A Deep Dive into Maine's Statewide Waste Characterization Study

MRRA Webinar

September 15, 2026

12pm-2pm



Disclaimer

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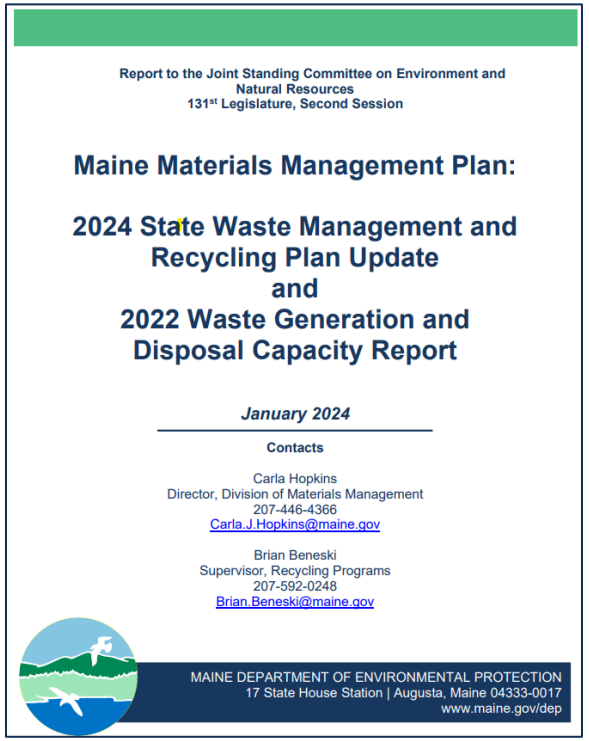
WCS Study Background

- ME DEP Responsibilities
- Maine law (38 M.R.S. §2122)
- Materials Management Plan
  - Section 2101
  - Section 2132
  - Comprehensive waste analysis
- U.S. EPA SWIFR Grant
- WCS Goals



Maine DEP Updates

- Materials Management Plan Updates
- Municipal & Facility Reporting
- Maine Enterprise Licensing System (MELS) Hub
- Putting the WCS results into action



Report to the Joint Standing Committee on Environment and Natural Resources
131st Legislature, Second Session

Maine Materials Management Plan:

2024 State Waste Management and Recycling Plan Update and 2022 Waste Generation and Disposal Capacity Report

January 2024

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MELS

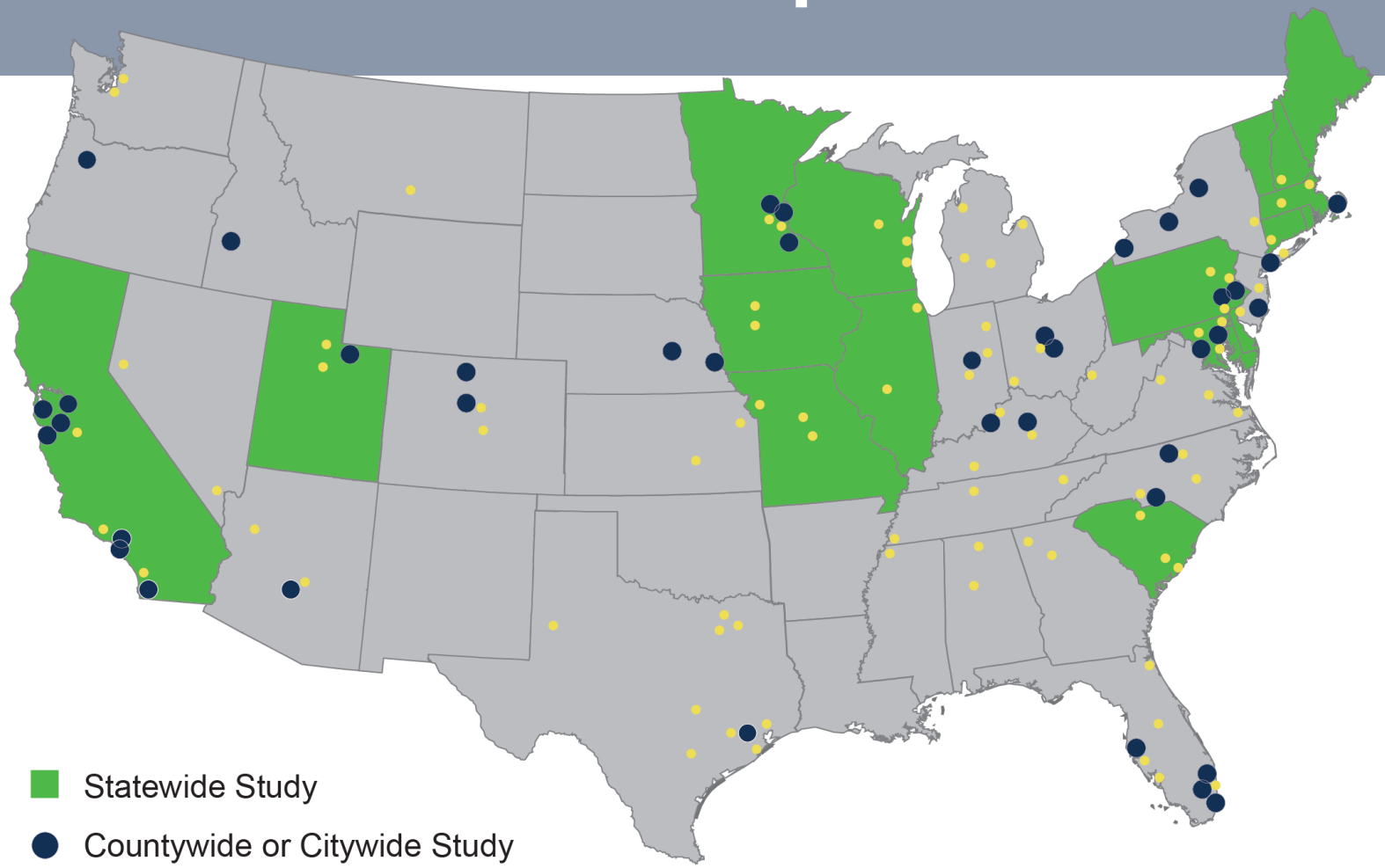
866-894-2578

About MSW Consultants

- Independent Consultants Specializing in the **Municipal Waste Management Sector**
- Wide Knowledge of **National Waste Management Best Practices**
- Deep Understanding of **Materials Management Market Dynamics**
- Industry-Leading **Solid Waste Operational Evaluation & Performance Modeling**
- **Collection, Disposal & Recycling Procurement** Experts

MSW CONSULTANTS

Materials Characterization Specialists



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Acronyms

- **ADC**: Alternative Daily Cover
- **CDD/C&D**: Construction and Demolition Debris
- **EPA**: US Environmental Protection Agency
- **EPR**: Extended Producer Responsibility
- **HHW**: Household Hazardous Waste
- **ICI:** Industrial/Commercial/ Institutional
- **MSW**: Municipal Solid Waste
- **OBW:** Other Bulky Waste
- **QAPP**: Quality Assurance Project Plan
- **SAHP:** Safety and Health Plan
- **WCS**: Waste Composition Study or Waste Characterization Study
- **WTE**: Waste-to-Energy



Maine
MSW & CDD Waste Disposal

Solid Waste







Maine MSW and CDD/OBW Disposal Tons (2023)

Disposal Facility	MSW	CDD/OBW	Total
Landfills	567,178	530,638	1,097,816
WTE	223,764		223,764
Total	790,942	530,638	1,321,580

Project Focus:

- MSW, Mixed CDD, and OBW generated and disposed in Maine
- We did not deploy field research teams to other states that may receive Maine wastes
- We avoided imported MSW, Mixed CDD, and OBW

Study Elements

Waste Composition Field Research

- Annual Tonnage data review
- Gate Surveys at 8 facilities
- MSW Composition (manual sorts) at 10 facilities over 2 seasons
- CDD/Bulky Waste Composition (visual surveys) at 11 facilities over 2 seasons

Supplemental Research

- Residential Food Scrap Management Survey
- CDD Disposition Data Analysis



Gate Surveys

Gate Survey Summary

Facility Name	Location	Facility Type	Number of Gate Survey Days
Waterville Transfer Sation	Waterville	Transfer Station	1
Westbrook Transfer Station	Westbrook	Transfer Station	1
Pine Tree Waste TS - West Bath	West Bath	Transfer Station	1
Crossroads Landfill	Norridgewock	Landfill	2
Hatch Hill Solid Waste Landfill	Augusta	Landfill	1
Juniper Ridge Landfill	Old Town	Landfill	2
ecomaine Waste-to-Energy	Portland	WTE	1
Maine Waste-to-Energy	Auburn	WTE	1
Total			10

- 1,001 inbound trucks were surveyed
- Many drivers reported collecting both residential and ICI material on the same route
- The gate surveys focused on the sites receiving the largest tonnages; additional sites were included in the field surveys for manual sorts and CDD visuals

Gate Surveys Results: Transfer Stations

Metrics	Residential MSW	ICI MSW	CDD	Total
Composition of Inbound MSW	41.1%	58.9%	N/A	100.0%
Composition of All Inbound Wastes	24.1%	34.6%	41.2%	100.0%
Implied Tons	177,325	254,249	302,791	734,366

Findings

- Roughly two-fifths of inbound material was CDD/Bulky Waste
- ICI (non-residential) wastes were more prevalent than residential wastes

Gate Surveys Results: WTE Facilities

Findings

- Similar residential/ICI split as transfer stations
- De minimis inbound CDD is incinerated at ecomaine
- Maine WTE inbound CDD loads are transferred to landfill

Metrics	Residential MSW	ICI MSW	Mixed MSW	Total
Composition of Inbound Wastes Identifiable by Generator	43.1%	56.9%	0.0%	100.0%
Composition of All Wastes	40.5%	53.5%	6.0%	100.0%
Implied Tons	90,685	119,624	13,454	223,764

Gate Surveys Results: Landfills

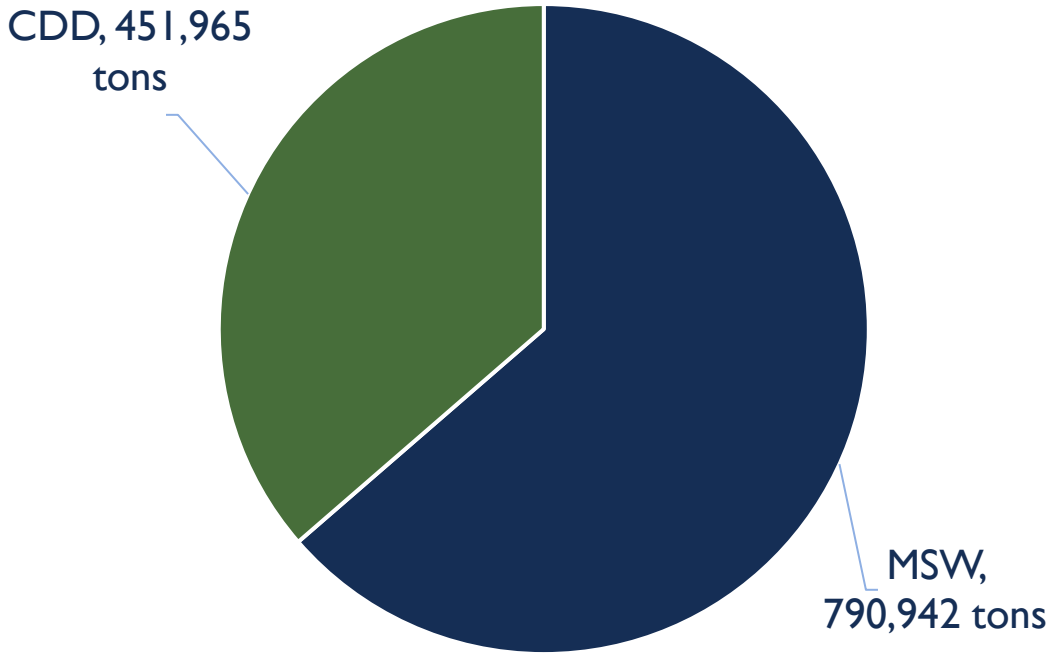
Metrics	Residential MSW	ICI MSW	CDD	Mixed	Total
Composition of Inbound MSW	17.3%	22.4%	N/A	60.3%	100.0%
Implied Tons	98,051	126,857	N/A	342,270	567,178
Composition of All Inbound Wastes	9.6%	12.4%	44.3%	33.6%	100.0%
Implied Tons	98,051	126,857	451,965	342,270	1,019,143

Findings

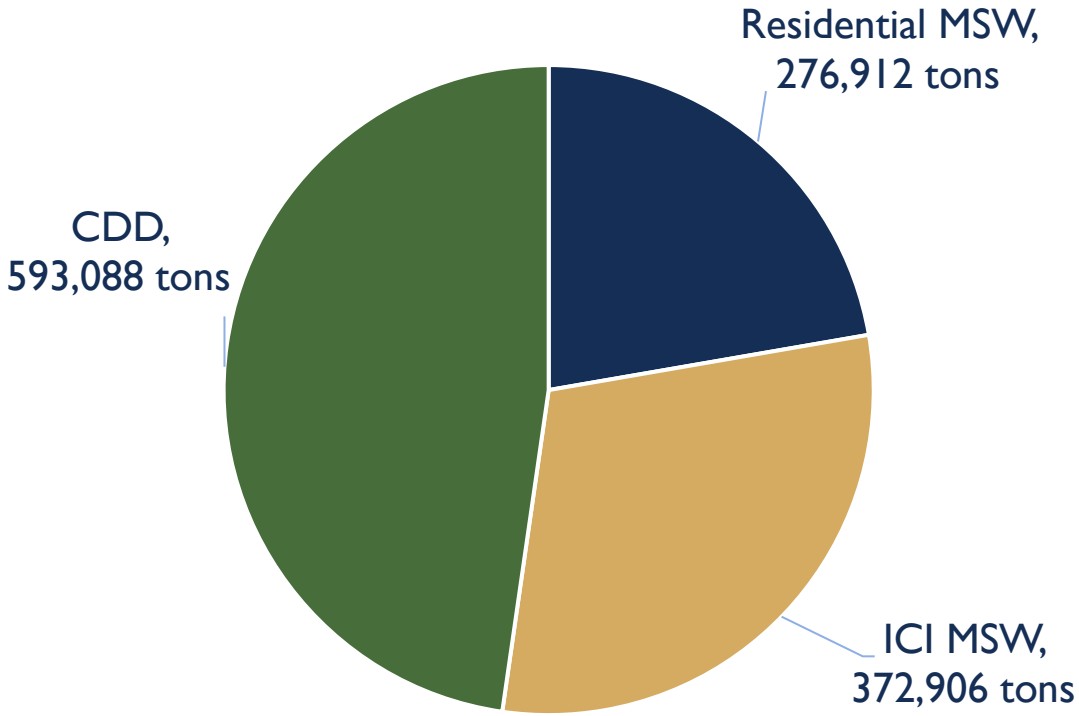
- Similar residential/ICI split as transfer stations and WTEs in inbound MSW
- Over 60% of reported MSW arrives on transfer trailers
- Roughly half of inbound wastes are reported by the facilities as CDD

Reported vs. Adjusted MSW and CDD Disposal

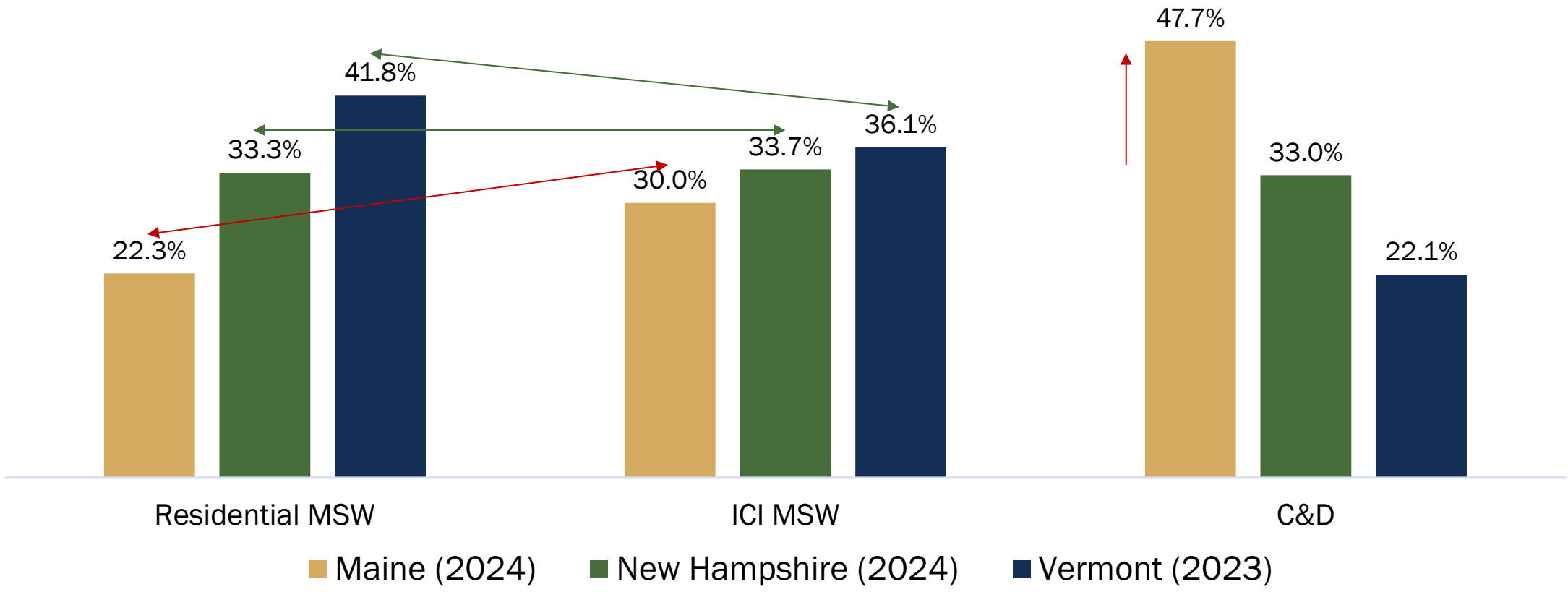
Reported



Adjusted



New England Disposal Contribution by Waste Type

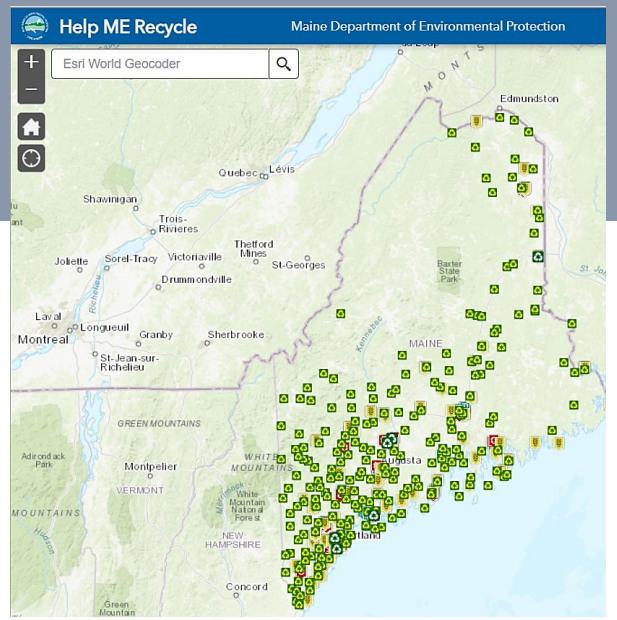




Field Data Collection

Methodology

- Sampling Plan
- Host Facilities
- Material Categories
- "Divertibility" of Wastes
  - Recyclable
  - Compostable
  - Special Collections
  - Non-divertible
- Data Management
- Safety and Health







Sampling Targets – MSW (Manual Sorts)

Facility	Targeted	Actual
Juniper Ridge Landfill	56	61
Crossroads Landfill	42	42
ecomaine Waste-to-Energy	40	50
Maine Waste-to-Energy	20	23
Hatch Hill Solid Waste Landfill	10	11
Westbrook Transfer Station	8	10
Waterville Transfer Station	8	15
Wells Transfer Station	8	12
Pine Tree Waste Transfer Station (West Bath)	8	14
Tri-Community Landfill	N/A	30
Total	200	268

Notes

- Wide distribution of facility participation across Maine
  - Tri-Community in The County was an add-on site to ensure coverage of northern Maine
- Overall targets were met or exceeded

Sampling Targets – CDD/Bulky Waste (Visual Surveys)

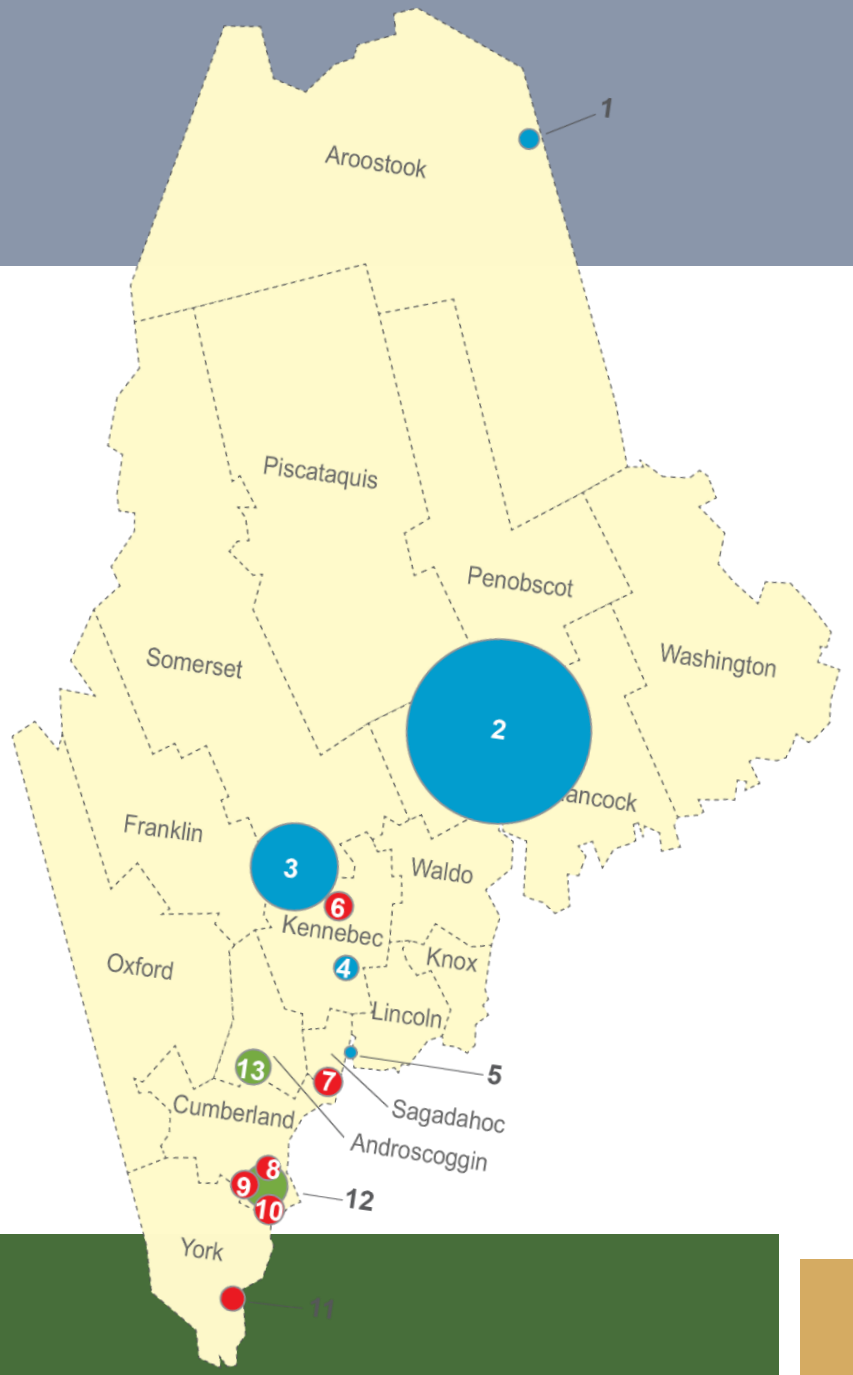
Notes

- Based on reported tonnage, JRL and Crossroads were assigned substantial CDD survey targets
  - Gate surveys and field observations revealed limited direct haul CDD
  - JRL primarily receives CDD in transfer trailers in the form of:
    - CDD from Maine Transfer Stations
    - Imported CDD "Product" for ADC stabilization
- Redistribution of targets after gate surveys
- Targets met or exceeded

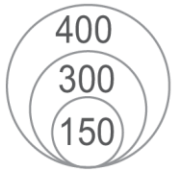
Facility	Targeted	Actual
Juniper Ridge Landfill (JRL)	220	0
Crossroads Landfill	50	19
Troiano Waste Services	30	51
City of Portland (Riverside Facility)	24	52
Waterville Transfer Station	14	50
Pine Tree Waste Transfer Station (West Bath)	10	17
Westbrook Transfer Station	10	29
Wells Transfer Station	2	12
Hatch Hill Solid Waste Landfill	0	34
Tri-Community Landfill	0	23
Maine Waste-to-Energy	0	60
ecomaine Waste-to-Energy	0	39
Total	360	386

Host Facilities

1 Tri-Community Landfill
2 Juniper Ridge Landfill
3 Crossroads Landfill
4 Hatch Hill Solid Waste Landfill
5 City of Bath Landfill
6 Waterville Transfer Station
7 Pine Tree Waste Transfer Station (West Bath)
8 Riverside Recycling Facility Transfer Station
9 Westbrook Transfer Station
10 Troiano Waste Services Transfer Station
11 Wells Transfer Station
12 ecomaine Waste-to-Energy
13 Maine Waste-to-Energy



Annual Tons (1,000)



Transfer Stations
Disposal (Landfill)
Disposal (WTE)

MSW Material Categories

Material Groups

- Paper
- Plastic
- Metal
- Glass
- Organics
- Electronics
- Batteries
- Universal/Hazardous Waste
- CDD
- Special and Other Waste















CDD/Bulky Waste Material Categories

Material Groups

- Wood
- Shingles
- Metal
- Inert Materials
- Bulky Waste
- Other CDD
- MSW





Data Management

- Tablet-based data entry
- Built-in QA/QC
- Upload to cloud

Result:

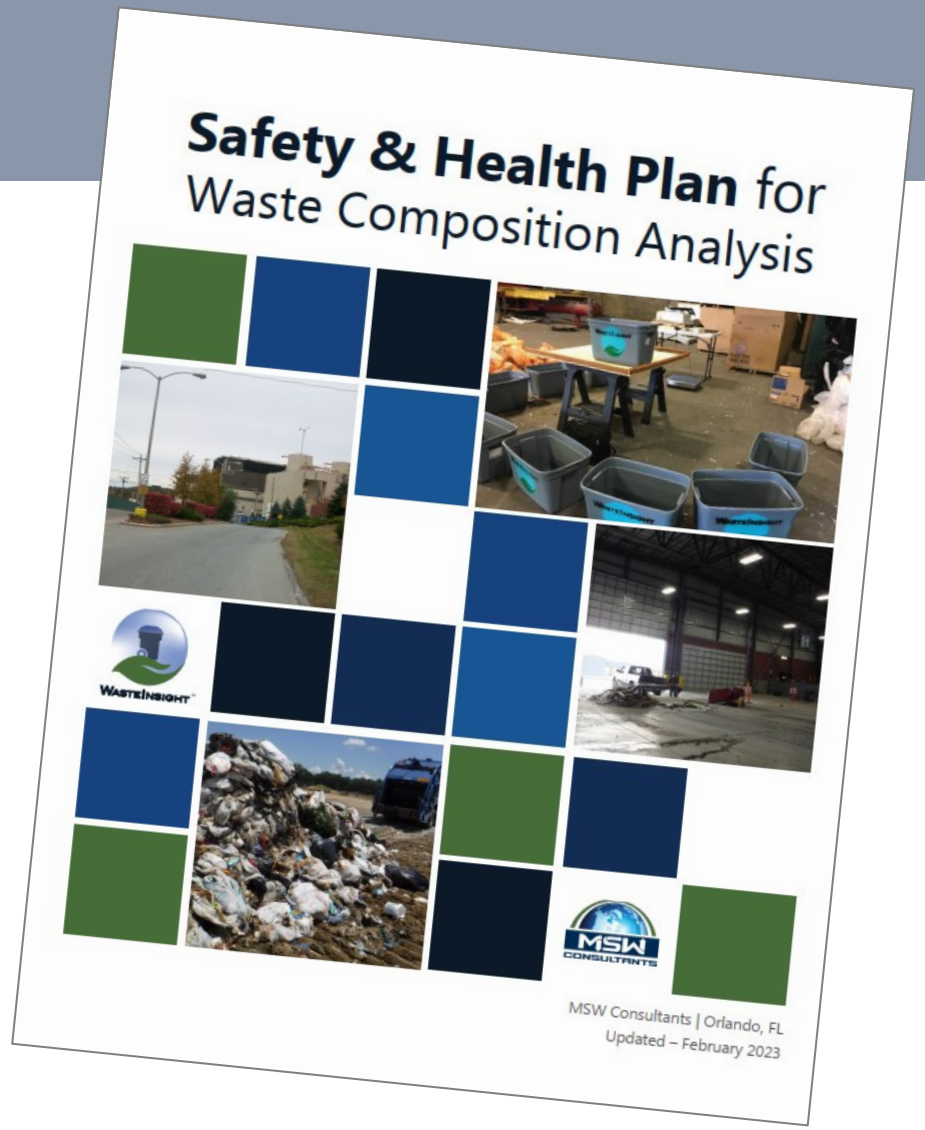
Maximum accuracy and data security



Safety and Health

- Site specific safety briefings
- Zero accidents while in the field
- SAHP QA'd by professional Health and Safety Inspector





MSW Sampling









Manual Sorting



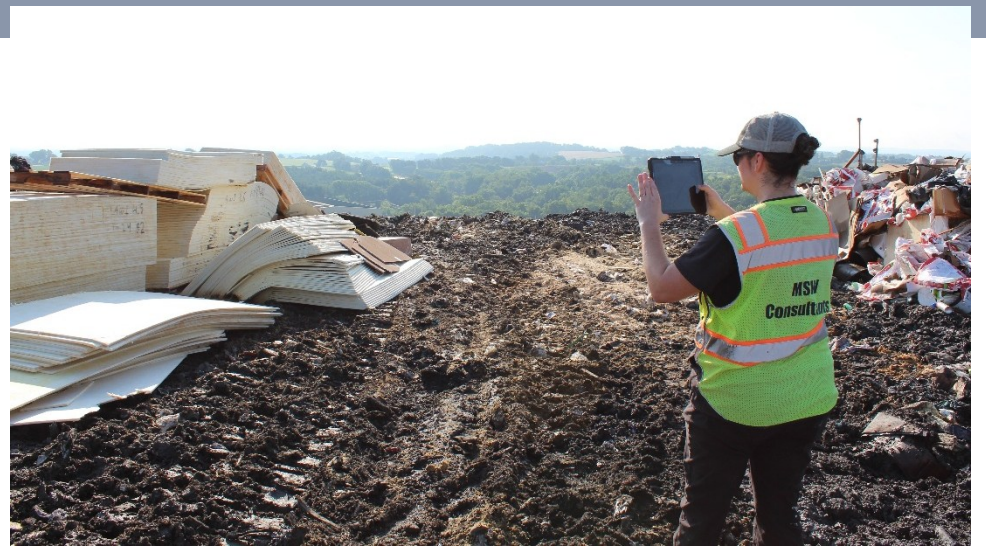






CDD/Bulky Waste Visual Surveys





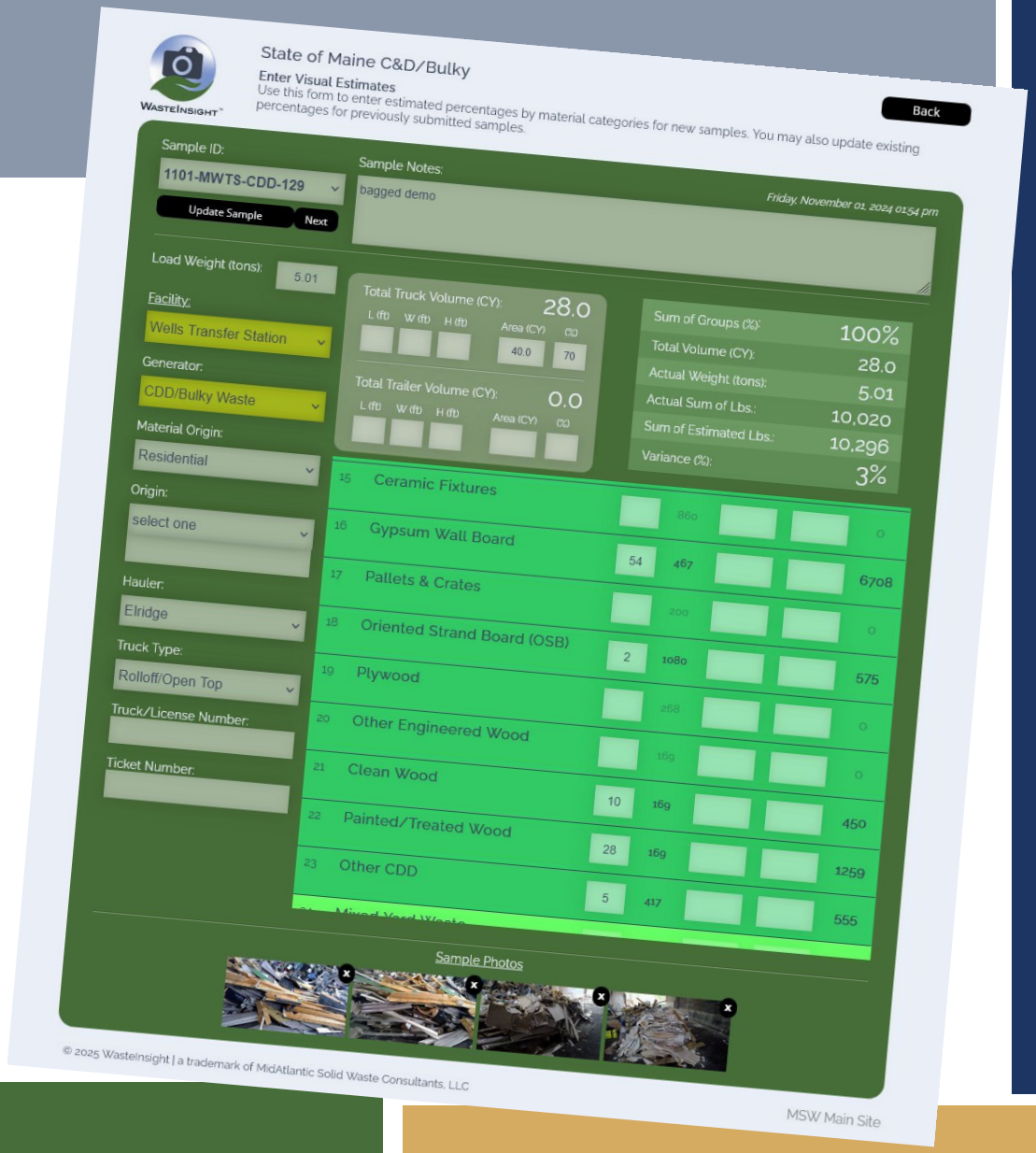




CDD/Bulky Waste Visual Surveying

- Apply industry standard density factors for CDD categories
- Volumetric surveys
- Tablet functionality



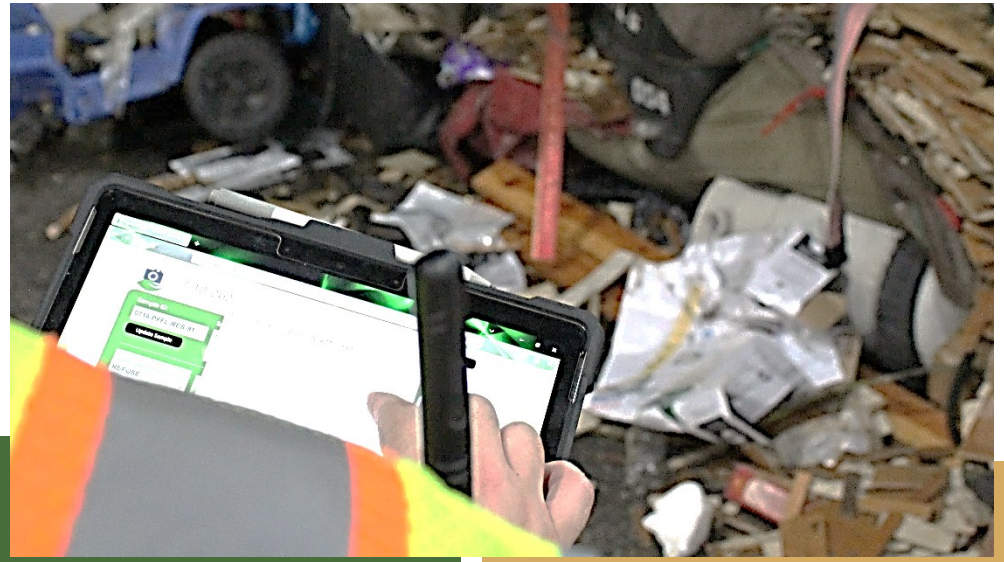


Data Management





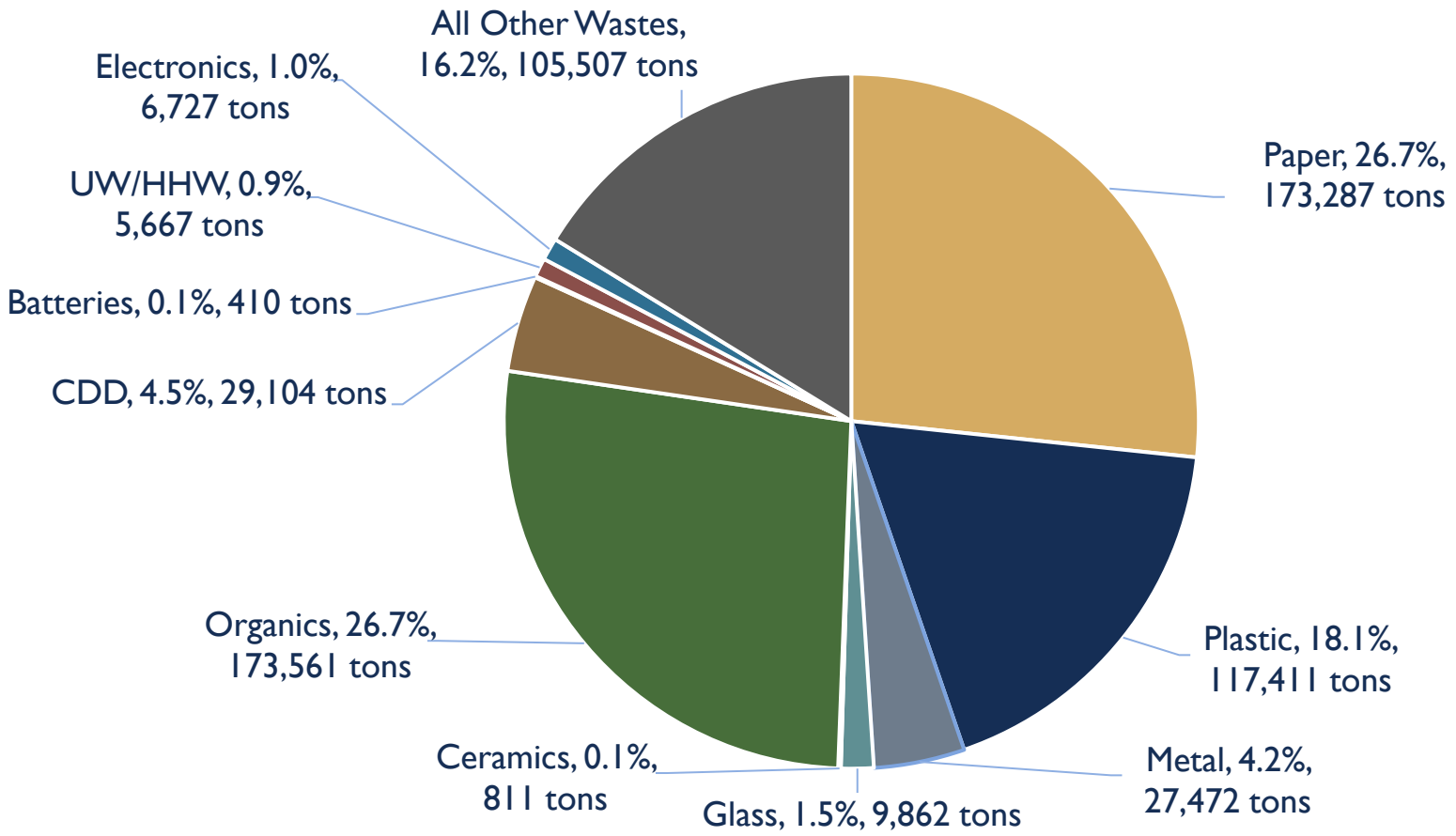




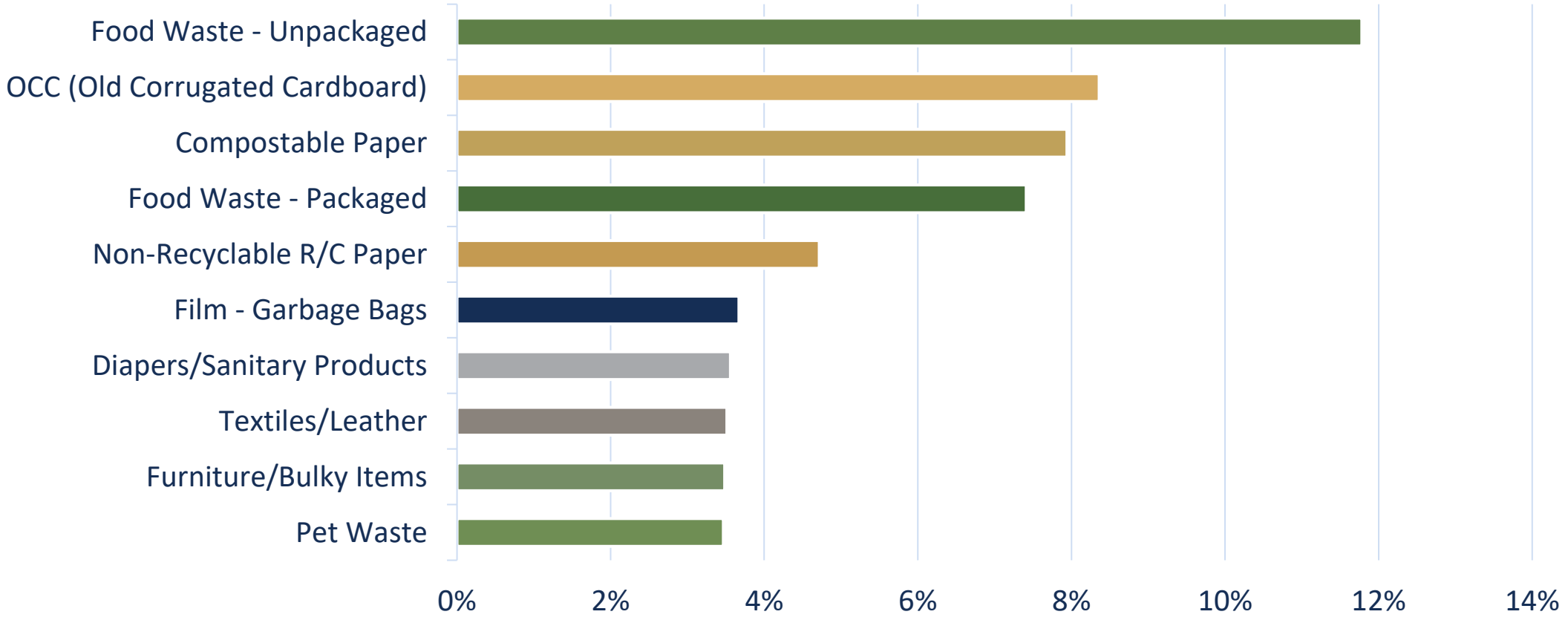


MSW Composition

Maine MSW Composition by Material Group



Top 10 Constituents in MSW



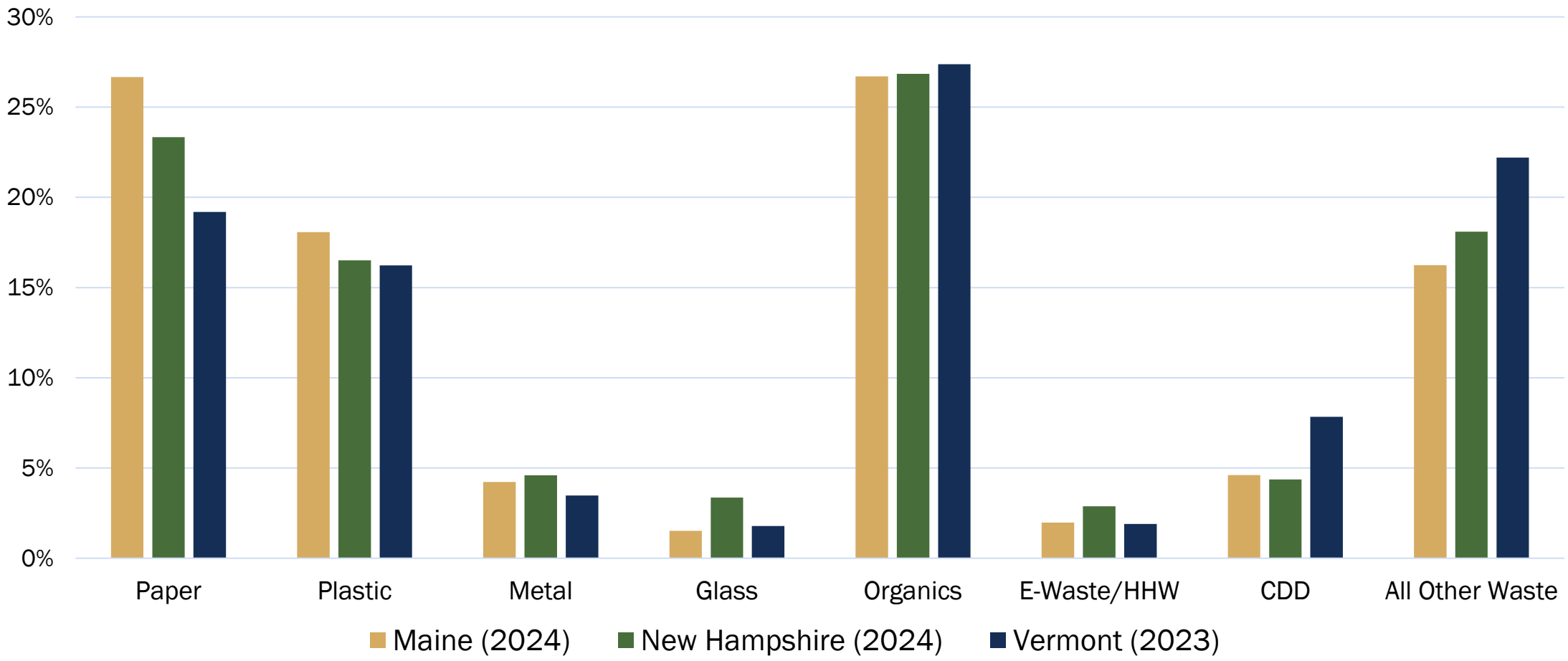
Detailed Results

FINAL RESULTS

No.	Material Category	Mean	Margin of Error	Tons
Paper		**26.7%**	**1.1%**	**173,287**
1	OCC (Old Corrugated Cardboard)	8.4%	0.9%	54,334
2	Boxboard (Chipboard)	1.5%	0.1%	9,700
3	Aseptic and Gable Top Cartons	0.4%	0.1%	2,684
4	High Grade Office Paper	0.3%	0.1%	1,711
5	Magazines/Catalogs	0.5%	0.1%	2,962
6	Mixed Recyclable Paper	2.3%	0.2%	15,166
7	Newsprint	0.3%	0.0%	1,723
8	Books	0.4%	0.1%	2,748
9	Compostable Paper	7.9%	0.4%	51,607
10	Non-Recyclable R/C Paper	4.7%	0.7%	30,651
Plastic		**18.1%**	**0.9%**	**117,411**
11	#1 PET Beverage Bottles - BB	0.5%	0.1%	3,243
12	#1 PET Bottles and Jars -NBB	0.4%	0.0%	2,412
13	#1 PET Thermoforms	0.6%	0.1%	3,706
14	#2 HDPE Natural Beverage Bottles - BB	0.0%	0.0%	70
15	#2 HDPE Colored Beverage Bottles - BB	0.0%	0.0%	56
16	#2 HDPE Natural Containers - NBB	0.5%	0.1%	3,390
17	#2 HDPE Colored Containers - NBB	0.6%	0.1%	3,936
18	#3, 4, 5, 7 Beverage Bottles - BB	0.0%	0.0%	9
19	#3, 4, 7 Bottles, Jars, Containers - NBB	0.0%	0.0%	186
20	#5 PP Containers	1.1%	0.1%	7,142
21	#6 PS Rigid Containers	0.3%	0.1%	1,722
22	#6 EPS Foam Food and Beverage Containers	0.1%	0.0%	916
23	#6 EPS Foam Non-Food Packaging/Products	0.2%	0.1%	1,363
24	Bulky Rigids >1 Gallons	2.3%	0.3%	14,789
25	Film, Agricultural and Marine Shrink Wrap	0.1%	0.1%	568
26	Film - Garbage Bags	3.7%	0.3%	23,854
27	Film - Other PE Film	2.9%	0.4%	18,591
28	Film - Non-PE	1.6%	0.2%	10,594
29	Film - Retail Bags	0.3%	0.1%	1,954
30	Remainder/Other Plastic	2.9%	0.4%	18,910
Metal		**4.2%**	**0.5%**	**27,472**
31	Aluminum Cans - BB	0.4%	0.0%	2,425
32	Aluminum Cans - NBB	0.2%	0.0%	1,036
33	Aluminum Foil & Pans - NBB	0.3%	0.0%	2,242
34	Ferrous Containers	0.8%	0.1%	5,189
35	Other Ferrous	1.6%	0.4%	10,522
36	Other Non-Ferrous	0.9%	0.2%	6,058
Glass		**1.5%**	**0.2%**	**9,862**
37	Glass Beverage Bottles - BB	0.5%	0.1%	3,287
38	Glass Bottles and Jars - NBB	0.7%	0.1%	4,347
39	Other Glass (Non-Container)	0.3%	0.2%	2,227
Organics		**26.7%**	**1.3%**	**173,561**
40	Food Waste - Packaged	7.4%	0.6%	48,163
41	Food Waste, Unpackaged	11.8%	0.8%	76,558
42	Branches and Stumps >1" Diameter	0.0%	0.1%	210
43	Mixed Yard Waste	1.4%	0.4%	9,083
44	Clean Wood	1.4%	0.4%	8,902
45	Other Organics	1.2%	0.2%	8,108
46	Pet Waste	3.5%	0.5%	22,536

No.	Material Category	Mean	Margin of Error	Tons
Electronics		**1.0%**	**0.2%**	**6,727**
47	Non-CED Electronics	0.2%	0.0%	1,094
48	CEDs - CRTs	0.0%	0.0%	49
49	CEDs - Desktop Computers	0.0%	0.0%	0
50	CEDs - Laptops and Tablets	0.0%	0.0%	0
51	CEDs - Printers	0.0%	0.0%	0
52	CEDs - Television and Monitors (non-CRT)	0.0%	0.0%	239
53	CEDs - Other	0.0%	0.0%	240
54	Computer Peripherals	0.0%	0.0%	158
55	Products with Embedded Batteries	0.1%	0.0%	354
56	Small Appliances	0.5%	0.1%	3,293
57	White Goods	0.2%	0.2%	1,299
58	Solar/PV Panels/Components	0.0%	0.0%	0
Batteries		**0.1%**	**0.0%**	**410**
59	Batteries - Primary	0.1%	0.0%	393
60	Batteries - Rechargeable, Li-ion	0.0%	0.0%	18
61	Batteries - Rechargeable, Other	0.0%	0.0%	0
Hazardous Waste		**0.9%**	**0.3%**	**5,667**
62	Mercury-Containing Products - Lamps	0.0%	0.0%	10
63	Mercury-Containing Products - Thermostats	0.0%	0.0%	0
64	Mercury-Containing Products - Other	0.0%	0.0%	0
65	Architectural Paint	0.0%	0.0%	185
66	Non-Architectural Paint	0.0%	0.0%	259
67	Household Hazardous Waste	0.1%	0.1%	931
68	Medical Waste - Residential	0.1%	0.0%	518
69	Medical Waste - Commercial	0.6%	0.3%	3,764
Ceramics		**0.1%**	**0.0%**	**811**
70	Ceramic Bottles - BB	0.0%	0.0%	4
71	Other Ceramics Containers	0.1%	0.0%	807
CDD		**4.5%**	**0.7%**	**29,104**
72	Asphalt Brick and Concrete (ABC)	0.0%	0.0%	137
73	Asphalt Shingles	0.1%	0.1%	944
74	CDD Metal	0.2%	0.1%	1,369
75	Ceramic Fixtures	0.0%	0.0%	257
76	Drywall/Gypsum Board	0.4%	0.2%	2,317
77	Oriented Strand Board (OSB)/Plywood	0.1%	0.1%	703
78	Other/Residual CDD	2.1%	0.4%	13,623
79	Painted/Treated Wood	1.5%	0.4%	9,753
All Other Waste		**16.2%**	**1.1%**	**105,507**
80	Carpet/Padding	0.8%	0.3%	5,276
81	Diapers/Sanitary Products	3.6%	0.5%	23,135
82	Furniture/Bulky Items	3.5%	0.9%	22,648
83	Supplements/Pharmaceuticals/Medicines	0.0%	0.0%	193
84	Textiles/Leather	3.5%	0.3%	22,834
85	Rubber/Tires	0.8%	0.2%	5,159
86	Mattresses	0.3%	0.2%	1,684
87	Other Materials Not Elsewhere Classified	1.5%	0.2%	9,483
88	Fines	2.3%	0.1%	15,097
	Total	**100.0%**		**649,818**
	Samples	*238*		

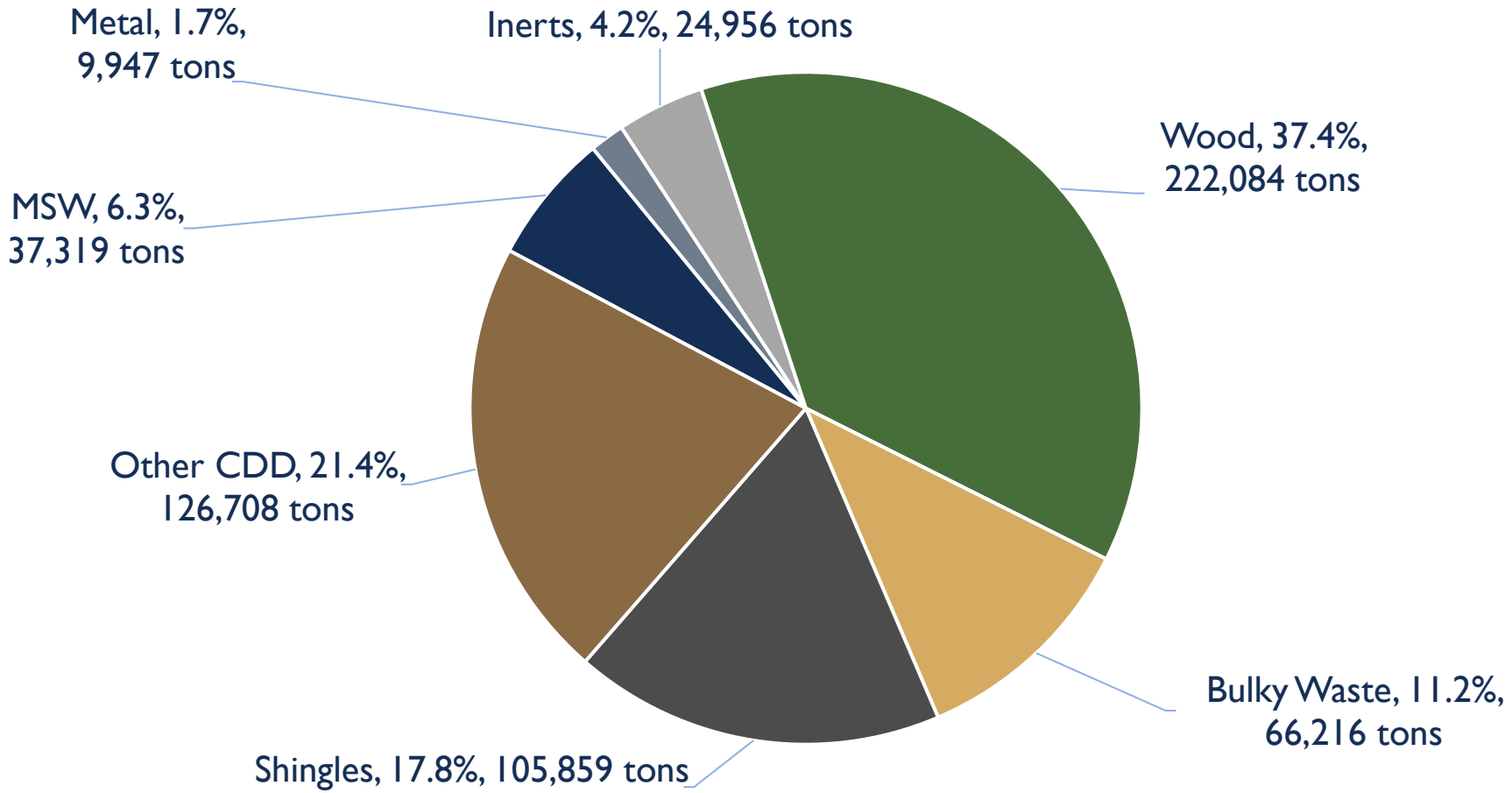
New England MSW Composition Comparison



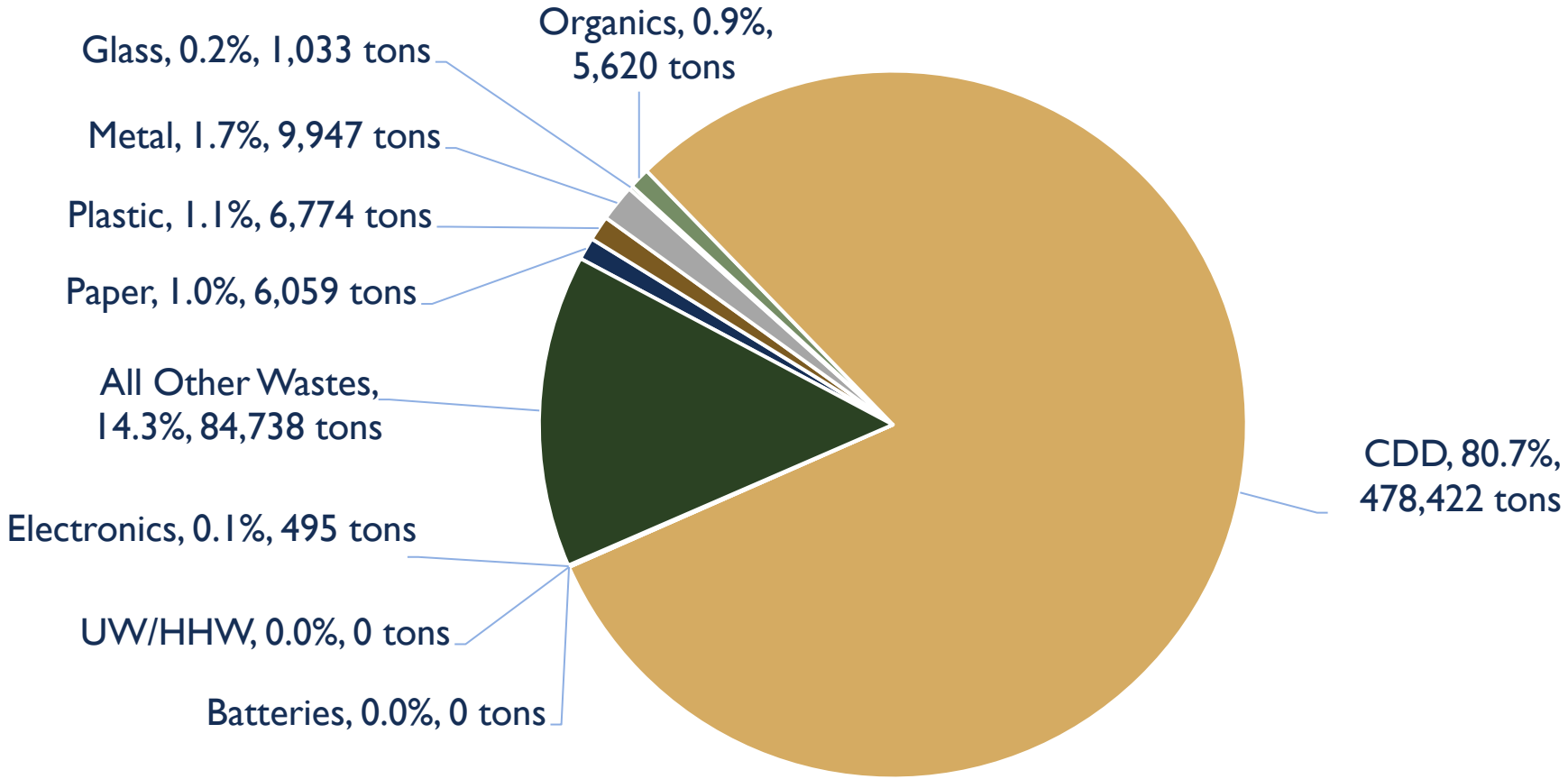


CDD Composition

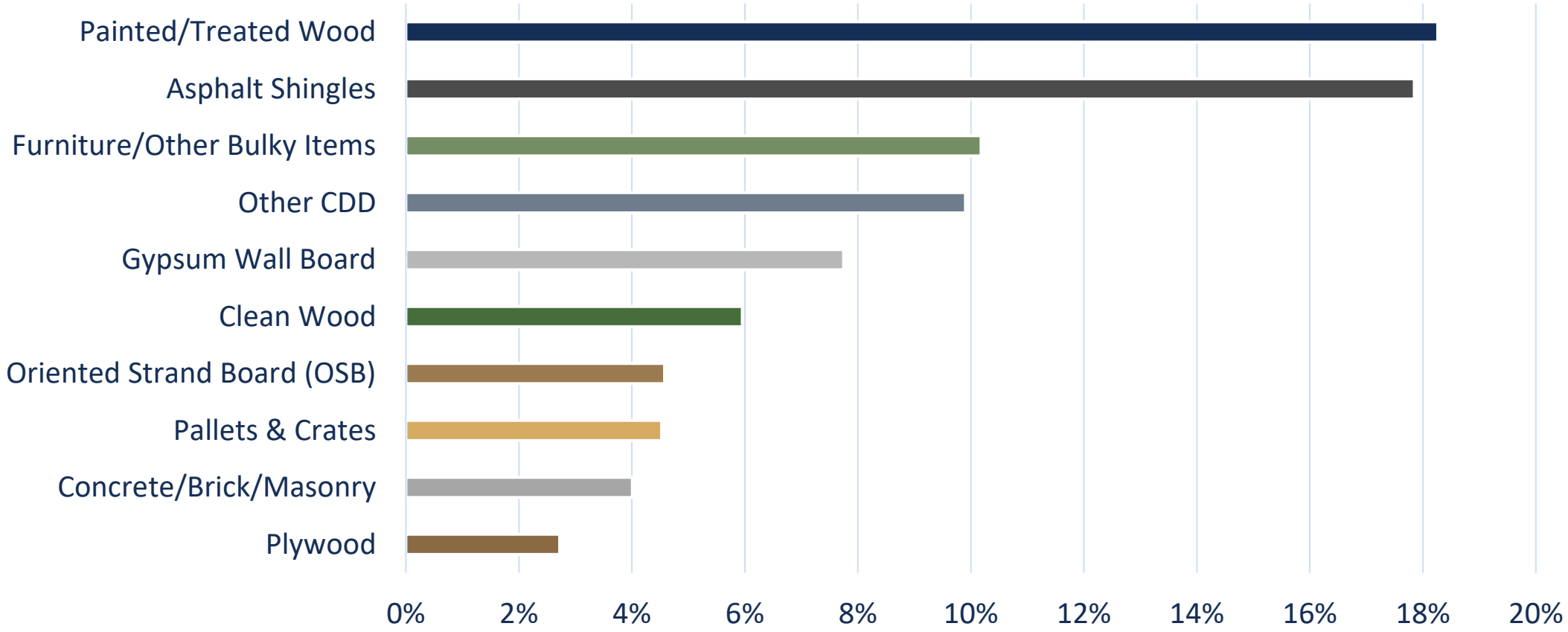
CDD Composition



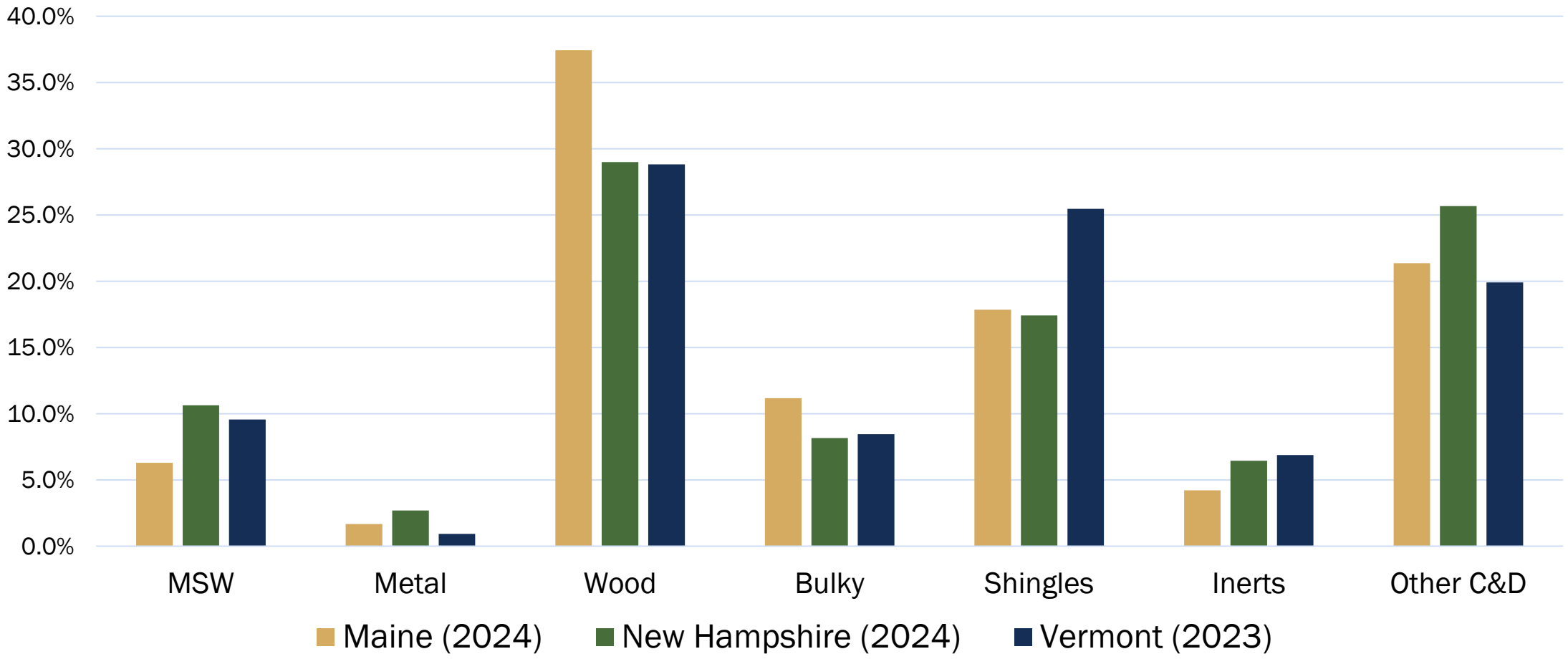
CDD Composition Recast to MSW Material Groups



Top 10 CDD Materials



New England CDD Composition Comparison





Supplemental Research

Residential Food Scraps Management



- Survey Approach
  - Historical: Phone survey
  - 2024 Best Practice: Pre-selected panel of representative Mainers
- 925 responses from Pine Tree State Panel members
  - 41% response rate
  - MOE +/- 3.2%

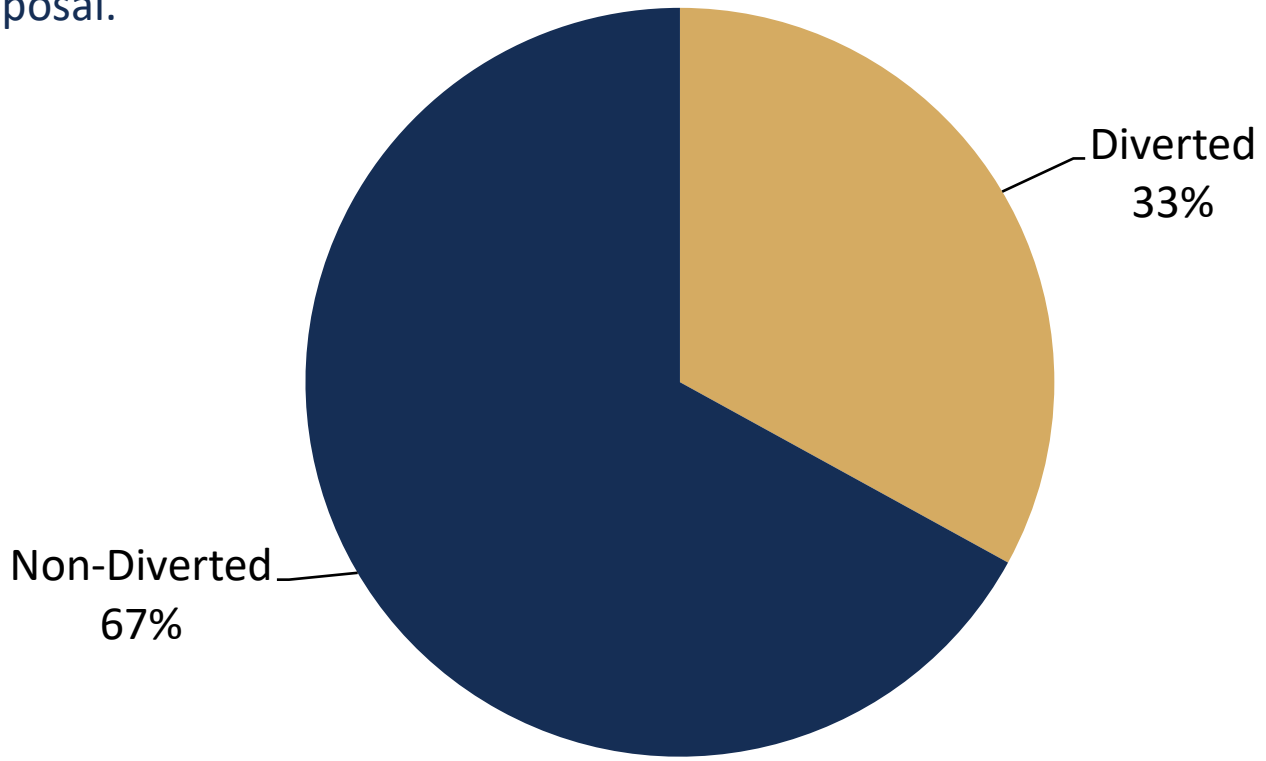
Residential Food Scraps Management

- 7 out of 10 Mainers surveyed discard some food waste in regular trash
- More than ½ of respondents divert some of their food waste most commonly via:
  - Backyard composting
  - Pet or livestock feed
  - Disposal to woods

- "Most Mainers think it is true that diverting food waste is good for the environment and think that Mainers should participate in [diversion]."
- "It is estimated that the average household in Maine diverts about 7 pounds of food waste per week, which amounts to about 360 pounds per year."

State-level Food Scraps Diversion Estimate

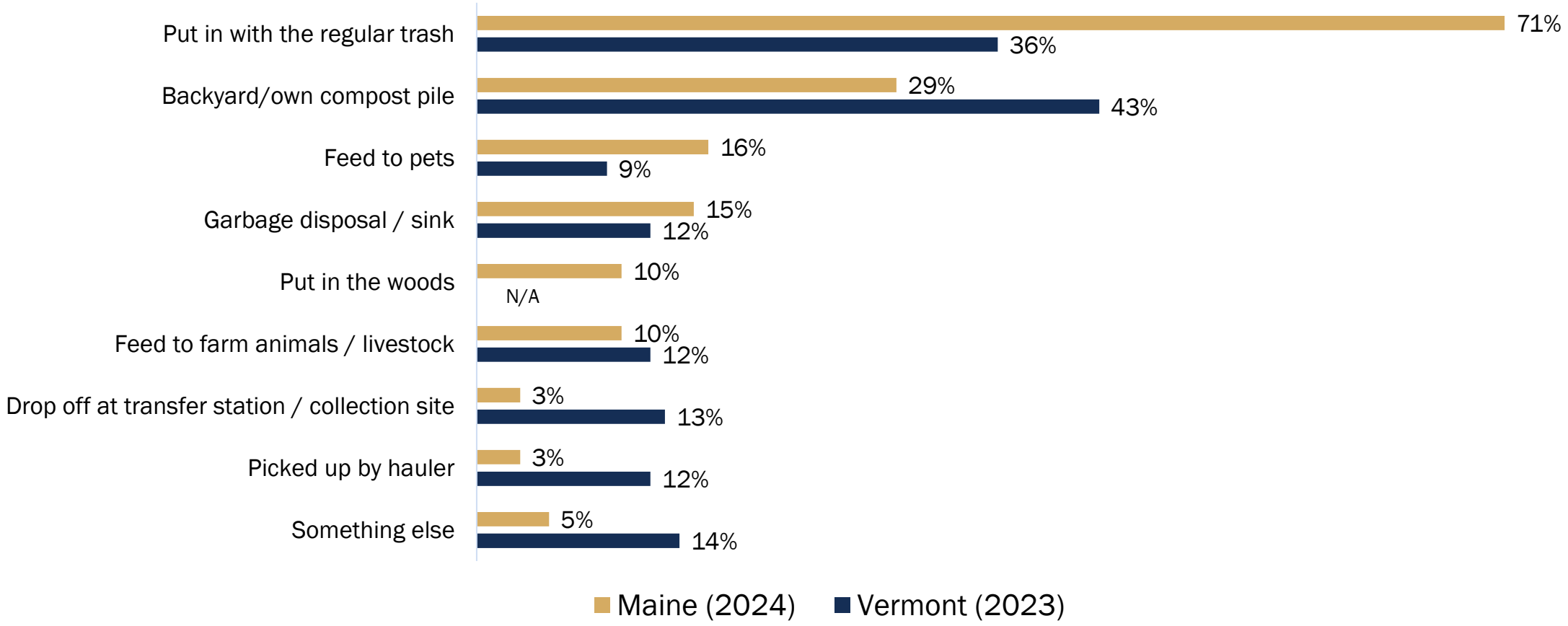
Figure 12: Overall, one-third of Maine residents (33%) divert food waste from landfill, incineration, or in-sink garbage disposal in at least one way, while 67% do not divert food waste and dispose of all of it in the trash or garbage disposal.



Source: University of NH Survey Center

Food Scraps Diversion Response Details

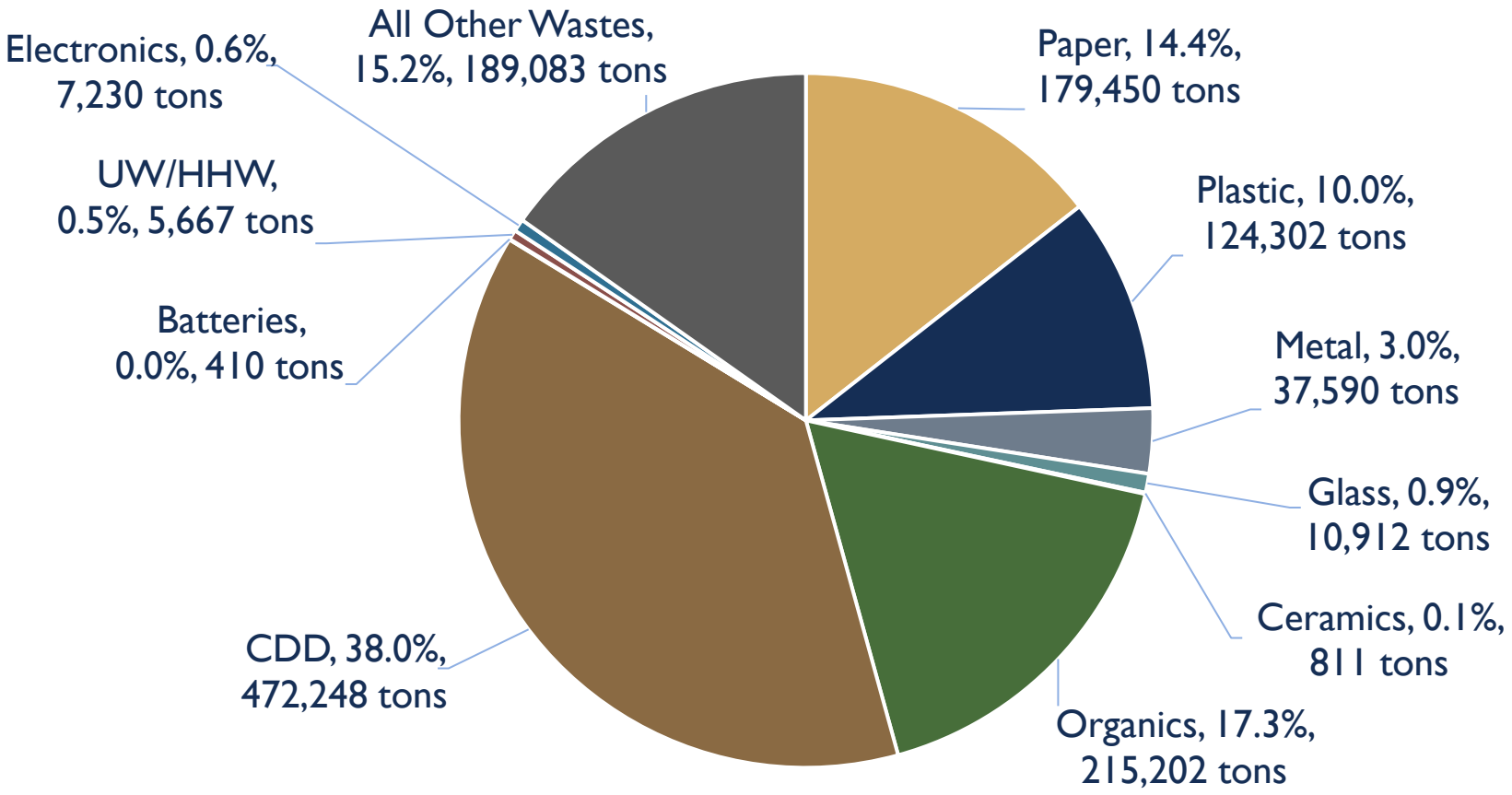
Figure 10a: Which of the following does your household do with food waste that comes from eating or preparing food, including any scraps, inedible parts, and spoiled or rotten foods? (Select all that apply)





Other Findings

MSW + CDD Composition



Commodity Value* of Disposed Recyclable Fiber and Containers

Recyclable Paper

Material Components	Estimated Tons Disposed	Average Market Price ($/ton) [1]	Estimated Total Market Value ($) [2]
OCC (Old Corrugated Cardboard)	54,334	$101	$5,488,000
High Grade Office Paper	1,711	$127	$217,000
Mixed Recyclable Paper	15,166	$58	$880,000
Newsprint	1,723	$80	$138,000
Magazines/Catalogs	2,962	$80	$237,000
Boxboard (Chipboard)	9,700	$58	$563,000
Total Paper	85,596	$88	$7,523,000

[1] Source: Recyclingmarkets.net - Northeast Region of U.S., 2024 annual average.

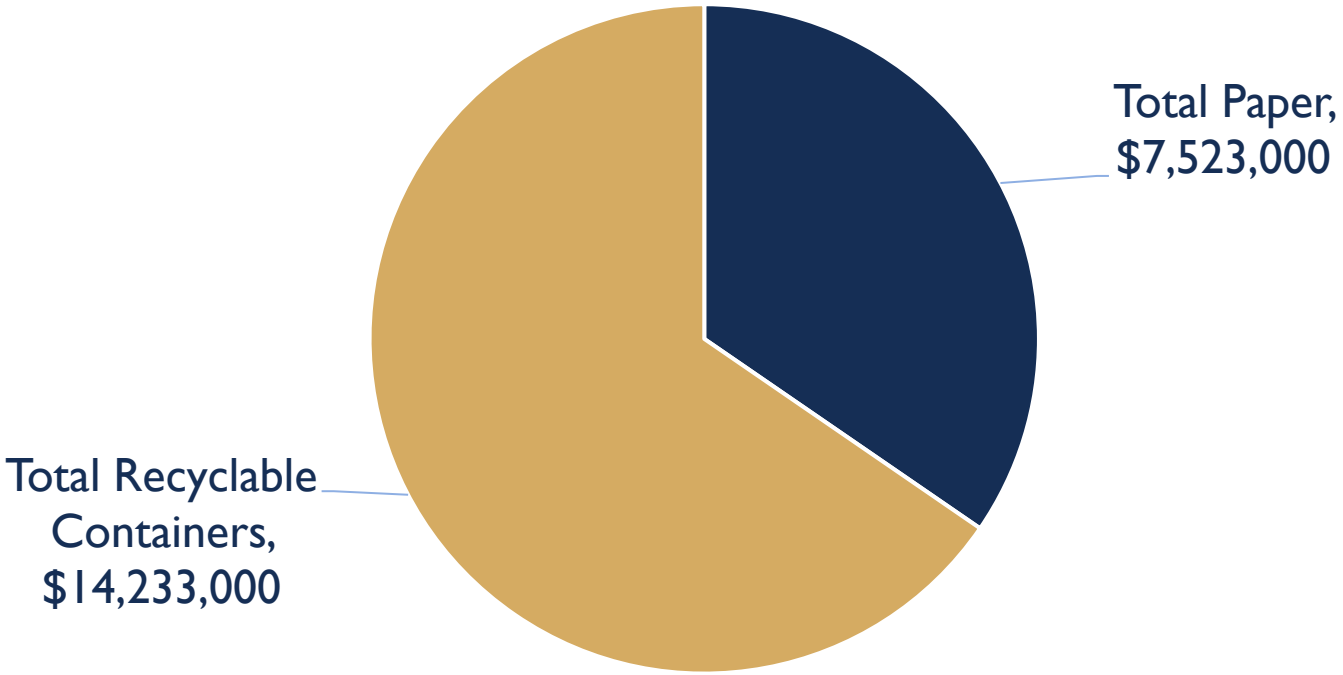
[2] Rounded to the nearest whole thousand.

*Does not attempt to include the return value of deposit containers

Recyclable Containers

Material Components	Estimated Tons Disposed	Average Market Price ($/ton) [1]	Estimated Total Market Value ($) [2]
#1 PET Beverage Bottles - BB	3,243	$340	$1,102,000
#1 PET Bottles and Jars -NBB	2,412	$340	$820,000
#1 PET Thermoforms	3,706	$170	$630,000
#2 HDPE Natural Beverage Bottles - BB	70	$871	$61,000
#2 HDPE Colored Beverage Bottles - BB	56	$319	$18,000
#2 HDPE Natural Containers - NBB	3,390	$871	$2,953,000
#2 HDPE Colored Containers - NBB	3,936	$319	$1,256,000
#3, 4, 5, 7 Beverage Bottles - BB	9	$35	$0
#3, 4, 7 Bottles, Jars, Containers - NBB	186	$35	$7,000
#5 PP Containers	7,142	$165	$1,178,000
#6 PS Rigid Containers	1,722	$60	$103,000
Aluminum Cans - BB	2,425	$1,515	$3,674,000
Aluminum Cans - NBB	1,036	$1,515	$1,569,000
Aluminum Foil & Pans - NBB	2,242	$0	$0
Ferrous Containers	5,189	$188	$976,000
Glass Beverage Bottles - BB	3,287	-$15	-$49,000
Glass Bottles and Jars - NBB	4,347	-$15	-$65,000
Total Recyclable Containers	44,399	$321	$14,233,000

Commodity Value* of Disposed Recyclable Fiber & Containers



Source: Recyclingmarkets.net - Northeast Region of U.S., 2024 annual average.

*Does not attempt to include the return value of deposit containers

Carbon Emissions from Landfilled and WTE Materials

Material Components	Tons Recycled/ Composted [1]	Emissions Reduced ($MTCO_2E$) [2]
Recyclable Paper	85,596	312,052
Corrugated Cardboard/Kraft Paper	54,334	193,023
High Grade Office Paper	1,711	6,573
Mixed Recyclable Paper	24,866	98,925
Newsprint	1,723	4,103
Magazines/Catalogs	2,962	9,428
Recyclable Containers	44,399	116,579
Aluminum	5,702	62,045
Steel Cans	5,189	7,482
Glass	7,634	2,692
PET	9,361	18,331
HDPE	7,452	13,136
PP	7,142	12,893
Mixed Plastics	1,918	0
Compostable	134,014	52,341
Food Waste	124,721	53,349
Yard Waste[3]	9,293	-1,008
Total	**264,009**	**480,972**

TOTALS:

Tons Recycled or Composted
264,009

Emission Reduced ($MTCO_2E$)
480,972

[1] Based on estimated overall MSW waste composition estimated by this study and Maine reported MSW disposal tonnage for calendar year 2023. Assumes the materials would be recycled/composted instead of disposed.

[2] U.S. EPA Waste Reduction Model, Version 15; New England region, landfill emissions scenarios assume landfill gas recovery in place and methane is recovered for energy.

Acknowledgements

- **Facility Hosts**
  - Juniper Ridge Landfill
  - Crossroads Landfill
  - Hatch Hill Solid Waste Landfill
  - Tri-Community
  - ecomaine Waste-to-Energy
  - Maine Waste-to-Energy
  - Westbrook Transfer Station
  - Waterville Transfer Station
  - Wells Transfer Station
  - Pine Tree Waste Transfer Station (West Bath)
  - Troiano Waste Services
  - City of Portland (Riverside Facility)

Thank You!

Thank You

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