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Report to the Joint Standing Committee on
Environment and Natural Resources
129th Legislature, Second Session

Mattress Stewardship Report

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I. Executive Summary

This report is prepared and submitted to the Maine Legislature in accordance with Resolves 2019 Chapter 36 (“Resolve, to Require the Department of Environmental Protection to Study the Establishment of a Product Stewardship Program for Mattresses”), which is attached as Appendix A. The Resolve directed the Department to “study the establishment of a new stewardship program in the State for mattresses” in accordance with the provisions of 38 M.R.S. chapter 18 (Product Stewardship). The Resolve further directed that the Department report its findings including recommendations and any recommended legislation to the Joint Standing Committee on Environment and Natural Resources by December 4, 2019.

In developing this report, the Department evaluated how waste mattresses are presently managed in Maine and considered management approaches that have been employed in various other states and Canadian provinces. The Department consulted with numerous municipalities, waste management facilities, other states, and various other organizations and entities. The Department’s study highlights the challenges and questions associated with waste mattress management in view of Maine’s large land area, low population density, and lack of processing locations. Although mattresses have been considered likely candidates for product stewardship for a number of years and meet all five statutory criteria for eligibility, the Department has concluded that, at this time, the most appropriate course of action is to proceed with field trials and pilot projects to address outstanding questions concerning waste mattress management, rather than implement a stewardship program.

II. Introduction

Mattresses and box springs (“mattresses” or “units”), represent a significant challenge for operators of solid waste facilities in most areas of the State. The exception is in more sparsely populated areas where generation rates are low enough that disposal in a mixed waste landfill is not a significant hardship. At many transfer stations, however, mattresses represent increased wear and tear on compaction equipment and lower overall densities of waste requiring over the road transport contributing to greater fuel consumption. In most landfills, particularly smaller construction and demolition landfills, they tend to “float” on top of the harder surface and springs often wrap around equipment gears and sprockets causing maintenance issues and down time. Further, once buried, lower density areas are created which tend to hold moisture, or air which encourages combustion within the waste mass. While mass burn waste to energy (“WtE”) facilities are less impacted by waste mattress handling, those that process waste prior to incineration face significant operating challenges. The newest municipal solid waste processor in the State does not accept mattresses and other bulky furniture.

III. Mattresses as a Candidate for Product Stewardship

Maine’s Product Stewardship Framework Law (38 M.R.S. § 1772(2)) identifies the following 5 criteria for evaluating product stewardship as a mechanism to facilitate recycling (each of these criteria as they relate to mattresses is discussed further below):

- The product or product category is found to contain **toxics** that pose the risk of an adverse impact to the environment or public health and safety;
- A product stewardship program for the product will increase the **recovery of materials** for reuse and recycling;
- A product stewardship program will **reduce the costs** of waste management to local governments and taxpayers;
- There is success in collecting and processing similar products in **programs in other states** or countries; and
- Existing **voluntary product stewardship** programs for the product in the State are not effective in achieving the policy of this chapter.

A. Toxics

In 1973, Federal law was enacted requiring furniture, including mattresses, to withstand ignition from a smoldering ember. This law was expanded in 2007, further requiring mattresses sold in the U.S. to withstand an open flame, as well as a smoldering ember, for a minimum time period prior to the mattress itself igniting. Since these requirements were put in place, a series of flame retardants including organohalogen compounds, have been in use to treat household furniture, mattresses and electronic products. With increased concern regarding the effect on human health and the environment, certain groups of these long-lasting compounds have been banned or voluntarily removed from use. It appears that the mattress industry has made efforts to decrease or eliminate the use of flame retardant

compounds, and contemporary mattress construction relies more on physical barriers to ignition (e.g. tightly woven wool layers) than it used to. Expecting that phase out has occurred over time and that manufacturers likely did not act in unison, it is fair to expect legacy units containing such compounds are still in existence.¹

The long-lasting nature of flame-retardant compounds has spurred discussion regarding the appropriateness of recycling materials potentially containing such compounds. The question should be considered whether it is worthwhile to extend the life of such compounds continuing possible exposures during recovery and use as recycled products.

B. Material recovery

Generally, mattresses are composed of the following:

40 - 50% metal

10 – 30% foam – mostly polyurethane (PU), increasing latex (includes quilt tops)

10 – 15% wood

15 - 25% other fiber and residue – coconut husk, flax, wool, cotton (disposed)

While it is frequently stated that mattresses are up to 90% recyclable, in practical terms this depends on the proximity to markets, the demand (value) for the secondary materials and the accepted definition of the term “recyclable”. According to Fiscal Year 2019 annual reports submitted to the States of Connecticut and Rhode Island by the Mattress Recycling Council² the recycling rates for processed mattresses in those states were 67% and 69% respectively. Spring steel is a reliable commodity that regularly generates a positive cash value but, due to its springy, wiry nature is not without challenge to move efficiently to market. Shredding is often difficult and capable balers are generally dedicated to the one material. Efficient loads take effort and close proximity to markets is helpful.

Current market for post-consumer polyurethane foam and quilted mattress tops is the carpet padding industry. Mixed with post-industrial scrap, the materials are shredded into smaller pieces and bonded together using polyurethane resin (called re-bond) for use under wall-to-wall carpeting. Some latex is accepted in this category but as incidental only. With potential increases in supply as more mattresses are recovered, as well as consumer preferences turning away from wall-to-wall carpet, this market could be described as softening or expected to soften.

Wood is recovered for biomass but is often too contaminated with glues and metal fasteners to be considered as higher valued mulch. Exceedingly dry, the wood requires grinding or chipping in preparation for the biomass market. The nearest market for cotton padding located in Phoenix Arizona, is too distant for New England states to participate in economically. Markets for remaining materials tend to be local and niche. The sale of these low value components to secondary markets generally does not produce positive cash flow

¹ Consumer Products Safety Commission - <https://greensciencepolicy.org/cpscpetition/>

² Mattress Recycling Council website - <https://mattressrecyclingcouncil.org/>

but helps to defray or avoid costs of disposal. Even in more urban and industrialized areas, recycling components cannot be relied on to cover the cost of processing, so a processing fee is necessary.

C. Cost reduction

As discussed in the Introduction, it is difficult to achieve efficient management of mattresses within our current system, and harder still to ascertain the direct cost to municipalities (taxpayers). Mattress disposal generally lowers the efficiency of our solid waste system, the costs of which are picked up by municipalities and taxpayers. At landfills, mattresses represent an excessive use of airspace, time consuming handling and maintenance issues, and increased potential for fire. For municipal transfer stations, mattresses require more time/effort to compact resulting in greater wear and tear on equipment and lighter loads traveling to final disposal. For waste to energy plants (WtE) reliant on front end processing, and other facilities that mechanically process waste materials, mattresses require dedicated machinery and significantly greater effort. Only the mass burn WtE facilities in the state are able to handle mattresses with little extra effort, provided they arrive within the mixed waste stream; they require logistical planning and physical space if delivered in straight loads.

Recognizing the added cost of handling and disposal, many municipalities have initiated per unit fees for mattresses. Overall, extra effort and lighter loads result in not only economic cost, but also environmental cost associated with increased carbon releases through energy usage. While many costs are externalized or untallied, it is clear that improved management and handling of mattresses could provide both economic and environmental benefits.

D. Programs in other jurisdictions

A variety of management schemes exist in other state and provinces; a summary of various approaches follows in Section IV.

E. Voluntary stewardship within the State

Voluntary efforts to divert mattresses from traditional disposal do occur within the State but only rarely. Several transfer stations have, at various times, undertaken the disassembly of mattresses as they arrive, into three main categories: steel, wood and soft goods. Steel is diverted to bulky metal, wood to biomass and the remainder to WtE. This concept has not caught on to any appreciable extent.

IV. Successes and Activities in Other States and Provinces

According to the International Sleep Products Association (ISPA), there are more than 56 mattress processing facilities operating across North America.³ Many of these facilities remain viable by taking advantage of greater population densities, higher local disposal fees and limited public access to waste management facilities. Proximity to secondary markets is also important. Often, mattress processing is performed by disadvantaged populations such as at-risk youth and others entering or re-entering the workforce. Higher population densities provide adequate throughput to sustain operations and help to shorten critical trucking distances within a region. Higher disposal costs in many locations allow processors to charge fees and still offer savings over disposal by diverting materials. In these instances, government can limit its involvement to simply promoting the existence of a market alternative to disposal.

More involved government roles vary by region and waste management system. Often, it is local government that takes the lead. Cities, and large highly populated counties controlling their own waste management systems and providing curbside pickup, can maintain significant control over items to be disposed and when. Programs are in place in some areas where residents fill out “pick up tickets” online for various items including mattresses (and other items including household hazardous wastes, furniture and mercury containing devices). These wastes are then diverted to contracted processing facilities for a fee. This approach seems popular in various counties in Minnesota and cities in Washington. Still other local governments simply promote the use of existing processing facilities that can charge less than the rate for disposal.

Greater Vancouver in British Columbia has banned disposal of mattresses. Instead, they are directed to two contracted companies with numerous locations. Vancouver Pacific Mattress Recycling has 50 employees and processes 10,000 mattresses per month and Canadian Mattress Recycling, employs 18 and processes 5,250 mattresses per month. The appeal of this program is growing and it is beginning to attract mattresses, for a fee, from outside the Greater Vancouver area. It has been necessary however, to provide grants to towns and other jurisdictions included in the program to address the costs associated with retrieval and delivery of abandoned mattresses. Canada is currently considering a Canada-wide EPR program for mattresses. An excellent study of economic and environmental impacts has been prepared for Metro Vancouver by Morrison Hershfield.⁴

As further discussed in Section V, California, Connecticut and Rhode Island have passed stewardship legislation for mattresses and more states are considering it.

Massachusetts has a well established mattress recycling program which is supported by two grant programs: the Sustainable Materials Recycling Program for municipalities, and the Recycling Business Development Grant for businesses. Both grant programs are funded through

³ Cascade Alliance Report - <https://cascadealliance.us/wp-content/uploads/2017-Mattress-Recycling-White-Paper.pdf>

⁴ Morrison Hershfield - <http://www.metrovancouver.org/services/solid-waste/SolidWastePublications/EconomicandEnvironmentalImpactsofMattressRecyclinginBC.pdf#search=%22mattresses%22>

waste energy credits, created as part of the Massachusetts Green Communities Act. It qualifies municipal waste combustors to earn waste energy credits, 50% of which goes to MassDEP to fund recycling programs. With this program, municipal grants can cover the purchase of approved storage containers as well as hauling and tipping costs for up to two years, after which municipalities are responsible. Business grants for infrastructure can cover the purchase of fixed and rolling equipment. As a result, Massachusetts has four contracted processing facilities in the region and has diverted over 70,000 mattresses since the program's inception.

It is noteworthy that Massachusetts otherwise has a relatively high disposal cost at \$20 - \$60 per unit. Processing fees at contracted facilities are between \$10 and \$16. Since the program began in 2017, the state has awarded \$1.2 million and has diverted over 72,000 mattresses (at an average total cost of \$16.58 per unit including transportation).

Massachusetts recently released its draft Solid Waste Master Plan and is recommending a ban on the disposal of mattresses and a study considering EPR.⁵

V. ISPA Mattress Stewardship Program

In response to state shifts to stewardship and EPR for mattresses, ISPA has taken an active role in administering a mattress stewardship program which is funded directly and visibly by consumers. Funds to operate the program are collected from consumers at the point retail sale of a new mattress and are managed by ISPA within each state to accomplish the intent of the program. ISPA has established the non-profit Mattress Recycling Council (MRC), which is responsible for managing each participating state's program and providing annual reporting through a program called "Bye Bye Mattress".

The program starting dates and the amount of the "visible fees" collected at the point of retail mattress sale by each currently participating state are as follows:

	<u>Start-up</u>	<u>Visible Fee</u>
Connecticut	(1/16)	\$9.00 per unit
Rhode Island	(5/16)	\$16.00
California	(1/15)	\$10.50

Collected fees cover:

- Cost of sheltering units at collection sites (trailer or overseas container)
- Hauling mattresses to processing facility
- Processing fee (\$10 - \$14 unit)
- Public education/outreach and training at collection points
- Program management

⁵ Draft 2030 MA Solid Waste Master Plan - <https://www.mass.gov/doc/draft-2030-solid-waste-master-plan/download>

Since the fate of individual mattresses is impossible to track in order to determine a recycling rate, participating states have required the program to demonstrate annual increases in units collected and measurable increases in programs established in various sectors generating waste mattresses (i.e. municipal drop-offs, hospitals, schools and universities, the hospitality industry). To date, the overall capture rate has risen in each state each year. Specific numbers can be found in the three annual reports from this website.⁶ Annual capture for all three states is as follows:

<u>State</u>	<u>Year initiated</u>	<u>Annual Capture '19</u>
California	2016	1,505,002
Rhode Island	2016	103,807
Connecticut	2015	184,190

The Massachusetts grant based program collected 72,160 units since the program inception in 2017. Figures were not available for 2019.

VI. Potential ISPA Program Implementation in Maine

ISPA presented a conceptual proposal to the State to implement the Mattress Recycling Council program here, and initially estimated that implementation of its stewardship program in Maine would result in a visible fee at point of sale of between \$17 and \$19 per unit. The higher relative cost of this fee is reflective of the unique characteristics of Maine: it has a comparatively large geographic area, it has a significantly dispersed population (about a quarter of the population occupies about 75% of the land area), and its population is relatively low (40th in the U.S.). There is no existing mattress processing infrastructure in the State; other mattress diversion programs in New England began with some processing infrastructure already in place. The program ISPA proposed for Maine would collect consolidated mattresses state-wide and truck them south, likely to Massachusetts. It assumed providing adequate dry storage at all consolidation points as well as program management responsibilities and reporting to the State. Assumptions included that the same rate of purchase and disposal of mattresses the ISPA's MRC experiences in other New England states (40% of sales) holds true for Maine and would generate a potential of almost 70,000 mattresses per year. No bans or mandates were assumed in planning the proposal.

Pros and Cons of implementing the ISPA program in Maine:

Pros

- Experienced and well established program
- Excellent education and outreach
- Program compatibility with other New England programs
- Disassembly closer to recycling markets
- Higher volume market = greater recycling opportunities

⁶ Mattress Recycling Council - <https://mattressrecyclingcouncil.org/>

Cons

- Cost is high
- Funding – visible fee to consumer
- Energy and carbon intensive – trucking (almost \$1.73 per mile and 6 mpg)
- Recyclables other than metal are of little value
- Most of collected funds spent out of state
- High cost to extend service to rural areas
- Little incentive for industry to design for recyclability

The primary factors driving costs are trucking (28%) and processing (51%) followed by collection at locations (9%). Trucking cost reflects the size of our state and the inherent inefficiency of transporting whole, uncompacted mattresses. A 53-foot trailer delivers approximately 120 mattresses per load (a little over 3 tons). Light loads may be more acceptable for a high value product but from a carbon footprint perspective, the fuel consumed, and wear and tear incurred to deliver a little over 3 tons of low value material is less than optimal stewardship of resources. Unfortunately, mattresses cannot be compacted to achieve efficient trucking prior to being manually processed into components for recycling. It is the experience of ISPA that a stand-alone mattress processing business would require a minimum 70,000 unit per year throughput.

VII. Alternatives to the ISPA Program

As indicated previously in this report, the two main components of the typical mattress are steel and PU foam. Spring steel is the primary culprit in operational issues associated with mattress disposal. Steel recovery generally however, is well established, with most transfer stations providing capacity for bulky metals. There is no secondary market for recovered polyurethane foam in Maine, although a scattering of markets exist across North America and into Asia. Destabilizing these markets, however, is changing consumer demand away from wall to wall carpeting (lowering demand for padding products) and increasing foam recovery. There is also the likelihood that an unknown percentage of legacy mattresses may contain flame retardants that were removed from use over the past decade or so. Whether it is rational to participate in a potentially shrinking and low value market which may, in practice, extend the life of chemical compounds of concern that are being or have been intentionally phased out, is a valid question. Mattress processing is not a highly technical endeavor, and it appears that the chief benefit of transporting whole, uncompressed mattresses out of state is to move the processed components closer to their secondary markets. Given the nature of these markets, this approach seems to have dubious value both economically and environmentally.

An alternative approach to recovery was considered which, at least initially, would only pursue the steel content of mattresses with the requirement that the remaining soft components be directed higher up the hierarchy to WtE facilities. This approach raises the possibility of significant improvements in transportation efficiency. Simplifying processing in this way presents the possibility that it could be accomplished at collection sites, either by employees or a small business providing a mobile service prior to any trucking over the road. Steel springs could be metered into the host facilities' already existing bulky metal recovery programs, and

soft materials could be baled or otherwise densified for efficient delivery to WtE. This approach allows for much more efficient and effective reach into less populated areas of the state.

Pros and Cons of Steel Recovery Only and WtE:

Pros

- Potentially less expensive than recycling the full array of components
- Simpler processing can be performed by transfer station staff
- Requires significantly less space to store materials prior to baling
- Efficient trucking – fewer and more dense loads
- Destruction of flame-retardant compounds
- Regional cooperation and consolidation points
- Provides fuel to WtE plants not at capacity

Cons

- Unknowns - cost, logistics, processing needs
- Does not maximize recycling
- Tip fee charged for soft components at WtE facilities

Since considering a steel only approach, the Department received interest from an in-state WtE facility to participate in identifying a solution for mattresses. This facility uses front end processing to provide an evenly graded fuel to its boiler. A trial run of about thirty mattresses was conducted through two specialized shredders to determine if the resulting material could be metered into the boiler. Shredding would recover steel magnetically rather than manually, either from the ash or potentially prior to burn. Steel recovered prior to burn is a higher quality product. This approach may allow more efficient trucking and would be more tolerant of moisture, filth and other issues limiting acceptance in programs recycling more fully.

While the results of this trial were mixed, it appeared plausible that if steel was magnetically removed at the output conveyor from the shredder and either fed through again, or, if clean, diverted to scrap, a manageable fuel stream of the remaining mattress components may be achieved. Further trials are necessary to determine if this method can achieve acceptable performance levels. Limiting the recycling requirement to steel only may potentially resolve much of the trucking inefficiency issue associated with providing a program in the northern two thirds of the state.

Much of southern Maine is served by two mass burn WtE plants. The larger of the two facilities has no significant issues handling mattresses from their member towns as they are delivered within the waste stream. Larger numbers and concentrated loads are accepted although they require careful metering into the boiler chute system. A specific fee based on size is charged for mattresses at this facility. The smaller of the two WtE plants has a three-foot maximum size limit and by-passes bulky wastes such as mattresses to a secure landfill. In both instances, breaking down the mattresses by shredding or perhaps removal of the springs beforehand may suffice to allow acceptable and unimpeded flow to the boilers. Trials would be necessary to determine the most cost effective processing method to achieve acceptable results. Whether either of these

plants has capacity to accept more processed material from outside their current customer base also is a question requiring further evaluation. Additional data remains to be gathered regarding the management of waste mattresses in certain parts of southern and central Maine.

Recently, a nonprofit organization has expressed interest in providing labor to recover steel springs from units potentially consolidated in Central Maine. This would be in the service area of the smaller of the two WtE plants in the southern part of the state. Potential locations exist for such an operation in that area and it appears appropriate to consider a pilot or temporary program to answer various outstanding questions.

VIII. Field Trials / Pilot Study

A number of issues related to waste mattress volumes, logistics and handling require further analysis. Field trials and pilot studies are being considered that would provide necessary data and information as it relates to operations and handling at WtE facilities, processing and consolidation locations, and transfer stations. Trials/pilots may include work to further evaluate (including costs):

- Best methods of delivery, consolidation and processing of mattresses at selected existing transfer stations.
- Best handling practices for delivery of mattresses to WtE facilities.
- Best practices for collection, delivery and manual processing of mattresses for steel recovery, at selected consolidation/processing locations other than transfer stations.
- Current acceptance rates and future capacity of existing facilities to accept and handle mattresses.

IX. Conclusions and Recommendations

Results of the Department's study of the management of waste mattresses confirm that there are significant challenges in Maine to ensuring state-wide recovery and recycling of mattresses. Processing of mattresses into components for recycling requires significant effort, and also the establishment of consolidation points for efficient collection and transportation. Although there is a market and collection systems for steel, there are no Maine recycling markets for the "soft" components of mattresses. Transportation of this relatively low value material to an out of state destination for recycling does not appear to be economically or environmentally beneficial at this time.

In view of the results of this study, the Department recommends that it continue to pursue field trials and pilot study in cooperation with stakeholders and certain existing waste facilities. Such work would result in valuable data concerning costs, logistics, and handling methods that would inform our future efforts to ensure state-wide opportunity to manage waste mattresses in the most cost effective and environmentally sound way as possible.

Appendix

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND NINETEEN

H.P. 515 - L.D. 710

**Resolve, To Require the Department of Environmental Protection To Study
the Establishment of a Product Stewardship Program for Mattresses**

Sec. 1. Department of Environmental Protection to study the establishment of a product stewardship program for mattresses. Resolved: That the Department of Environmental Protection, referred to in this resolve as "the department," shall study the establishment of a new stewardship program in the State for mattresses, in accordance with the Maine Revised Statutes, Title 38, chapter 18.

Sec. 2. Reporting date established. Resolved: That the department shall report the findings of its study in section 1, including recommendations and recommended legislation, to the Joint Standing Committee on Environment and Natural Resources by December 4, 2019. The joint standing committee may report out a bill relating to the subject matter of this report to the Second Regular Session of the 129th Legislature.