



Average Market Rate Recommendations - April 1, 2018

Executive Summary:

The Office of Research and Analysis (ORA) recommends the following Average Market Rates (AMRs) for use by the Colorado Department of Revenue (Department) in levying the excise tax on the sale or transfer of Retail Marijuana from a Retail Marijuana Cultivation Facility¹:

	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Average Market Rate	\$1,012	\$700	\$349	\$302	\$5	\$230	\$5

The AMRs were calculated based on retail marijuana transactions recorded from November 1, 2017 through January 31, 2018. Starting August 9, 2017, the AMR is required for transfers between affiliated businesses, whereas, the contract price is required for transfers between unaffiliated businesses. Beginning January 1, 2018, the rate for Contaminated Product Allocated for Extraction Rate (introduced on August 9, 2017) is no longer applicable.

Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between affiliated businesses; 5) transfers to retail cultivators.

Detailed information related to the methodology and estimation techniques used to arrive at these results can be found on the following pages of this document.

¹ Starting August 9, 2017, the AMR is required for transfers between affiliated businesses, whereas, the contract price is required for transfers between unaffiliated businesses.

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Average Market Rate Methodology:

The Department's Taxation Division determined that the excise tax upon wholesale sales of Retail Marijuana can effectively be levied upon seven product categories (sources: Department of Revenue Retail Marijuana Rules 1 CCR 212-2 and 1 CCR 201-18):

1. Bud (product in the flowering stage);
2. Trim (any part of a plant other than the Bud or Wet Whole Plant);
3. Bud Allocated for Extraction (bud that is designated for the extraction of Retail Marijuana Concentrate and not for direct sale to consumers);
4. Trim Allocated for Extraction (bud that is designated for the extraction of Retail Marijuana Concentrate and not for direct sale to consumers);
5. Immature Plants (nonflowering plants that are no taller than eight inches and no wider than eight inches produced from a cutting, clipping or seedling);
6. Wet Whole Plants (plants that are cut off just above the roots and are not trimmed, dried, or cured; the plant must be weighed within 2 hours of the plant being harvested and without any further processing);
7. Seeds (the seeds of the marijuana plant).

In order to estimate the AMR for each of the categories and in order to comply with the rate-setting requirements of §39-28.8-101(1.5), C.R.S., ORA calculated the AMRs for April 1, 2018, based on transactions from November 1, 2017, through December 31, 2018, that originated from retail marijuana cultivators and were recorded by manifest numbers in the Marijuana Enforcement Tracking Reporting Compliance (METRC). Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between affiliated businesses; 5) transfers to retail cultivators.

Pursuant to §12-43.4-104, C.R.S., October 1, 2014, marked the beginning of the retail marijuana market for businesses which did not previously hold medical marijuana licenses. At that time, the Marijuana Enforcement Division updated the METRC system and required that price data be entered and recorded for wholesale marijuana transfers. Initially, price data for entire manifests containing multiple categories was entered into METRC, and as a result, category prices were not able to be calculated. However, in February 2015, the price field was revised to allow prices with multiple categories under the same manifest number. Additionally, in March 2016, the Department made modifications on the data collection in METRC by including the receiver wholesale price and item descriptions.

For the July 1, 2016 AMR, the Department calculated rates for two new categories, Whole Wet Plants and Seeds.

Starting with the July 1, 2017 AMR, the Department began calculating rates using the median instead of the mean.

For the August 9, 2017 AMR, the Department calculated a rate for the Contaminated Product Allocated for Extraction category.

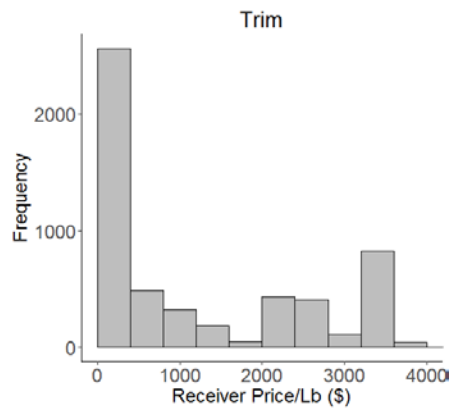
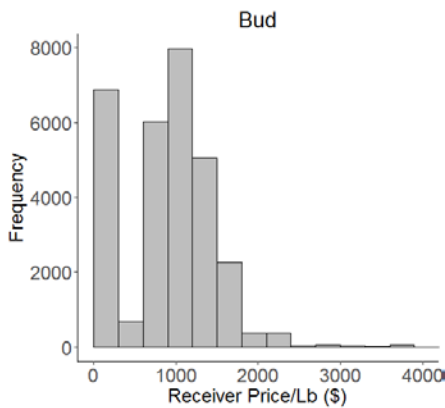
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For the April 1, 2018 AMR, prices per pound (for bud, trim, bud allocated for extraction, trim allocated for extraction, and wet whole plant) and prices each (for immature plants and seeds) were calculated for each item. The distribution of price frequencies was assessed to identify potential outliers or data entry errors. The following tables and graphs display the raw data of all single item transfer manifests from November 1, 2017, through January 31, 2018.

The frequency tables, histograms, and summary statistics for the raw data are shown below.

Raw Frequencies	
Bud	
Rate (\$/lb)	Frequency
\$0 - \$300	6,861
\$301 - \$600	688
\$601 - \$900	6,011
\$901 - \$1,200	7,958
\$1,201 - \$1,500	5,038
\$1,501 - \$1,800	2,272
\$1,801 - \$2,100	379
\$2,101 - \$2,400	389
\$2,401 - \$2,700	29
\$2,701 - \$3,000	48
\$3,001 - \$3,300	30
\$3,301 - \$3,600	6
\$3,601 - \$3,900	66
\$3,901 and over	28
Total	29,803

Raw Frequencies	
Trim	
Rate (\$/lb)	Frequency
\$0 - \$400	2,559
\$401 - \$800	485
\$801 - \$1,200	321
\$1,201 - \$1,600	182
\$1,601 - \$2,000	44
\$2,001 - \$2,400	429
\$2,401 - \$2,800	407
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\$3,601 - \$4,000	42
\$4,001 and over	14
Total	5,415



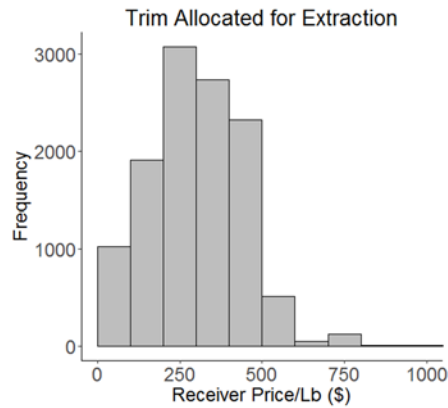
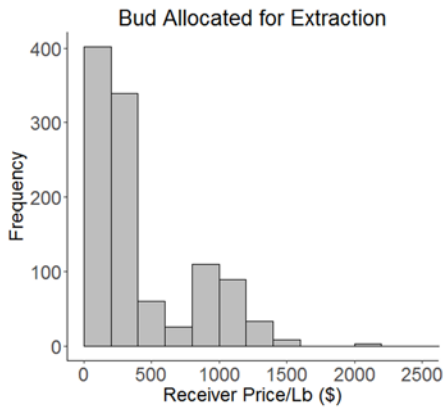
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Raw Frequencies

Bud Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	402
\$201 - \$400	339
\$401 - \$600	60
\$601 - \$800	26
\$801 - \$1,000	110
\$1,001 - \$1,200	89
\$1,201 - \$1,400	33
\$1,401 - \$1,600	8
\$1,601 and over	5
Total	1,072

Raw Frequencies

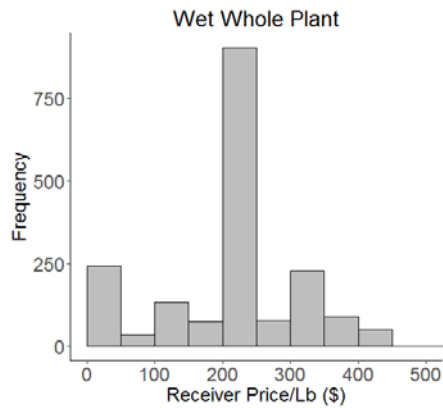
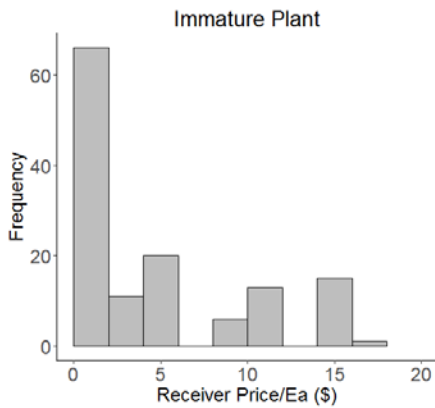
Trim Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$100	1,026
\$101 - \$200	1,909
\$201 - \$300	3,073
\$301 - \$400	2,733
\$401 - \$500	2,324
\$501 - \$600	511
\$601 - \$700	51
\$701 - \$800	122
\$801 - \$900	5
\$901 - \$1,000	10
\$1,001 and over	112
Total	11,876



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Raw Frequencies	
Immature Plant	
Rate (\$/ea)	Frequency
\$0.00 - \$2.00	66
\$2.01 - \$4.00	11
\$4.01 - \$6.00	20
\$6.01 - \$8.00	0
\$8.01 - \$10.00	6
\$10.01 - \$12.00	13
\$12.01 - \$14.00	0
\$14.01 and over	16
Total	132

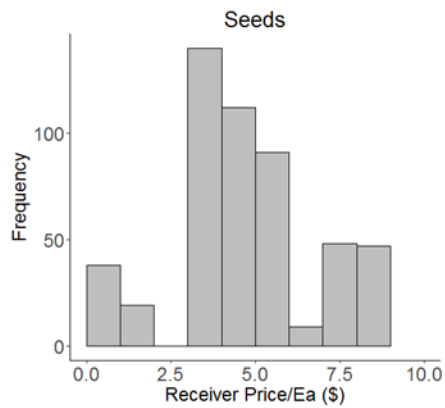
Raw Frequencies	
Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$50	242
\$51 - \$100	34
\$101 - \$150	132
\$151 - \$200	75
\$201 - \$250	904
\$251 - \$300	76
\$301 - \$350	227
\$351 - \$400	90
\$401 - \$450	50
\$451 and over	11
Total	1,841



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Raw Frequencies

Seeds	
Rate (\$/ea)	Frequency
\$0.00 - \$1.00	38
\$1.01 - \$2.00	19
\$2.01 - \$3.00	0
\$3.01 - \$4.00	140
\$4.01 - \$5.00	112
\$5.01 - \$6.00	91
\$6.01 - \$7.00	9
\$7.01 - \$8.00	48
\$8.01 - \$9.00	47
Total	504



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Summary statistics (the minimum, maximum, median, mean, mode, median absolute deviation, standard deviation, skewness, kurtosis, and number of records) related to the distribution of prices in each category are shown in the table below. The median absolute deviation is a robust measure of how spread out the values are, relative to the median. Skewness is a measure of the asymmetry of a distribution. A symmetric distribution has skewness = 0. Kurtosis is a measure of the size and shape of the distribution's tails. A normal distribution has kurtosis = 3.

Summary Statistics (Raw Data)

Descriptive Statistics	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Min	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$14,493,218	\$68,039	\$22,680	\$13,835	\$18	\$1,302	\$9
Median	\$925	\$425	\$315	\$300	\$2	\$230	\$5
Mean	\$1,381	\$1,269	\$451	\$314	\$5	\$216	\$5
Mode	\$799	\$3,402	\$861	\$150	\$5	\$237	\$3
Median Absolute Deviation	\$430	\$629	\$318	\$148	\$3	\$34	\$3
Standard Deviation	\$84,030	\$1,828	\$1,036	\$316	\$6	\$114	\$2
Distribution Statistics							
Skewness	172	13	18	22	1	1	0
Kurtosis	29,684	397	396	773	2	14	3
Number of records	29,803	5,415	1,072	11,876	132	1,841	504

Some extreme outliers in each product category that were likely errors were identified.

It is ORA's recommendation that the Department should levy the excise tax using the median for each category after removing the following outliers:

- For all product categories: Receiver Wholesale Prices <= \$.01

Additionally, the following outliers were removed for these five categories:

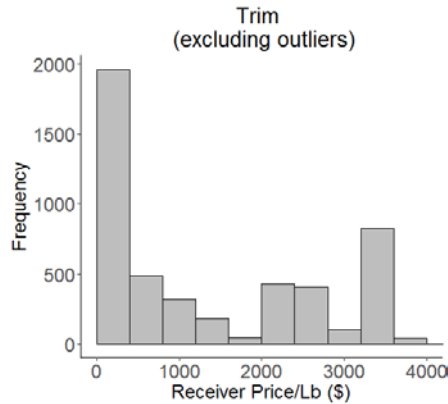
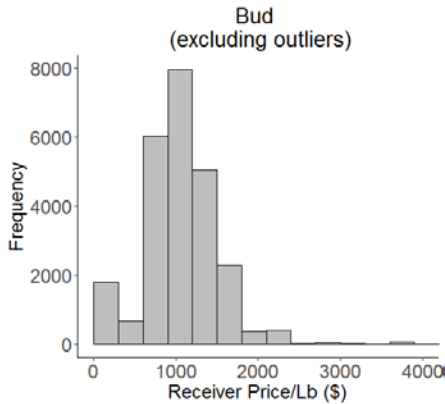
- **Bud:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Trim:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Bud Allocated for Extraction:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Trim Allocated for Extraction:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Wet Whole Plant:** Receiver Price/lb >= \$500

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The frequency tables, histograms, and summary statistics for the data excluding outliers are shown below.

Excluding Outliers Frequencies	
Bud	
Rate (\$/lb)	Frequency
\$0 - \$300	1,794
\$301 - \$600	688
\$601 - \$900	6,011
\$901 - \$1,200	7,958
\$1,201 - \$1,500	5,038
\$1,501 - \$1,800	2,272
\$1,801 - \$2,100	379
\$2,101 - \$2,400	389
\$2,401 - \$2,700	29
\$2,701 - \$3,000	48
\$3,001 - \$3,300	30
\$3,301 - \$3,600	6
\$3,601 - \$3,900	66
\$3,901 and over	23
Total	24,731

Excluding Outliers Frequencies	
Trim	
Rate (\$/lb)	Frequency
\$0 - \$400	1,961
\$401 - \$800	485
\$801 - \$1,200	321
\$1,201 - \$1,600	182
\$1,601 - \$2,000	44
\$2,001 - \$2,400	429
\$2,401 - \$2,800	407
\$2,801 - \$3,200	106
\$3,201 - \$3,600	826
\$3,601 - \$4,000	42
\$4,001 and over	8
Total	4,811



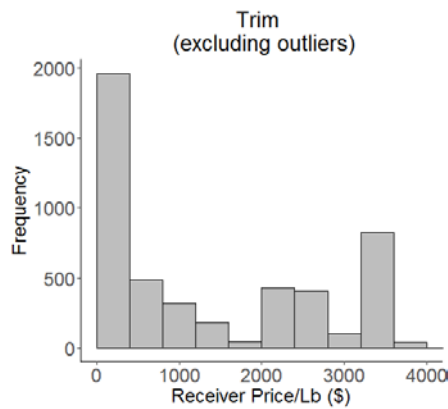
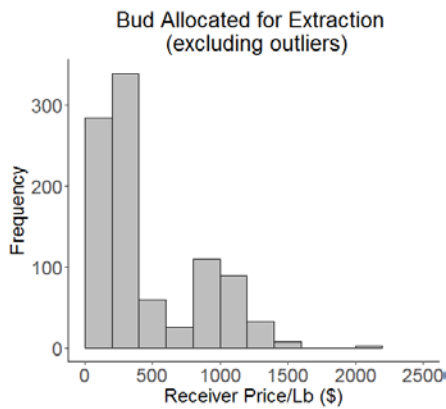
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Excluding Outliers
Frequencies

Bud Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	284
\$201 - \$400	339
\$401 - \$600	60
\$601 - \$800	26
\$801 - \$1,000	110
\$1,001 - \$1,200	89
\$1,201 - \$1,400	33
\$1,401 and over	11
Total	952

Excluding Outliers
Frequencies

Trim Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$100	687
\$101 - \$200	1,909
\$201 - \$300	3,073
\$301 - \$400	2,733
\$401 - \$500	2,324
\$501 - \$600	511
\$601 - \$700	51
\$701 - \$800	122
\$801 - \$900	5
\$901 - \$1,000	10
\$1,001 and over	109
Total	11,534



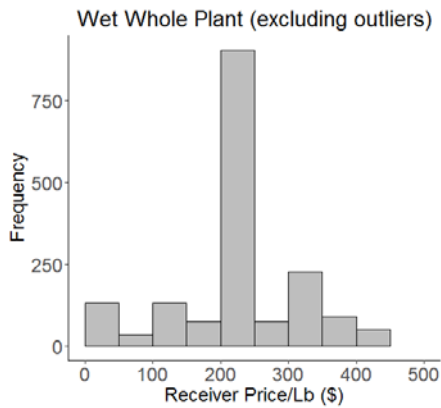
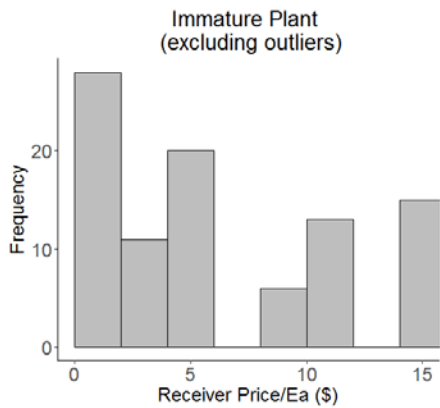
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Excluding Outliers
Frequencies

Immature Plant	
Rate (\$/ea)	Frequency
\$0.00 - \$2.00	28
\$2.01 - \$4.00	11
\$4.01 - \$6.00	20
\$6.01 - \$8.00	0
\$8.01 - \$10.00	6
\$10.01 - \$12.00	13
\$12.01 - \$14.00	0
\$14.01 and over	16
Total	94

Excluding Outliers
Frequencies

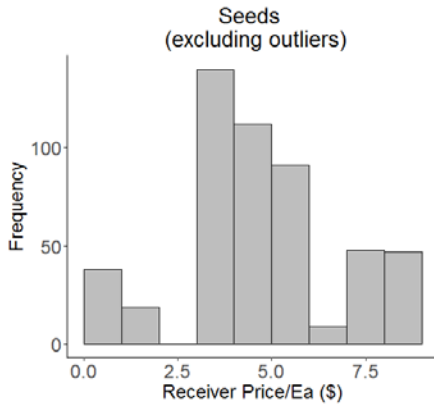
Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$50	132
\$50 - \$100	34
\$101 - \$150	132
\$151 - \$200	75
\$201 - \$250	904
\$251 - \$300	76
\$301 - \$350	227
\$351 - \$400	90
\$401 - \$450	50
Total	1,720



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Excluding Outliers Frequencies

Seeds	
Rate (\$/ea)	Frequency
\$0.00 - \$1.00	38
\$1.01 - \$2.00	19
\$2.01 - \$3.00	0
\$3.01 - \$4.00	140
\$4.01 - \$5.00	112
\$5.01 - \$6.00	91
\$6.01 - \$7.00	9
\$7.01 - \$8.00	48
\$8.01 - \$9.00	47
Total	504



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Summary Statistics (Excluding Outliers)

	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Descriptive Statistics							
Min	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$9,281	\$6,804	\$2,126	\$8,709	\$18	\$403	\$9
Median	\$1,012	\$700	\$349	\$302	\$5	\$230	\$5
Mean	\$1,050	\$1,383	\$461	\$320	\$7	\$226	\$5
Mode	\$799	\$3,402	\$861	\$150	\$5	\$237	\$3
Median Absolute Deviation	\$316	\$1,004	\$294	\$151	\$7	\$10	\$3
Standard Deviation	\$489	\$1,313	\$381	\$240	\$6	\$87	\$2
Distribution Statistics							
Skewness	1	1	1	11	0	-1	0
Kurtosis	18	2	3	253	2	4	3
Number of records	24,731	4,811	952	11,534	94	1,720	504