more countries that the U.S. has traditionally sent e-waste to are strengthening their environmental regulations.

Waste Batteries

Batteries convert chemical energy to electrical energy to power electronic equipment, and their chemistry differs according to the purpose and use of the battery. Batteries are divided into three main categories: lead-acid automobile batteries, non-automotive lead-based batteries, and dry-cell batteries. Dry-cell batteries are further divided into three categories: alkaline, button-cell, and rechargeable. As small, portable electronic items increasingly become part of everyday life, dry-cell battery usage continues to increase, along with public interest in recycling of all batteries, regardless of chemistry. EPA estimates that nearly 3 billion household dry-cell batteries are purchased in the United States each year, along with 99 million wet-cell lead-acid car batteries and an unknown number of heavy-duty batteries for industrial applications (http://www.epa.gov/waste/hazard/wastetypes/universal/batteries.htm).

Management

Automotive batteries contain lead and sulfuric acid, which warrant the designation of hazardous waste when disposed. Fortunately, lead has inherent value and is recyclable. In the U.S., over 95% of all automotive batteries are recovered and recycled. Virtually any place that sells car batteries will accept used ones in trade. Commercial demand for the lead drives private sector interest in collecting and recycling these battery types. The chemistry of dry-cell batteries ranges from those with no recovery value (household batteries) to rechargeable batteries for which a recycling program is federally required.

There is no federal requirement for alkaline battery recycling and only limited programs are available. The available programs charge handling and processing fees to offset the costs of collection and recycling household batteries.

The chemistry of rechargeable batteries requires more toxic materials than alkaline batteries and a federal law requires manufacturers of rechargeable batteries to provide a program for collecting and recycling their products. The intent of the law is to recover the heavy metals and reduce potential pollution at disposal. The Call2Recycle program (formerly the Rechargeable Battery Recycling Corporation) is an industry-funded non-profit organization that offers free recycling of all rechargeable batteries that weigh less than 11 lbs. (www.call2recycle.org). Postage-paid collection boxes are provided at no charge to retailers, public agencies, and other interested parties. Many home improvement stores, electronics, and battery retailers participate in this program and provide drop-off locations for consumers. Consumers can visit www.Earth911.org to find the nearest collection center.

Source reduction for batteries occurs at the point of purchase, where businesses, government agencies, and consumers can choose to purchase rechargeable batteries rather than disposable alkaline batteries. Purchasing rechargeable batteries reduces the need for replacement of alkaline batteries, and the Call2Recycle program

provides convenient recycling opportunities. For this reason, DEQ promotes the purchase of rechargeable batteries over alkaline batteries.

Environmental Issues

Although the chemistry of household batteries has changed to contain fewer heavy metals and almost no mercury, public perception has not changed. Household alkaline batteries can be safely disposed of in landfills, but DEQ receives many requests for household battery recycling programs. Because battery manufacturers started phasing out the use of mercury in alkaline batteries in 1989, the dry-cell battery types that continue to require it are now made with much less mercury than in the past. Research continues into alternatives that would allow reduced use of heavy metals in other battery types.

Rechargeable batteries are of more concern, however, due to significant amounts of cadmium, copper, zinc, lead, manganese, nickel, and lithium. These heavy metals may create a hazard to human health when disposed of incorrectly. In landfills, heavy metals have the potential to leach slowly into soil, ground water, and surface water, aided by the corrosive activity of the battery electrolyte.

Additionally, primary lithium batteries become hazardous when the outer casing is damaged and the contents are exposed. If improperly discarded or mishandled with machinery, the batteries can explode or combust, causing harm or fire within the landfill, which can burn for long periods and are very difficult to extinguish.

Economic Issues

All batteries can be recycled to some extent, but collection and processing costs, in addition to federal law, often determine whether recycling programs exist. Alkaline battery recycling programs are rarely established because of associated costs. The Call2Recycle free collection and recycling program for rechargeable batteries exists due to federal requirements on manufacturing. Rechargeable batteries cost more initially, but DEQ promotes the purchase of rechargeable batteries over disposable batteries because of the available recycling programs.

Pharmaceutical Waste

Pharmaceutical waste encompasses discarded prescription and over-the-counter therapeutic drugs, veterinary drugs, diagnostic agents, and supplements such as vitamins. The pharmaceutical industry estimates 3% of the prescriptions written in the U.S. are filled but never used. The preferred disposal option for these prescriptions is through take-back programs when available.

Management

The Montana Department of Justice (DOJ) launched Operation Medicine Cabinet in 2010 to assist local law enforcement agencies in establishing permanent prescription drug drop-off locations. Though developed primarily to prevent illegal use of prescription drugs, this program has the added advantage of ensuring proper disposal of pharmaceutical waste. Several Montana communities have established permanent drop-off locations. See https://dojmt.gov/consumer/prescriptiondrugabuse/ for more information on the DOJ program.

When a take-back program is not available, the preferred method of disposal is to place medication in a sealed container and place into the landfill. These products should never be flushed into sewer or septic systems.

Environmental Issues

The two greatest concerns related to improper disposal of pharmaceutical waste are hormone disruption in fish and other animals, and bacteria that can become resistant to antibiotics. Many contaminates are currently

unregulated. The Safe Drinking Water Act (SWDA) requires EPA to publish the Contaminate Candidate List (CCL) every five years. The SDWA directs the EPA to consider the health effects and occurrence information for unregulated contaminants as the EPA makes decisions to place contaminants on the list. SDWA further specifies that the EPA place contaminants on the list that present the greatest public health concern related to exposure from drinking water. EPA uses the CCL to identify priority contaminants for regulatory decision making and information collection (www.epa.gov/ogwdw/ccl/indix.html). The National Toxicology Program is also researching the effects on human health of low-dose exposure to pharmaceuticals in drinking water.

Economic Issues

Drug take-back programs require money for collection and processing. The programs rely on donations or grants and may not be sustainable.

Animal Waste (tissue/offal)

Animal waste is primarily derived from the agricultural sector (e.g., farms, ranches, and livestock holding areas), but can also include roadkill, wild game, and animals from managed game farms. Animal waste includes whole or parts of carcasses from butchering and veterinary medical procedures.

Montana landfills need to carefully dispose of animal waste, as well as be prepared to handle a contamination incident should it occur. In the event of an outbreak of a highly contagious animal disease, special measures must be taken to ensure the disease agent is eradicated, and to contain the outbreak and prevent its reoccurrence. In some cases, the agent will not survive long after the death of the infected organism, and proper burial of the carcass is sufficient. Other diseases require incineration to be eradicated. Determination of the correct option is addressed on a case-by-case basis by state agencies. It is the owner's responsibility to properly dispose of diseased animals.

Management

Animals found on public roadways are handled by the Montana Department of Transportation (DOT), which usually removes the carcasses and takes them to maintenance facilities to be composted. Animal carcasses found in the wild can typically be left to naturally decompose, unless they appear to have died from a threatening disease. In that case, the animal should be reported to the Montana Department of Fish, Wildlife and Parks (FWP).

Entrails and other organic remnants from hunting can typically be disposed of with regular household waste, while hides can often be sold to "hide and fur" locations throughout the state. An animal corpse can also be disposed of on private property with the consent of the owner if disposal meets requirements and restrictions in Section 75-10-213, MCA.

DEQ regulates some aspects of the disposal of dead animals under Sections 75-10-212 and 213, MCA, and provides guidelines for proper burial of animals. For animals that did not die from a contagious disease, the primary disposal method is to bury them in a high and dry location to protect surface and ground waters. Animals buried must be covered with a minimum of two feet of soil. The Montana Department of Livestock provides guidelines for the disposal of animals from agricultural operations.

Environmental Issues

There are two primary concerns with disposal of animal waste: the effect it may have on water quality in the process of natural decomposition, and the potential of spreading disease. Anthrax, foot and mouth disease,

chronic wasting disease (CWD), and bovine spongiform encephalopathy are just a few of the diseases that could be spread by inadequate disposal of sick animals.

Economic Issues

Rendering plants are the main source for recycling dead animals, slaughterhouse wastes, and supermarket waste into various products known as recycled meat, bone meal, and animal fat. These products are sold as a source of protein and other nutrients. Currently, there is no rendering plant in Montana.

In Montana, livestock continues to graze on public and private lands, and dairy and other animal products are produced across the state. Hunting draws a large group of visitors to the state each year. Successful animal-related industries are therefore vital to the economy and environment of the state.

Yard & Food Waste (Organics)

The EPA estimates that roughly 31% of the domestic food supply is wasted, with nearly 38 million tons being disposed in the U.S. every year. Yard trimming contribute an additional 34.5 million tons to the waste stream.

Food waste includes food that has spoiled; uneaten prepared food; fats, oils, and grease used to cook food; and by-products of the food and beverage manufacturing considered unfit for human consumption. Food waste comes from the following sources:

- Single and multi-family residences
- Foodservice establishments (restaurants, cafeterias, etc.)
- Institutions (universities, prisons, hospitals, etc.)
- Grocery stores
- Hospitality and entertainment venues (hotels, stadiums, etc.)
- Food processing and manufacturing industries
- Agriculture

Yard waste includes grass clippings, woody debris, and other plant materials such as weeds, which come from residential and commercial landscaping. Woody debris may also come from natural events such as high winds and wildfire.

Management

Together with paper and paperboard, organic materials make up the majority of MSW generation. The most common method of disposal for food waste has been landfill or incineration.

Yard trimmings are often composted on-site in landfills and account for around 23% of total recycling in 2014 nationwide. However, only 5.1% of food waste was diverted from landfills and incineration.

The EPA estimates that more food reaches landfills and incinerators than any other single material in everyday trash, constituting 21.6% of discarded municipal solid waste in 2014. In 2010, the U.S. Department of Agriculture (USDA) estimates that 31% of the food produced in the U.S. was not available for human consumption at the retail and consumer levels. The Food and Agriculture Organization of the United Nations (FAO) estimated that approximately one-third of all food produced worldwide was lost or wasted in 2011.

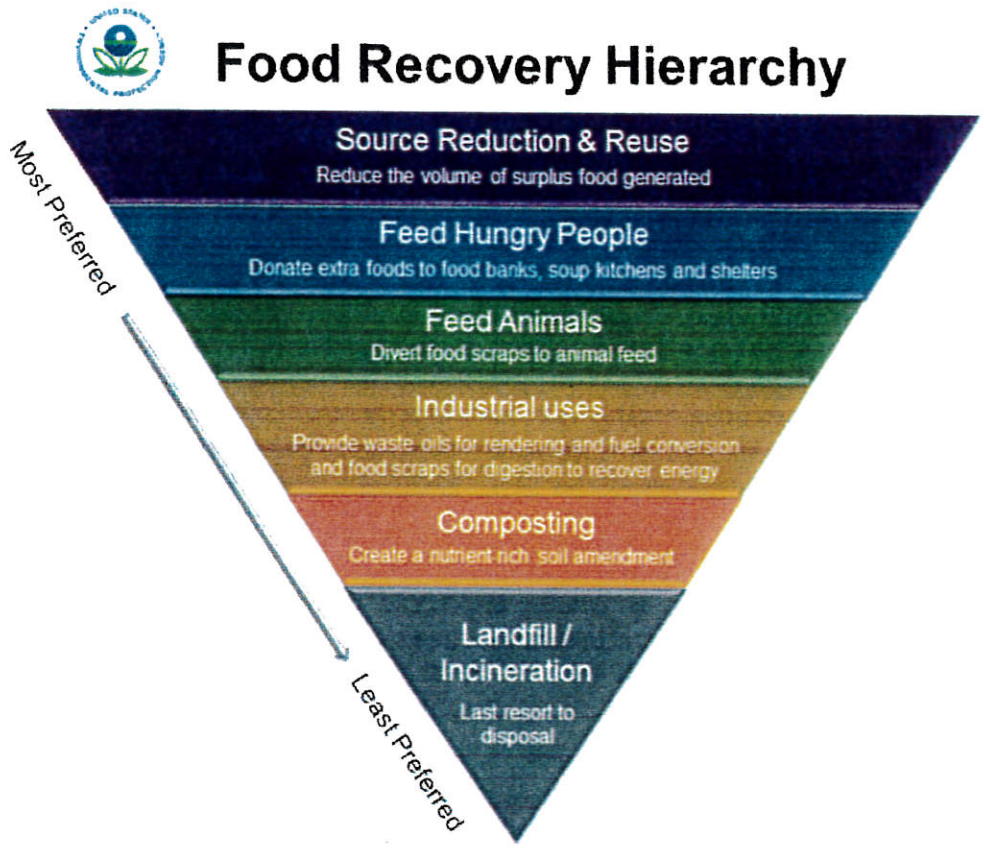

Figure 3: Advancing Sustainable Materials Management: 2014 Fact Sheet

The above EPA hierarchy shows food recovery methods ranked from most to least preferable. Reduction of food waste is the preferred option.

Many non-perishable and unspoiled perishable foods can be donated to organizations to feed hungry people if they are managed properly. Corporate donors are protected from liability under the Bill Emerson Good Samaritan Food Donation Act, as long as the donor has not acted with negligence or intentional misconduct. There are also potential tax benefits for companies that donate food.

If donating food to feed people is not an option, the next preferred management strategy is feeding livestock and other animals with the waste. MCA 81-2 Part 5 details the Montana regulations for feeding food waste to swine. Montana allows the feeding of animal-derived waste to swine if it has been properly heat-treated and fed by a licensed facility. All other waste may be fed to swine without heat-treatment. Individuals may feed household garbage to their own swine without heat-treating and without a permit: "Garbage fed to swine must be heated to a temperature of 212 degrees Fahrenheit for at least 30 minutes or treated in some other manner approved by the department of agriculture" MCA 81-2-509.Industrial uses for organic wastes includes anaerobic digestion, rendering, and the conversion to biodiesel fuel.

Anaerobic digestion is a process where microorganisms break down organic materials, such as food scraps, manure, and sewage sludge in the absence of oxygen. Recycling wasted food through anaerobic digestion produces biogas and a soil amendment, two valuable products. Food waste can be processed at facilities specifically designed to digest the organic portion of municipal solid waste. It can also be co-digested at wastewater treatment plants and manure digesters. Liquid fats and solid meat products can be used as raw materials in the rendering industry, which converts them into animal food, cosmetics, soap, and other products. However, there are no rendering facilities in Montana.

Biodiesel is a renewable fuel produced from agricultural resources such as vegetable oils. Most biodiesel is made from soybean oil, but canola oil, sunflower oil, recycled cooking oils, food waste, and animal fats are also used. In Montana, biodiesel production facilities that produce biodiesel from waste cooking oil, and who produce more than 2,500-gallons of biodiesel per year must obtain a Class II Solid Waste Management System license. Biodiesel production facilities that produce biodiesel from waste cooking oil and who produce less than 2,500 gallons per year for personal use must obtain a Small Biodiesel Production Facility license. The license is free and is renewed annually.

Compost is created by combining organic wastes in the correct ratios into piles, rows, or vessels. Mature compost is created using high temperatures that destroy pathogens and seeds from weeds that natural decomposition does not destroy. A free license is available in Montana to compost operations that meet the definition of a Minor Compost Facility, which is a composting operation that:

- Has less than two acres of active working area;
- Accepts less than 5,000 cubic yards of feedstock annually;
- Produces less than 2,500 cubic yards of compost annually; and
- Does not accept sewage sludge, biosolids, or septage.

A Major Compost Facility is a composting operation that does not meet the definition of Minor Compost Facility. Facilities that accept sewage sludge, biosolids, or septage for composting are major composters. They are subject to an application and licensing fee.

While residential and commercial food waste collection services are available in urban areas, including Missoula and Bozeman, it is not available state-wide. Households can compost food and yard waste at home, but should be mindful of proper composting methods to avoid odor and wildlife issues.

Environmental Issues

The major environmental issue with organic waste in landfills is the production of methane, which contributes 18% of the total methane produced in the U.S. Reducing food waste, reusing food for humans and animals, and repurposing it through industrial uses and composting can help mitigate methane emissions in Montana landfills.

Pollution related to food production can be lessened by reducing the amount of food wasted, which also saves energy associated with growing, preparing, and transporting food. Using composted food and yard waste can improve soil health and structure, improve water retention, and reduce the need for fertilizers and pesticides.

In Montana, wildlife can also cause issues with composting in similar ways to landfills and transfer stations. Proper containment should be used in any composting operation.

Economic Issues

Wasted food is wasted money for consumers and businesses; money can be saved buying only what is needed and by avoiding disposal costs. Organizations might pay less for trash pickup by keeping wasted food out of the MSW. Some haulers lower fees if wasted food is separated from the trash and sent to a compost facility instead of the landfill.

Recovering and recycling wasted food through donation, salvaging, processing, industrial reuse, and composting strengthens infrastructure and creates jobs. Food recycling in these sectors employs more than 36,000 people in the U.S., supporting local economies and promoting innovation.

Contaminated Soils

When petroleum products, solvents, or other toxic chemicals leak or spill onto soils, action must be taken to prevent the migration of the contaminants into ground and surface water. Contaminated soils that are not hazardous may be treated *in situ* (at the spill location) depending on the level of contamination, or by removal to a landfarm or a Class II landfill. Contaminated soils as well as sump solids from vehicle service centers and car washes are regarded as Group II solid waste. These are handled as contaminated soils, provided they are not listed as characteristic hazardous waste under RCRA. Soils from an automated car wash or an attended car wash that prohibits use of chlorinated solvents and remain visually free of grease and oil are not considered solid waste (ARM 17.50.814). If contaminated soils are determined to be hazardous, they are regulated under hazardous waste rules. Waste managers must ensure environmentally sound treatment and disposal.

Management

In 2011, six facilities in Montana were licensed as soil treatment facilities, and five Class II Landfills were licensed to include soil treatment facilities. Contaminated soils are typically landfarmed on-site in Montana, or taken to a licensed facility. Numerous sites may have been licensed as "one-time" landfarms for *in situ* remediation.

Environmental Issues

While treatment and disposal methods may provide greater protection than leaving the soils untreated on-site, they raise some environmental concerns. Depositing large amounts of petroleum-contaminated soil in a landfill takes up valuable space and introduces contaminants that may eventually leach from the landfill. Landfarming also releases volatile organic chemicals into the air, which may be of concern to surrounding residents.

Petroleum products generally contain more than 100 different constituents that possess a wide range of volatility. The volatility of contaminants proposed for treatment by landfarming is important because volatile constituents tend to evaporate, particularly during tilling or plowing operations, rather than being biodegraded by bacteria. In general, gasoline, kerosene, and diesel fuels contain constituents with sufficient volatility to evaporate from a landfarm. Lighter (more volatile) petroleum products such as gasoline tend to be removed by evaporation during landfarm aeration processes. Landfarms must regularly monitor water and soil contaminants as heavy precipitation increases the danger of leachate formation.

Economic Issues

Landfarming is a cost-competitive treatment for contaminated soils, running between $30 and $60 per ton (https://deq.mt.gov/Portals/112/Land/SolidWaste/Documents/docs/LandfarmGuidance.pdf). If contaminated soils are shallow (less than three feet below ground surface), it may be possible to effectively treat the contamination without excavating the soils.

TENORM Waste

Naturally occurring radioactive material (NORM) occurs at low levels in soils and rocks and contains one or more radioactive isotopes, also called radionuclides. These radionuclides are present in geologic formations from which oil and gas are produced and from other sources, such as ground water aquifers that are used for drinking water and in bio-solids derived from wastewater treatment. The material generally consists of the radionuclides uranium and thorium and their daughter products, including radium, specifically Radium 226 and Radium 228. Since radium is present at low levels in the natural environment, everyone has some exposure to it. NORM is found in the air and soil, and even in radioactive potassium in our own bodies. Natural radioactivity is present in common household items. Examples include: bananas 4 picocurie per gram (pCi/gm), brazil nuts 6 pCi/gm, cat litter 5 pCi/gm, coffee 27 pCi/gm, granite countertops 27 pCi/gm, and phosphate fertilizer 123 pCi/gm.

Technologically enhanced naturally occurring radioactive material (TENORM) is in the same group of NORM radionuclides that has been modified or "technologically enhanced". TENORM waste is not nuclear waste or byproduct material defined under the Atomic Energy Act and commonly regulated by the Nuclear Regulatory Commission (NRC).

NORM/TENORM only poses a radiation health risk if inhaled or ingested because the radiation is primarily emitted in the form of alpha particles. Compared to other particles, alpha particles undergoing decay do not have high penetration rates and can be stopped by something as simple as a sheet of paper or skin protecting the human body. Therefore, proper landfilling of NORM/TENORM waste, such as requiring daily cover and other protective measures, poses minimal risk from external exposure.

Management

In Montana, wastes are classified according to their physical and chemical characteristics and the resulting potential of the wastes for causing environmental degradation or public health hazards. This classification determines the degree of care required in handling and disposal. To this point, TENORM wastes have been regulated as Group II wastes and require management at a Class II facility. Class II facilities are designed to include the most protective controls to ensure the continued protection of human health and the environment.

The Montana Department of Environmental Quality (MDEQ) Solid Waste Program:

- Published draft Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) waste management rules on August 18, 2017;
- Held two public hearings and received valuable comments from the public;
- Extended the initial 60-day public comment period another 30 days due to public interest;
- Has revised the entire rule package to include clarifications, modifications, and technical input based upon comments received during the initial and subsequent public comment periods;
- Organized a TENORM workgroup that met October 16, 2018 to work out relevant details and refine draft TENORM rules before publishing for formal public comment;
- Rule structure will ensure transparency and provide the regulatory framework to protect human health and the environment; and
- Revised TENORM rules are anticipated to be adopted during 2019.

Environmental Issues

At the national level, EPA is working to understand the problems associated with TENORM and to develop effective ways to protect people and the environment from unnecessary exposure to the radiation from these materials. Because TENORM is generated by many industries in varying amounts and occurs in a wide variety of products, the management of TENORM is a complex issue. Management of TENORM waste in the United States is inconsistent from state to state, therefore Montana has decided to draft its own rules regarding this issue.

EPA is investigating TENORM challenges in three ways:

- Studying the TENORM-producing industries to characterize their residuals and wastes, and evaluate potential exposures.
- Identifying and studying TENORM to assemble an understanding of where TENORM wastes are from, what's in them, and the risks they present to people and the environment.
- Working with other organizations that are also confronting the problem, including states, tribes, other federal agencies, industries, environmental groups and international organizations.

Many of the materials that are considered TENORM have only trace amounts of radioactivity and are part of our everyday landscape. However, some TENORM has relatively higher concentrations of radionuclides that can result in elevated exposures to radiation.

Economic Issues

The economic issues are not fully understood at this time since this a relatively new waste management category.

TASK FORCE RECOMMENDED STRATEGIES FOR INCREASING WASTE DIVERSION

(PLAN ELEMENTS DEVELOPED BY TASK FORCE)

Perhaps the most valuable aspects of the IWMP is the strategy section for increasing the yearly solid waste diversion rate through recycling/composting, and developing recommendations for improved handling of "Special Wastes." To compose this chapter, DEQ sought input from an advisory task force composed of representatives from local governments, solid waste and recycling entities, environmental organizations, citizens, and other parties interested in solid waste management. Outcomes from the task force meeting guided the structure of this section. The agenda and notes for the task force can be requested from DEQ's Materials Management Program.

Successes:

There has been some incredible success in Montana over the past five years. The following list is not inclusive of all those successes. These were some of the highlights discussed at the task force meeting on May 8, 2018.

- Recycle Montana has created educational trunks for use in schools. There are currently 8 trunks.
- First graders in Missoula engaged in the civic process to have their municipality to ban straws unless requested and were granted a Straw Free Day in Missoula on the May 4th.
- Sanders County has enacted a voluntary ban on Styrofoam packaging and containers. Commissioners sent out letters to local businesses asking for their support to stop the use of this material in the county.
- Yellowstone National Park has committed to the reduction of plastic in the park. They are working with a Montana company to provide water in aluminum bottles instead of single use plastic bottles. This will

potentially divert a quarter million water bottles from the waste stream. They are also seeking to reduce or compost food waste across the park.

- Helena Recycling is now collecting glass with its curbside recycling. The glass is then taken to Ash Grove cement plant.
- Three bars and concert venues in Missoula have eliminated single use containers to help with the "Zero by Fifty" initiative in Missoula.
- Pacific Steel and Recycling has received third-party accreditation for e-waste and R-2, with some sites offering a 24-hour drop-off bin.
- The community of Eureka has recycled a large portion of its cardboard for the past 10 years.
- There is a growing trend of people wanting to recycle, and even a willingness to pay for these services.

Barriers:

The IWMP Task Force identified the following barriers to sustainable materials management within in their communities and across the state:

- The annual Recycling Survey is voluntary, which leads to incomplete diversion data. Without accurate reporting, diversion rates cannot be correctly used to see if the state has reached its diversion goals.
- Lack of public education — where to recycle, how to recycle, effects of product contamination, and the realization that recycling is not free.
- China Shutdown – many materials are not currently being collected since there is nowhere to send them.
- Transportation costs — substantive quantity of commodity is needed to pay the cost of shipment to markets.
- The closure of AWARE in Butte and Helena Industries in Helena, two non-profits that provided an outlet for goods to be reused/repurposed as well as e-waste collection and recycling, has reduced the opportunities of people in those communities to divert certain waste streams.
- DEQ Solid Waste HHW event licenses – requiring a license for individual event often puts a burden on coordinators by necessitating redundant licenses for collection sites, haulers, and events.

Common Opportunities:

- Public support — interest in recycling and composting is very high.
- Public mindset — the disposable nature of consumerism is being scrutinized by community members.
- Community Events — recycling drives are popular and successful.

Task Force Recommendations:

The IWMP is updated every 5 years according to statue, but the department should gather available stakeholders for a task force meeting more often. This meeting should rotate around the state for better involvement with county and private organizations.

- Integrate recycling into the Solid Waste Advisory Committee meetings.
- Present pound per person per day diversion and waste statistics to compare with national averages.
- Move composting initiatives higher on DEQ's priority list.
- Create an on-line market exchange similar to Craigslist.

Additional Task Force Ideas and Comments:

- Research how other states are successfully addressing C & D waste. What are their formulas and best practices?
- Research what other states are doing about producer responsibilities related to paint, laptops, carpeting and other toxic wastes.
- Research which states have higher diversion rates than Montana and how they achieve those results.

- Consider breaking down diversion rates further, by county or region, to show where more energy should be used on education and outreach.

IMPLEMENTATION APPROACHES FOR INCREASING WASTE DIVERSION

(DEQ Response to Task Force Recommendations)

State and local governments, universities, K-12 schools, businesses, and citizens of Montana must continue to develop and improve partnerships to increase recycling/diversion of solid waste. The last goal set by the legislature was a diversion rate of 22 percent by 2015. The state achieved this number in 2014, but fell short in 2015. Because the recycling reporting surveys are voluntary, it is hard to get an accurate percentage showing the state's diversion rate. The materials management program (MMP) believes that the amounts are underreported, and the 22% diversion rate is being reached or exceeded.

Moving forward the MMP will continue using the 2015 measurement of 22% until the legislature establishes new timelines and goals for diversion.

DEQ will utilize the common strategies recommended by the Task Force to build upon past successes and to build momentum at local and state levels. Education and outreach will continue to be the foundation of the MMP's efforts over the next five years as will be working with community and business partners and supporting stakeholder efforts.

An issue discussed at the Task Force meeting was that this group is brought together only once every five years. It may be in the best interest for the MMP, NGO's and private businesses to have more frequent conversations about the recycling markets and trends. More public input from around the state will help the MMP gauge where our efforts are best used to increase diversion. We will attempt to have more frequent meetings and move the location around the state, to maximize attendance from all areas.

ACKNOWLEDGEMENTS

The Solid Waste Section of the Department of Environmental Quality wishes to acknowledge the guidance and assistance of the Integrated Waste Management Plan (IWMP) Task Force. Members included local government officials, citizens, solid waste and recycling industries, environmental groups, and others involved in the management of solid waste. IWMP task force members worked with DEQ to define goals, develop recommendations, and review preliminary drafts of the document.

Special thanks to Beki Brandborg for facilitating the task force meeting.

IWMP Task Force members include:

NAME	COMPANY/FACILITY	REPRESENTING
Leaf Magnuson	US Forest Service	Federal Government
John Hilton	Helena Recycling LLC	Private Business
Jennifer Battles	AERO	Environmental Organization
Matt Elsaesser	406 Recycling	Private Business
Barb Butler	Billings Landfill	Public Landfills
Larry Laknar	Beaverhead County	Public Landfills
Ryan Green	Happy Trashcan Composting	Small Composter Operations
Dylan Hoffman*	Xanterra Resorts – Yellowstone	Private Business
Cathy Conlin*	Sanders County	Local Government
Jeremy Drake	Home ReSource	Nonprofit Organization
Elaine Taylor	Montana Beverage Association	Trade Association
Kirby Farner	Pacific Steel	Private Business
Rick Farrow	Pacific Steel	Private Business
Chase Jones	City of Missoula	Local Government
Mark Nelson	Lake County	Municipal Transfer Station
Dianna Robinson	Solid Waste Section	Montana DEQ
Brady Christensen	Solid Waste Section	Montana DEQ
Dusti Johnson	Solid Waste Section	Montana DEQ
Rick Thompson	Solid Waste Section	Montana DEQ
Ed Thamke	WUTMB	Montana DEQ
John Podolinsky	Small Business Ombudsman	Montana DEQ

* Attended via conference call

PUBLIC COMMENT SUMMARY