

# CITY OF DETROIT SALES VERIFICATION ANALYSIS & 2024 SALES RATIO STUDY

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PROFESSIONAL  
CONSULTING SERVICES  
OF IAAO, LLC

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# ABOUT PROFESSIONAL CONSULTING SERVICES OF IAAO, LLC

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The International Association of Assessing Officers (IAAO) is a nonprofit, educational organization founded in 1934. It is a global community of diverse mass appraisal professionals advancing fair and equitable property appraisal, assessment administration, and property tax policy through professional development, research, standards, and technical assistance. Its members are government officials and others interested in the administration of assessment and property tax. All IAAO members subscribe to IAAO's Code of Ethics and Standards of Professional Practice and to the Uniform Standards of Professional Appraisal Practice (USPAP).

The IAAO is the primary publisher, educator, and leader of standards in the field of mass appraisal and assessment administration. As a standard-setting organization, the IAAO has published fifteen standards aimed at improving assessment practices. As an educator, the IAAO has established a curriculum of courses and workshops to supplement university-level and professional training for individuals interested in pursuing a career in property tax administration. We offer the only comprehensive program of mass appraisal courses in the world. In addition, we offer special seminars and an international conference on assessment administration annually.

The IAAO professional designation program recognizes that assessment administration is a specialty within public service and that assessment personnel are mobile. The association therefore offers professional designations to certify the competence of individuals and to attest to their competence when career paths cross state/provincial lines.

Several routes are available to designations, all of which involve some independent project, such as a demonstration appraisal or a mass appraisal case study, in addition to the successful completion of one of the prescribed curricula. The IAAO offers six designations: a generalist designation requiring demonstrated competence in all areas of assessment—Certified Assessment Evaluator (CAE)—and five specialist designations: Mass Appraisal Specialist (MAS), Residential Evaluation Specialist (RES), Cadastral Mapping Specialist (CMS), Personal Property Specialist (PPS), and Assessment Administration Specialist (AAS).

For more than 20 years, the association has established voluntary, objective standards for the improvement of assessment practices and conducted a research and technical services program to help jurisdictions attain these standards. Technical assistance services or consulting services are offered in a number of areas and by means of a variety of arrangements. Our most common engagement is to perform an evaluation of assessment practices within a specific jurisdiction.

IAAO is an independent association not affiliated with any vendor, company, or firm in the private sector or any other association not in the assessment field. IAAO does not undertake technical assistance projects for taxpayers or any other individual or group in the private sector.

IAAO has been a leader in mass appraisal education, technology, and standard-setting for mass appraisal and ad valorem systems in North America and many countries around the world. IAAO has the team, resources, and ability to provide services to meet Client needs.

Professional Consulting Services of IAAO, LLC (PCSIAAO) provides professional consulting worldwide based on a deep and objective understanding of the assessment challenges confronting property valuation and tax practitioners. PCSIAAO is a wholly owned subsidiary of the International Association of Assessing Officers (IAAO).

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# SUMMARY OF PROVIDED DATA

This analysis compares the assessor's assessed values for tax year 2024 to sales that occurred between April 1, 2021, and March 31, 2023 (the time frame leading up to 2024 residential valuation). The assessed values and corresponding sales utilized for the 2024 valuation cycle were provided by the Office of the Assessor for the City of Detroit to PCSIAAO's project team to complete the technical analysis. In addition to the sales information, the Assessor's Office provided standard operating procedures and documents regarding sales validation (including in-house sales validation and verification training materials, Michigan's 2024 Assessor Manuals, data entry protocols, and other documents).

This project required PCSIAAO to review sales verification protocols utilized by the office to ensure staff within the Assessor's Office were following industry best practices. Additionally, PCSIAAO was to conduct a technical analysis of the performance of residential property valuation by completing a sales ratio study in compliance with IAAO Technical Standards and Michigan State Tax Commission protocols.

In completing the sales ratio study PCSIAAO's project team followed protocols established within IAAO's *Standard on Sales Ratio Studies*. Sales determined to be open market, arm's length transactions by the staff of the Assessor's Office were the only sales utilized for this phase of analysis. The determination of sale validity was completed by the Assessor's Office based on their internal office procedures and verification practices. Multi-parcel sales, sales demonstrating undue distress by the buyer or seller at the time of the sale, and sales that were not arm's length in nature were not considered in this sales ratio analysis in keeping with standard operating procedures from the assessor's office.

In this report, the full data set was reviewed in smaller market area breakouts following the Economic Condition Factors (ECF) established by the assessor's office. The sales ratio analysis provided later in this report provides background information regarding the logic and mathematical formulas utilized to complete the analysis. Detailed explanations of the results for each ECF are provided later in this report.

A significant portion of this report is spent analyzing the performance of the results of the sales ratio study. IAAO's technical Standards will be referenced throughout this report. By necessity, the Technical Standards are broad in nature and assume ideal circumstances under which they will be applied by practitioners who are fully trained and experienced in mass appraisal. It is not unusual to find gaps between current operations and IAAO Technical Standards. The primary purpose of this report is to point out the gaps and offer suggestions for improvement. All recommendations are made with the understanding that their implementation is the responsibility of the client.

# REVIEW OF SALES VERIFICATION PROTOCOLS

The State of Michigan requires a Property Transfer Affidavit (PTA) to be completed and filed with the assessor within 45 days of the ownership transfer for all real property and specific types of personal property. Within the PTA the following information must be disclosed regarding the sales transaction:

- Address, County, Location (City, Township, Village), Property Identification Number
- Date of Transfer
- Purchase price
- Name of seller
- Name of buyer, and buyer's contact information

**The PTA document includes several optional questions on the following topics:**

- Type of transfer (land contract, lease, deed, other)
- If the property was purchased from a financial institution
- If the transfer was between related people
- The amount of down payment, the amount financed, and a question if the financed portion is at a market rate

The next section on the PTA document allows the person to note any exemptions the sale may qualify for, specifically if the type of transfer is exempt from an uncapping. The final section on the form is the certification by the person completing the form. The state has created a document that generally meets industry best practices for such a document.

Following the transfer of a property and the filing of the PTA and recording of the deed, the county assessor reviews the sales to remove sales that are considered invalid sales transactions. Once the county assessor has completed their review of sales, the modified sales report is provided to the city assessor's office for final sales verification, data collection, and record updates. Staff from the city's office reported to PCSIAAO the county assessor typically will only consider transfers via a warranty deed as valid open market transactions. City staff further reported this practice eliminates quit claim and other deed types that are commonly used for sales of lower value properties.

The practice of dismissing a significant segment of the market sales transactions due to the deed type does not meet with best practices established within IAAO's *Standard on Verification and Adjustment of Sales*. On page 17, the standard discusses sales generally considered to be invalid and when those types of sales might be included in a market analysis after verification has been completed. As an example, the standard highlights sales involving a financial institution as seller and states (emphasis added):

*"Sales in which a financial institution is the seller typically **should be considered as potentially valid for model calibration and ratio studies if they account for more than 20 percent of sales in a specific market area.**"*

The key takeaway being sales should be considered and included in modeling and sales ratio studies if they account for more than 20 percent of sales in a specific market area, for the needs of the city's assessor that would extend to consideration and inclusion of non-warranty deed sales transactions if those sales can be verified to be representative of market transactions in all other ways besides the deed type. The practice of routinely removing a significant portion of the sales transaction file without clearly identifying and documenting that process, and the logic behind the process, creates a scenario where estimates of market value could be unduly influenced upwards.

PCSIAAO strongly recommends this practice be reevaluated and updated to include allowances for city assessment staff to include sales that transfer with deeds other than warranty deeds. PCSIAAO understands that revising this practice will require cooperation and concessions made by multiple levels of government, however, finding a solution that allows the city's assessment staff the ability to fully review and verify the terms of sale for ALL property transfers throughout its jurisdiction is the best way to serve the entire community of Detroit. City assessment staff should have the ability to determine the validity of the transactions in compliance with established state laws and industry best practices. Revising this practice will comply with industry standards for best practices as well as leading to more accurate estimates of value for all residential properties.

The assessor's office has clear documentation and training materials explaining to staff how to research and review sales, verify the terms of the transaction, confirm the physical characteristics of the residential property, and how to enter the collected sales information into the CAMA system. The one area that the county's documentation was lacking was on the topic of sales verification interviews with the parties to the sale and field checks to confirm the physical characteristics of the property at the time of the sale.

These two points are particularly important for a jurisdiction that is the size of the City of Detroit that also experiences spread of market value demonstrated in the various ECFs throughout the City. It is especially important for the assessor's staff to complete the field reviews of sales in market areas experiencing significant decline or growth due to revitalization.

On the matter of the importance of sales verification IAAO's *Standard on the Verification and Adjustment of Sales* states (emphasis added) on page 13:

*"Sales data are needed for the valuation process and for sales ratio studies. The reliability of any valuation model or sales ratio study depends on the quality and quantity of its data. Sales data should be collected, edited, and adjusted to obtain valid indicators of market value. **Sales data should be verified by contacting a party to the sale (buyer, seller, or other knowledgeable party)...**"*

The assessor's office leadership team should develop a standard protocol and set of questions for staff to ask when conducting sales verification interviews. IAAO's *Standard on the Verification and Adjustment of Sales* Appendix F. on page 67 provides an example "Sale Verification Form" that could be used to help develop a similar form to suit the needs of the city assessor's office specifically.

# SALES RATIO STUDIES

## Purpose

Fundamental to the administration of property taxation is the concept that all property should be appraised and assessed on a uniform basis. Uniformity of like property assures an equitable distribution of the jurisdiction's property tax burden. Assessment offices worldwide utilize sales ratio studies to help evaluate both assessment accuracy and uniformity. These statistics and findings should be utilized to highlight potential successes and/or problems.

A sales ratio is the estimated value of a property divided by its sale price. For example, a sales ratio of 50.0% (or 0.50) means that the assessed value is set at 50.0% of that of the sale price (or market value). A foundational principle of ratio studies is that conclusions can be made about the assessment performance for the population of properties using the sales sample, so long as the sales sample has been appropriately collected and is sufficiently representative of the population.

Only sales transactions which are reviewed by staff of the City Assessor's Office and confirmed to be valid, arm's length transactions are utilized in a sales ratio analysis. These sales are commonly considered the "most objective estimates of market value" and are used as the basis for evaluating assessment performance in a sales ratio study.

Properly validated sales are the singularly most important part of a sales ratio study. Ratio studies analyze a set of ratios to determine the degree to which groups of assessed values accurately reflect market value.

The IAAO Standard on Ratio Studies states the following on page 7:

*"There are two major aspects of appraisal accuracy: level and uniformity. Appraisal level refers to the overall ratio of appraised values to market values. Level measurements provide information about the degree to which goals or certain legal requirements are met. Uniformity refers to the degree to which properties are appraised at equal percentages of market value."*

All value estimates, whether produced by the City of Detroit Assessor's Office or by an external appraiser, are inherently subject to a degree of statistical error depending on several factors such as the accuracy of available property data and the skill of the appraiser or model developer. The IAAO Standard on Ratio Studies sets professional standards for assessment level and uniformity that recognize there is some degree of imperfection in assessed values. Sales ratio studies can answer the question of whether a set of assessed value estimates meets the acceptable standards as promulgated by the IAAO with respect to assessment level and uniformity.

A population is the full set of properties defined by a set of criteria, and a sample is a subset of properties which is drawn from a given population. For the purposes of a sales ratio study, a sales sample is drawn from the population of all properties by the fact that the properties in the sample sold during the relevant time period and meets all other data constraints and filters. A foundational principle of ratio studies is that conclusions can be made about the assessment performance for the population of properties using the sales sample (IAAO 2013, pp.7-8), so long as the sales sample has been appropriately collected, is free from statistically and practically significant selective reappraisal, and is sufficiently representative of the population (IAAO 2013, p.11).

## Key Uses

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The IAAO Standard on Ratio Studies lists the key uses of ratio studies as follows (pg 7):

- Measurement and evaluation of the level and uniformity of mass appraisal models
- Internal quality assurance and identification of appraisal priorities
- Determination of whether administrative or statutory standards have been met
- Determination of time trends
- Adjustment of appraised values between reappraisals

## Steps in a Ratio Study

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Ratio studies generally involve the seven basic steps listed below. (IAAO 2013, p. 8)

### 1. Define the Purpose, Scope, and Objectives

Every well-constructed ratio study has an intended purpose, which is broadly defined according to end goal or key questions being posed to the researcher. The scope and objectives of the ratio study are then defined accordingly.

### 2. Design

The design of the ratio study is the methodologies by which the purpose, scope, and objectives of the ratio study are investigated. The design includes the choice of analyses, statistical tests, and means of presenting the results.

### 3. Stratification

Stratification is the process of dividing the sale properties in the ratio study into two or more groups called stratum and then running the ratio study in each stratum as well as for the overall set of properties. Stratification can be a useful tool to provide a more detailed picture of assessment performance (IAAO 2013, p.9). In ratio studies, a stratification framework should be derived according to several factors, including the goal of the sales ratio study, the availability of appropriate variables to use as a basis for stratification, and the number of sales in each proposed stratum.

### 4. Collection and Preparation of Market Data

It is important to accurately collect appropriate market data, such as sales, to use in a ratio study and to prepare it for analysis. This includes the sales verification (sales validation) process where information about the sale and the sale property are verified and a decision is made on whether a given sale is valid for

analysis. It also includes the preparation of all sales data in an appropriate format. Part of this process in a sales ratio study is defining an appropriate sale date range, where all verified sales within the sale date range are candidates for inclusion in the ratio study.

## **5. Matching of Appraisal and Market Data**

Once market data has been collected and prepared in a usable format, it must be appropriately matched with appraisal data. This forms the basis for the ratio analysis because the ratios analyzed in the study are simply the assessed (or appraised) value divided by the proxy for market value. In the case of a sales ratio study, this proxy for market value is the validated sale price. Properties that are fundamentally different between the sale date and the appraisal data are not matched appropriately and should be removed from the study.

## **6. Statistical Analysis**

The statistical analysis generates the key statistics evaluated in the ratio study. These analyses are defined in the ratio study design according to the purpose, scope, and objectives of the study. The researcher has the power to choose the most appropriate set of statistical analyses based on their experience, knowledge of relevant standards, and statistical knowledge.

## **7. Evaluation and Use of Result**

The key statistics generated from the statistical analysis must be interpreted and evaluated, with the end goal of fashioning them into a usable set of results.

# **Statistical Methods and Procedures**

## **Calculating Assessment-to-Sales Ratio**

The ratio for each property is calculated by dividing the assessed value by the sale price of a valid sale transaction. The resulting ratios indicate how closely the appraiser achieved the goal of fair market value with a ratio of 100 percent indicating the assessment is equal to market value as indicated by the sales price of the property. For the purposes of this report, all mathematical demonstrations will utilize the ratio expressed as a percentage (a whole number rather than the decimal).

### **Consider the following sales examples as an illustration of this calculation:**

Sale	Assessed Value	Sale Price	Ratio	Ratio as a Percentage
Sale 1	96,000	120,000	0.80	80.0 %
Sale 2	101,000	110,000	0.92	92.0 %
Sale 3	134,500	140,000	0.96	96.0 %
Sale 4	117,000	115,000	1.02	102.0 %
Sale 5	144,000	125,000	1.15	115.0 %

IAAO standards target a sales ratio of 1.00, or 100%. However, the Constitution for the State of Michigan; Section 3 of Article 9 states that all property shall be assessed at 50% of true cash value. Meaning the desired assessment level for the purposes of this analysis is 0.50, or 50.0%.

## Outlier Handling

The sales sample was trimmed of outliers prior to the computation of some statistical measures that are highly sensitive to outliers. Outliers are traditionally removed to better analyze uniformity measurements. The IAAO Standard of Ratio Studies states on page 12 that

*"The validity of ratio study statistics used to make inferences about population parameters could be compromised by the presence of outliers that distort the statistics computed from the sample."*

Therefore, it is necessary that outliers be dealt with appropriately in a sales ratio study. It is often best practice to first investigate outliers in case they are a result of data that can be corrected, such as an inaccurately recorded sale price. If outliers are unable to be corrected, they are then candidates for removal using an accepted statistical procedure in accordance with the size removal restrictions outlined in Appendix B of the *Standard on Ratio Studies*. Sales ratio outliers are sales ratios with unusually small or large values which could distort certain measures like the Arithmetic Mean Ratio (Average Ratio) or the Coefficient of Dispersion (COD).

For this statistical analysis outliers were trimmed using a commonly accepted industry trimming technique that identifies outlier ratios that fall more than 1.5 times beyond the inner quartile range of the first and third quartile.

### For example, assume the following:

- Locate the first quartile point of a sample set of ratios, assume 36.0
- Locate the third quartile point of a sample set of ratios, assume 75.0
- Calculate the inner quartile range

$$75.0 - 36.0 = \boxed{39.0 \text{ Inner Quartile Range}}$$

- Establish the lower boundary

$$36.0 - (39.0 \times 1.5) = \boxed{-22.5 \text{ Lower Boundary}}$$

- Establish the upper boundary

$$75.0 + (39.0 \times 1.5) = \boxed{133.5 \text{ Upper Boundary}}$$

Any data points in the hypothetical scenario below -22.5 or greater than 133.5 will be identified as outliers and removed from the statistical calculations.

This method is illustrated in the IAAO Standard on Ratio Studies in Appendix B on page 53.

## Confidence Intervals

The primary concern of ratio studies is to make conclusions about the population of properties based on a sample. Because not all properties sell in a given period of time, all properties that do sell make up a sales sample of the population of properties. Point estimate statistics calculated from a sales sample inherently contain sampling error, defined as the type of error resulting solely from the sampling process (IAAO 2013, p.43). For example, if 100 samples are drawn from a given population of properties, then 100-point estimate statistics will be calculated. The difference between the 100-point estimate statistics is explained by sampling error.

Confidence intervals account for sampling error and thus serve as a measure of the precision for the calculated point estimate statistic as an estimate of the unknown population parameter with a given degree of confidence. For example, if the point estimate of the mean sales ratio is 48.0 and the 95% confidence interval for the unknown population median sales ratio is 43.0 to 51.0, then the best estimate of the unknown population mean ratio is 48.0 and that it can be said with 95% confidence that the population mean sales ratio is in the range of 43.0 to 51.0.

## Statistical Hypothesis Testing

Statistical hypothesis testing is used to make conclusions about a population based on a sample. Confidence intervals can also be used to conduct statistical hypothesis testing. In fact, conclusions about the population of properties, including non-compliance with IAAO Standards, cannot be made without using statistical hypothesis testing to account for sampling error (IAAO 2013, p.15). If the confidence interval overlaps a standard range, then that statistic is said to have met the standard, regardless of the value of the statistic's point estimate (IAAO 2013, pp.34-35). A variety of statistical tests can be employed depending on the design of the ratio study.

## Sale Price Time Trend Analysis

Sale price time trends measure sale price fluctuations over a given date range. There are a variety of methods available to measure sale price trends and certain methods are preferred in certain contexts. Time adjustments can be derived from sale price time trend models as a multiplicative factor to adjust each sale to the estimated market value as of a given date.

## Assessment Level Statistics

Ratio studies typically include measures of assessment level and assessment uniformity. The assessment level is a measure of central tendency for the distribution of sales ratios. This is sometimes referred to as the equalization rate. Depending on the purpose for which the study is being made, different measures of assessment level may be used such as the mean ratio, median ratio, or the weighted mean ratio.

## Calculating Arithmetic Mean Ratio

The arithmetic mean ratio, commonly just referred to as mean ratio, is the average of the sample ratios. In a normal distribution, the mean ratio will be equal to the median ratio. If the distribution is skewed to the right, the mean ratio will be greater than the median ratio. If the distribution is skewed to the left, the mean ratio will be less than the median ratio.

The mean ratio is calculated by adding all of the ratios in the sample and dividing by the number of ratios in the sample.

Sale	Assessed Value	Sale Price	Ratio
Sale 1	96,000	120,000	80.0
Sale 2	101,000	110,000	92.0
Sale 3	134,500	140,000	96.0
Sale 4	117,000	115,000	102.0
Sale 5	144,000	125,000	115.0

$$\frac{80.0 + 92.0 + 96.0 + 102.0 + 115.0}{5} = \frac{485.0}{5} = \boxed{97.0 \text{ Arithmetic Mean}}$$

The IAAO Standard on Ratio Studies states that the mean ratio is generally not the preferred measure of the appraisal level (IAAO 2013, p. 28). This is because the mean ratio can be greatly influenced by the presence of outliers in the sample.

### Calculating Median Ratio

The median ratio is one of the most common statistical measures used in mass appraisal performance. It is considered the most relevant measure of central tendency in the assessment industry because of its insensitivity to low or high ratios in the sample. In other words, it is less influenced by outliers. The median ratio is the preferred measure of central tendency by IAAO.

To calculate, the ratios must first be arrayed, sorted in ascending or descending order. If the number of sample ratios is odd, the median is the value halfway through the arrayed data set with an equal number of ratios above and below the median.

Sale	Ratio
Sale 1	80.0
Sale 2	92.0
Sale 3	96.0
Sale 4	102.0
Sale 5	115.0

If the number of sample ratios is even, the median value is determined by adding the two middle values that fall in the center of the array and dividing by 2.

Sale	Ratio
Sale 1	80.0
Sale 2	92.0
Sale 3	96.0
Sale 4	102.0
Sale 5	115.0
Sale 6	130.0

The ratios 96.0 and 102.0 (Sale 3 & Sale 4) are in the middle of the array and should be added together and divided by 2.

$$\frac{96.0 + 102.0}{2} = \boxed{99.0 \text{ Median Ratio}}$$

### Calculating Weighted Mean Ratio

The weighted mean ratio is an aggregate ratio. It compares the total sum of the sample's assessed values to the total sum of the sample's sale prices. The weighted mean weights each ratio in proportion to its sale price. This differs from other measures of central tendency such as mean and median that give equal weight to each sale price. The weighted mean ratio may be referred to as the aggregate ratio.

**The steps to calculate the Weighted Mean:**

1. Sum the assessed values
2. Sum the sale prices
3. Divide the sum of the total Assessed Values by the sum of the total Sale Prices
4. Multiple by 100

Sale	Assessed Value	Sale Price
Sale 1	\$96,000	\$120,000
Sale 2	\$101,000	\$110,000
Sale 3	\$134,500	\$140,000
Sale 4	\$117,000	\$115,000
Sale 5	\$144,000	\$125,000
Total	\$592,500	\$610,000

$$\frac{\$592,500}{\$610,000} \times 100 =$$

**97.1 Weighted Mean Ratio**

## Measures of Appraisal Level

Assessment uniformity is a measure of the variability of the ratio distribution. Ratio studies are usually concerned with a general measure of overall variability, like the Coefficient of Dispersion (COD), and a measure of variability that specifically measures vertical inequity, like the Price-Related Differential (PRD).

### Calculating Coefficient of Dispersion

The coefficient of dispersion (COD) is the most common measure of horizontal uniformity in the mass appraisal industry. It measures the average amount of dispersion from the median and expresses the dispersion as a percentage of the median ratio. COD indicates how close the group of ratios are clustered around the median ratio. The lower the COD, the more tightly the sales ratios are distributed around the median sales ratio indicating more uniformity in assessed values. Conversely, the higher the COD, the more spread out the sales ratios are around the median sales ratio indicating less uniformity in assessed values.

**The steps to calculate the COD:**

1. Calculate the median sales ratio

Sale	Assessed Value	Sale Price	Ratio	
Sale 1	96,000	120,000	80.0	
Sale 2	101,000	110,000	92.0	
Sale 3	134,500	140,000	96.0	Median
Sale 4	117,000	115,000	102.0	
Sale 5	144,000	125,000	115.0	

2. Subtract the median ratio from each ratio to find the difference, take the absolute value of the differences

Sale	Assessed Value	Sale Price	Ratio	Median Ratio	Absolute Deviation from Median
Sale 1	96,000	120,000	80.0	96.0	16.0
Sale 2	101,000	110,000	92.0	96.0	4.0
Sale 3	134,500	140,000	96.0	96.0	0.0
Sale 4	117,000	115,000	102.0	96.0	6.0
Sale 5	144,000	125,000	115.0	96.0	19.0

3. Sum the absolute differences

Absolute Deviation from Median	
	16.0
	4.0
	0.0
	6.0
	19.0
<b>Sum:</b>	<b>45</b>

4. Divide by the total number of sales in the sample size to obtain the average absolute deviation

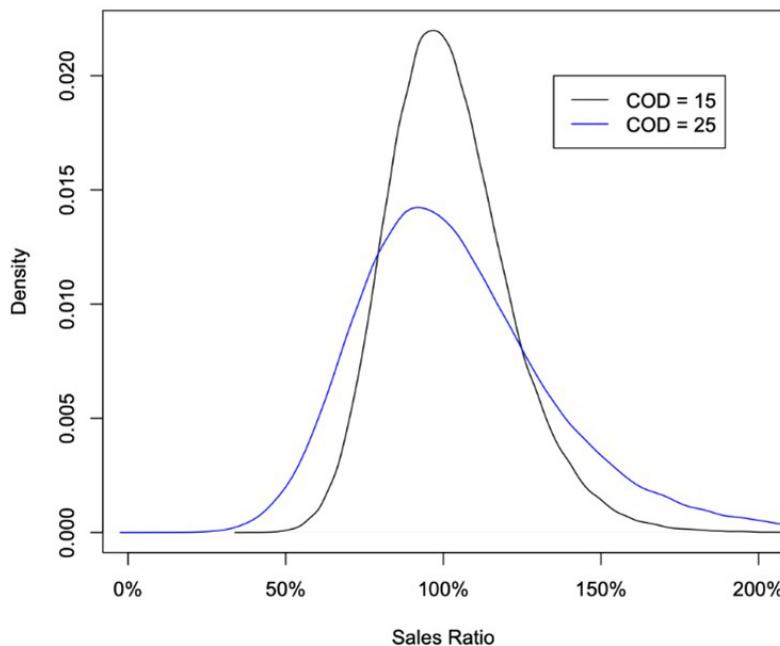
$$\frac{45.0}{5} = \boxed{9.0 \text{ Average Absolute Deviation from Median}}$$

5. Divide the average absolute deviation by the median ratio, then multiple by 100 to express as a percent, this represents the coefficient of dispersion

$$\frac{\text{Average Absolute Deviation}}{\text{Median}} = \frac{9.0}{96.0} \times 100 = \boxed{9.375\% \text{ Coefficient of Dispersion (COD)}}$$

Figure 1 provides a useful visualization of the COD where two hypothetical sales ratio distributions with different CODs are superimposed. The density lines show how the sales ratios fall in a distribution around the median of the sales ratios. The COD is a measure of this variability. Notice how the sales ratio distribution with a COD of 15 is more tightly distributed around the median sales ratio and the sales ratio distribution with a COD of 25 is more spread out. This means that the lower the COD, the more tightly distributed the sales ratios are around the median sales ratio and so the more accurate the assessed values are.

**FIGURE 1. A Hypothetical Comparison of Two CODs (15.0% and 25.0%)**



The IAAO Standard on Ratio Studies has promulgated standard ranges for the COD based on the type of property. There are two different tables of acceptable standard ranges (found on p.17 and p. 34 of the Standard, respectively) and both are shown in *Figure 2 & Figure 3* for context. Demonstrating the predictive error inherent in the assessment process, the lower end of each acceptable range is 5% and this is thought to be the best COD actually achievable in most circumstances assuming the assessment process has been conducted properly (IAAO 2013, p.19).

**FIGURE 2. IAAO Standard Ranges for the COD by Type of Property**

Type of property—General	Type of property—Specific	COD Range**
Single-family residential (including residential condominiums)	Newer or more homogeneous areas	5.0 to 10.0
Single-family residential	Older or more heterogeneous areas	5.0 to 15.0
Other residential	Rural, seasonal, recreational, manufactured housing, 2-4 unit family housing	5.0 to 20.0
Income-producing properties	Larger areas represented by large samples	5.0 to 15.0
Income-producing properties	Smaller areas represented by smaller samples	5.0 to 20.0
Vacant land		5.0 to 25.0
Other real and personal property		Varies with local conditions

These types of property are provided for guidance only and may not represent jurisdictional requirements.

\* Appraisal level for each type of property shown should be between 0.90 and 1.10, unless stricter local standards are required.

PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity.

PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted (see table 1-2).

\*\* CODs lower than 5.0 may indicate sales chasing or non-representative samples.

**FIGURE 3. IAAO Standard Ranges for the COD by Type of Property**

General Property Class	Jurisdiction Size/Profile/Market Activity	COD Range
<b>Residential improved (single family dwellings, condominiums, manuf. housing, 2-4 family units)</b>	Very large jurisdictions/densely populated/newer properties/active markets	5.0 to 10.0
	Large to mid-sized jurisdictions/older & newer properties/less active markets	5.0 to 15.0
	Rural or small jurisdictions/older properties/depressed market areas	5.0 to 20.0
<b>Income-producing properties (commercial, industrial, apartments)</b>	Very large jurisdictions/densely populated/newer properties/active markets	5.0 to 15.0
	Large to mid-sized jurisdictions/older & newer properties/less active markets	5.0 to 20.0
	Rural or small jurisdictions/older properties/depressed market areas	5.0 to 25.0
<b>Residential vacant land</b>	Very large jurisdictions/rapid development/active markets	5.0 to 15.0
	Large to mid-sized jurisdictions/slower development/less active markets	5.0 to 20.0
	Rural or small jurisdictions/little development/depressed markets	5.0 to 25.0
<b>Other (non-agricultural) vacant land</b>	Very large jurisdictions/rapid development/active markets	5.0 to 20.0
	Large to mid-sized jurisdictions/slower development/less active markets	5.0 to 25.0
	Rural or small jurisdictions/little development/depressed markets	5.0 to 30.0

These types of property are provided for general guidance only and may not represent jurisdictional requirements.

\* The COD performance recommendations are based upon representative and adequate sample sizes, with outliers trimmed and a 95% level of confidence.

\* Appraisal level recommendation for each type of property shown should be between 0.90 and 1.10.

\* PRD's for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity. However, PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted.

\* Alternatively, assessing officials can rely on the PRB, which is less sensitive to atypical prices and ratios. PRB coefficients should generally fall between -.05 and .05. PRBs that are statistically significant and less than -0.10 or greater than 0.10 indicate unacceptable vertical inequities.

\* CODs lower than 5.0 may indicate sales chasing or non-representative samples.

## Calculating Price-Related Differential

The Price-Related Differential (PRD) is a statistic conventionally used to measure appraisal uniformity as related to the equality of the assessed values of low- and high-value properties within the same market. Appraisals are considered regressive if high-value properties are under-assessed relative to low-value properties and progressive if high-value properties are relatively over-assessed.

A PRD of 1.00 indicates that low and high value properties are assessed equally. A PRD greater than 1.00 indicates regressivity, meaning high-value properties may be under assessed relative to lower value properties. A PRD less than 1.00 indicates progressivity, meaning high-value properties may be over assessed relative to lower value properties.

### The steps to calculate the PRD:

1. Calculate the arithmetic mean sales ratio

Sale	Assessed Value	Sale Price	Ratio
Sale 1	\$96,000	\$120,000	80.0
Sale 2	\$101,000	\$110,000	92.0
Sale 3	\$134,500	\$140,000	96.0
Sale 4	\$117,000	\$115,000	102.0
Sale 5	\$144,000	\$125,000	115.0
Total	\$592,500	\$610,000	

$$\frac{80.0 + 92.0 + 96.0 + 102.0 + 115.0}{5} = \frac{485.0}{5} = 97.0 \quad \boxed{\text{Mean Ratio}}$$

2. Calculate the weighted mean sales ratio

$$\frac{\text{Total of Assessed Values}}{\text{Total of Sale Prices}} = \frac{\$592,500}{\$610,000} = 97.1 \quad \boxed{\text{Weighted Mean Ratio}}$$

3. Divide the mean sales ratio by the weighted mean sales ratio

4. Multiple by 100

$$\frac{\text{Mean Ratio}}{\text{Weighted Mean Ratio}} = \frac{97.0}{97.1} \times 100 = 99.9 \quad \boxed{\text{Price Related Differential}}$$

## Calculating Standard Deviation

The standard deviation, under certain assumptions, can be a powerful measure of appraisal uniformity. As noted (emphasis added) within chapter 15 of IAAO's textbook *Property Assessment Valuation* (IAAO 2010, pp 446-450):

"Interpretation of the standard deviation depends on an unbiased, representative sample in which the data are normally distributed. A normal distribution is characterized by a symmetrical, bell-shaped curve, which the mean and median are identical; they should at least be similar for normality to be assumed. ... **If the data do not approximate a normal distribution, the standard deviation is less useful. ... Depending on the representativeness of the sample and distribution of the data, the standard deviation can be either a powerful or a misleading measure of appraisal uniformity.**"

### The steps to calculate standard deviation:

1. Subtract the mean from each ratio

Sale	Assessed Value	Sale Price	Ratio	Mean Ratio	Difference
Sale 1	\$96,000	\$120,000	80.0	97.0	-17
Sale 2	\$101,000	\$110,000	92.0	97.0	-5
Sale 3	\$134,500	\$140,000	96.0	97.0	-1
Sale 4	\$117,000	\$115,000	102.0	97.0	5
Sale 5	\$144,000	\$125,000	115.0	97.0	18

$$\frac{80.0 + 92.0 + 96.0 + 102.0 + 115.0}{5} = \frac{485.0}{5} = 97.0 \quad \text{Mean Ratio}$$

2. Square the resulting differences

Sale	Assessed Value	Sale Price	Ratio	Mean Ratio	Difference	Squared Differences
Sale 1	\$96,000	\$120,000	80.0	97.0	-17.0	289.0
Sale 2	\$101,000	\$110,000	92.0	97.0	-5.0	25.0
Sale 3	\$134,500	\$140,000	96.0	97.0	-1.0	1.0
Sale 4	\$117,000	\$115,000	102.0	97.0	5.0	25.0
Sale 5	\$144,000	\$125,000	115.0	97.0	18.0	324.0

3. Sum the squared differences

$$289.0 + 25.0 + 1.0 + 25.0 + 324.0 = 664.0 \quad \text{Sum of Squared Differences}$$

4. Divide the sum of squared difference by one less than the total number of ratios in the sample to obtain the variance of the ratios

$$\frac{664.0}{(5 - 1)} = 166.0 \quad \text{Variance}$$

5. Calculate the square root of the variance to obtain the standard deviation

$$\sqrt{664.0} = \boxed{12.9 \text{ Standard Deviation}}$$

### Calculating the Coefficient of Variation

The Coefficient of Variation (COV) expresses the standard deviation as a percentage, just as the COD does with the average absolute deviation. Expression as a percentage makes comparisons of appraisal levels between groups easier. Like the standard deviation, the predictive power of the COV depends on the extent to which the data are normally distributed. When the data is normally distributed the COV is a powerful measure of uniformity. Conversely, when the data is not normally distributed, the COV is not a meaningful measure of uniformity.

#### How to calculate COV:

Divide the standard deviation by the mean ratio, then multiple by 100 to express as a percent; this represents the coefficient of variation:

$$\frac{\text{Standard Deviation}}{\text{Mean Ratio}} = \frac{12.9}{97.0} \times 100 = \boxed{13.28\% \text{ Coefficient of Variation (COV)}}$$

# CURRENT RATIO STUDY AND RELATED STATISTICAL ANALYSIS

This section describes the current project in terms of the basic steps of creating a sales ratio study that were described previously.

## **Step 1 – Define the Purpose, Scope and Objectives**

The Assessor's Office for the City of Detroit produced an estimate of assessed value with an effective date December 31, 2023 for the 2024 valuation year. This project's purpose is to conduct an independent sales ratio study and other associated statistical analyses to investigate the overall performance of the assessed values established of the City of Detroit's Assessor's Office.

This sales ratio study is designed and oriented around this purpose and was conducted using the 2024 assessed values as determined by the Assessor's Office for the City of Detroit. These values were statistical reviewed for accuracy and uniformity by comparing them to sales that occurred between April 1, 2021 and March 31, 2023 (the time frame leading up to 2024 residential valuation).

A statistical review will be done considering valuation performance as it relates to Michigan law as well as IAAO's Technical Standards.

## **Step 2 – Design**

Recall that the design of the ratio study is the set of methodologies by which the purpose, scope, and objectives of the ratio study are investigated. This design includes the choice of analyses, statistical tests, and means of presenting the results. This study is performed according to the guidelines laid out in the IAAO *Standard on Ratio Studies* (2013). However, this section describes key elements of the design of this sales ratio study that are worth noting.

### **Outlier Handling**

Sales ratio outliers were trimmed according to the 1.5 IQR Method. This trimming technique identifies outliers by considering the inner quartile range times 1.5. This is done to better achieve distributional symmetry, which is recommended in Appendix B of the IAAO *Standard on Ratio Studies* (IAAO 2013). This method was outlined earlier in the report.

### **Statistical Hypothesis Testing**

All conclusions made in this sales ratio study are made using statistical hypothesis testing so that inferences about the population can be made. All confidence intervals used in this analysis are 95% two-sided intervals. Confidence intervals for the mean sales ratio and median sales ratio are calculated using a resampling procedure called "bootstrapping".

## Sale Price Time Trend Analysis

In periods of a rapidly changing market, it is necessary to consider making a market condition adjustment to sales to adjust sale prices to reflect the current market as of the valuation date. The creation of a market condition time factor was done independently by the PCSIAAO project team.

The sales used in this market condition analysis include arm's length transactions as determined by staff in the Assessor's Office that occurred between April 1, 2021, and March 31, 2023. Because this period covers a span of 24 months during a time in which home appreciation saw rapid growth. It is necessary to apply a market condition adjustment.

### **Several methodologies were considered prior to arriving at a representative market condition adjustment conclusion:**

- Both the median sale price per month and average sale price per month were reviewed to evaluate fluctuations in the market month over month
- Data from several national multiple listing service (MLS) sites were reviewed as a secondary means to confirm any indication(s) of changing market conditions
- A resales analysis was considered. This method compares two sales of the same property. The difference in sales price is divided by the price of the first sale to find the percent change and then divided by the number of months between the two sales to find the indicated monthly trend. There can be limitations in the resales approach due to the difficulty of identifying properties that experienced a physical change between sale dates.

After reviewing the analysis, the indicated annual adjustment ranged between 0.000% and 15.811%, with one outlier removed. The median annual adjustment was 7.082% with an average annual adjustment indicated of 7.447%.

The conclusion was made to apply an annual market condition adjustment of 8.500%, or a monthly adjustment of 0.708% per month, to every sale in the sample set in order to adjust all sales to a common point in time prior to analysis. This conclusion was made reviewing all of the indicated results weighing the pros and cons of each method, and factoring in the indicated range.

## Assessment Level Statistics

When measuring assessment level, the State of Michigan relies on the mean, or average, assessment-to-sales ratio. The desired assessment level is 50.0 per state law.

When considering IAAO Technical Standards, the median sales ratio is the thought to be the most appropriate measure of assessment level to use for monitoring appraisal performance because it is less susceptible to the presence of outliers. The target assessment level is 100.0 with an acceptable range of +/- 10%. According to the IAAO Standard on Ratio Studies, the assessment level should range between 90.0 and 110.0 (IAAO 2013, pp. 34-35) of the estimate of fair market value.

The IAAO Standard on Ratio Studies recommends this standard range for several reasons, including potential inflation or deflation during reappraisal cycles that extend beyond one year, the potential lack of available resources, and other limiting conditions "that may constrain the degree of accuracy that is possible and cost-effective within an assessment jurisdiction" (IAAO 2013, pp.18,33-34).

For this statistical analysis the target median assessment level is 50.0 to be in line with Michigan targets.

## Assessment Uniformity Statistics

The IAAO standard range used for the COD in this report is 5% to 20% for all strata, because Detroit is comprised mostly of older properties and is considered a depressed market area (IAAO 2013, p.34).

The IAAO standard range used for the PRD in this report is 0.98 to 1.03 for all strata. (IAAO 2013, p.36).

## Step 3 – Stratification

In this sales ratio study, sales are stratified by location for the calculation of the sales ratio statistics. Sales were stratified first by the full sample set of sales, then by ECF Neighborhood series group, and finally by individual ECF Neighborhood group.

### Sample Representativeness

Sample representativeness means that the properties in the sales sample used for the sales ratio study are sufficiently representative of the properties in the population. A specific test for sample representativeness is not prescribed in the IAAO *Standard on Ratio Studies*, but the Standard advises that sample representativeness be investigated (IAAO 2013, p.11).

When stratifying based on the individual ECF Neighborhood groups there several groups that where underrepresented in the sample relative to the population, with some groups having no representation. Ideally, to perform a statistical ratio analysis there are adequate occurrences in the sample to appropriately represent the population that is being tested.

For the large majority of ECF Neighborhoods reviewed in this analysis there were adequate sales in the sample set to represent the population. Groups with less than five sales representing less than 1.0% of the ECF Neighborhood population were noted as not being representative samples for their respective populations.

## Step 4 – Collection and Preparation of Market Data

Sales, valuation, and property-level data were requested from the Assessor's Office upon project commencement. Data meeting all project requirements was delivered to the PCSIAAO project team in November 2024. Sales data that was provided by staff had previously been reviewed and validated by the assessor's office. The sales included in the file were then further reviewed by the PCSIAAO project team for inclusion in the sales ratio study. They were filtered by the following criteria:

1. Identified as meeting the definition for "Arm's Length Transaction" as defined by the Assessor's Office sales validation procedures
2. Having a property class description of "Residential-Improved"
3. Having an Occupancy Type of:
  - 0 - Single Family
  - 2 - Town House
  - 3 - Duplex
4. Properties with "\$0" Assessed Value were removed from the analysis

5. Properties with multiple transactions on the same day were reduced to a single sale occurrence with consideration given to transaction involving a "Warranty Deed" as the instrument type

This resulted in a sample size of 12,498 sales to be used in the statistical analysis.

## Step 5 - Matching of Appraisal and Market Data

The matching of appraisal and market data was handled through a comparison of the data at the time of sale to the data as of the effective valuation date by the Assessor's Office.

This review was not part of the scope for this project. Data was provided by the Assessor's Office with any data inconsistencies addressed and reviewed prior to the data exchange for this project by the Assessor's Office.

## Step 6 - Statistical Analysis

The statistical analysis in this ratio study is broken down into two sections. First, a statistical analysis considering Michigan law and the jurisdictions adherence to it. Secondly, a statistical analysis with consideration towards IAAO and mass appraisal industry standards. Key findings are given on an on-going basis along with the results but are also listed again at the end of the section.

### STATISTICAL ANALYSIS CONSIDERING MICHIGAN STATE LAW

#### Broader City Summary

Sales ratio studies are assessment-to-sales ratios calculated by dividing the assessed value of real estate as determined by the Assessor's Office by the valid, open-market sales price of the residential real property. A perfect ratio would typically be 1.00, or 100%. However, the Constitution for the State of Michigan; Section 3 of Article 9 states that all property shall be assessed at 50% of true cash value. Meaning the desired assessment level for the purposes of this analysis is 0.50, or 50.0%.

The State of Michigan's laws emphasize the assessed values shall on average not exceed 50.0. Due to these jurisdictional conditions the mean, or average ratio was considered. Typically, IAAO standards and industry best practices do not place high reliance on the mean ratio as the mean is much more susceptible to being influenced by the presence of outliers, even when outliers are identified and removed from the analysis.

*Table 1* shows the results of the ratio study for the City of Detroit. This study compared the 2024 assessed value set by the Office of the Assessor to arm's length transactions of single-family homes, town houses, and duplexes that occurred between April 1, 2021, and March 31, 2023. All sales had a market condition adjustment applied as described previously in this report prior to the calculation of the assessment-to-sales ratio.

For metrics in which all 12,498 sales in the sample were used, this will be noted by (All). Outliers were removed, leaving 12,002 sales to be used in calculating the Mean Ratio, Coefficient of Dispersion (COD), Coefficient of Variation (COV), Weighted Mean, and Price-Related Differential (PRD) as these measures can be susceptible to outlier influence.

**TABLE 1. Overall City of Detroit Sales Ratio Analysis**

City of Detroit – Full Results			
Number of Sales	12,498	Mean Ratio (Outliers Removed)	50.1%
Outliers Trimmed	496	Lower Confidence Interval - 95%	49.7%
Number of Sales (Outliers Removed)	12,002	Upper Confidence Interval - 95%	50.5%
Monthly Market Condition Adjustment	0.708%	Median Ratio (All Sales)	45.7%
Annual Market Condition Adjustment	8.500%	Lower Confidence Interval - 95%	45.1%
		Upper Confidence Interval - 95%	46.1%
Minimum Sale Price (All)	\$1,000	Coefficient of Dispersion (COD)	36.6%
Maximum Sale Price (All)	\$4,900,000	Price-Related Differential (PRD)	1.14
Average Sale Price (All)	\$77,409	Weighted Mean Ratio	44.1
Median Sale Price (All)	\$60,000	Standard Deviation	20.9
		Coefficient of Variation (COV)	41.7%
Minimum Ratio (Outliers Removed)	3.3%		
Maximum Ratio (Outliers Removed)	111.1%		

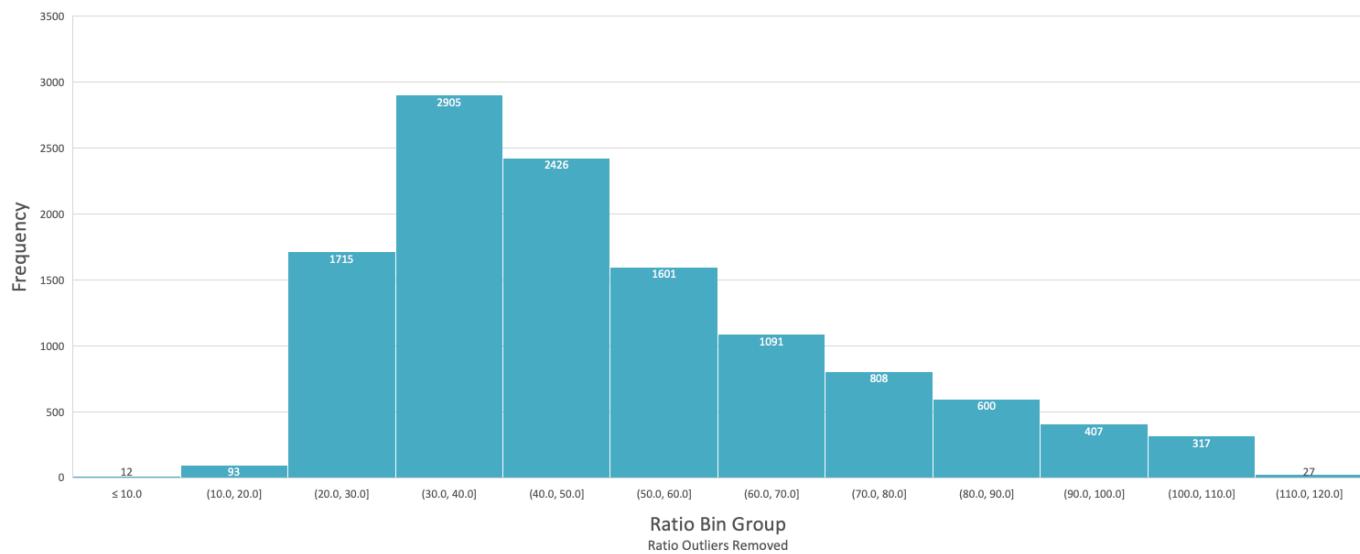
The mean ratio for the City of Detroit indicates that the staff in the Assessor's Office met their State of Michigan Constitutional mandated requirement to assess values at 50% of the true cash value.

However, in reviewing the additional statistics included in *Table 1* as compared to the expectations listed in IAAO's *Standard on Ratio Studies* the city is not meeting industry performance standards. The COD of 36.6% and the PRD of 1.14 both indicate significant spread in valuation estimates versus sale price and potentially regressive estimates of value on lower value properties. Further analysis is necessary to better understand the valuation performance at the ECF level.

The standard deviation and coefficient of variation results were both calculated, however, the data in this analysis is not normally distributed (shown in *Chart 1*). As such, both performance metrics were not considered reliable statistics and were not utilized for any further analysis within this report.

*Chart 1* shows the distribution of assessment to sales ratio by ratio range. This graph can indicate whether a normal distribution occurs within the sample. For many of the statistical measures reviewed, a normal distribution is assumed. A normal distribution would be indicated by a bell shape curve in the histogram.

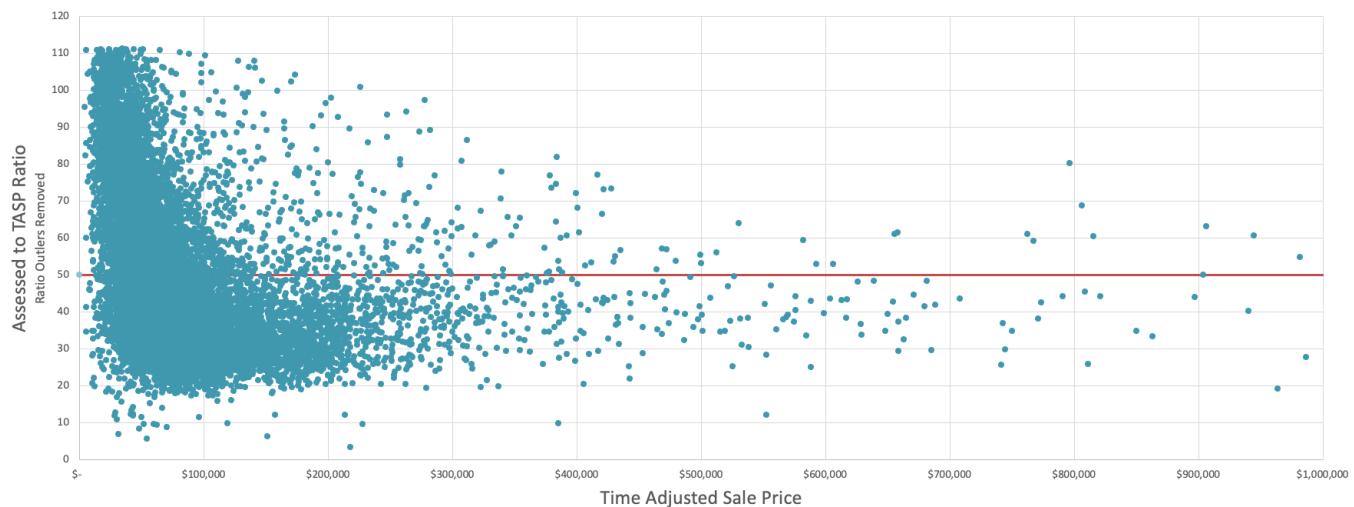
## CHART 1. Sales Ratio Frequencies by Distribution of Ratio Groups



Ideally, the most frequency would occur around the 50.0% ratio, as this is the target ratio. We would then see the “bins” filled relatively equally as the frequency moved left and right of 50.0%. Since the histogram is not evenly disturbed as the groupings move away from the 50.0% target, this is an indication that somewhere within the data sample there are some distribution issues. Furthermore, since the distribution is skewed to the right of the target, this suggests that there are a fair number of high ratios somewhere in the data set, indicating assessed values are higher than the 50.0 target.

Chart 2 depicts the sale ratios by time-adjusted sale price. In an ideal environment, the sales ratio data points would be equally distributed around the 50% target line for every price range within the market area, this would suggest good vertical uniformity amongst the various value groups within the jurisdiction.

## CHART 2. Ratio by Time Adjusted Sale Price



In Chart 2, the City's sales ratio data points fall much closer in proximity to the target line for higher sale price properties. However, there is significant deviation from the target line in the sales ratio data points for the low sale price properties. This suggests that there are some regressivity concerns that need to be further investigated.

It is worth noting that the margin of error when comparing assessed values to sales price is much smaller on lower priced sales compared to higher priced sales. For example, an assessed value missed by \$2,000 on a \$20,000 sale has a much greater impact on the sales ratio compared to an assessed value missed by \$2,000 on a \$200,000 sale. This concept could be a contributing factor in the amount of dispersion depicted in Chart 2 on the lower price range. In practice, lower priced properties less room for value estimate error for an assessor, which can result in higher ratios when sale prices are missed. Moreover, when the target ratio is 50.0, as opposed to 100.0, this also shrinks the amount of acceptable error.

Table 2 gives a summary of the sale count that was considered for this analysis along with sale price range, average and median sale price. This was done for the entire city and all ECF Neighborhood Series Groups. Neighborhoods are areas that experience similar physical, economic, governmental, and social factors. The Assessor's Office has broken out the city into ECF Neighborhood Groups as part of their appraisal assignment.

**TABLE 2. City of Detroit and ECF Neighborhood Series Sales Summary**

ECF Group	Sale Count	Minimum Sale Price	Maximum Sale Price	Average Sale Price	Median Sale Price
City of Detroit - TOTAL	12,498	\$1,000	\$4,900,000	\$77,409	\$60,000
ECF NBHD - 1R100 Series	2,433	\$4,000	\$845,000	\$83,132	\$69,000
ECF NBHD - 2R200 Series	2,476	\$8,000	\$4,900,000	\$107,383	\$80,000
ECF NBHD - 3R300 Series	1,664	\$1,800	\$175,000	\$47,427	\$45,000
ECF NBHD - 4R400 Series	2,047	\$4,000	\$325,000	\$67,659	\$57,000
ECF NBHD - 5R500 Series	678	\$3,500	\$1,355,000	\$130,137	\$65,000
ECF NBHD - 6R600 Series	795	\$1,000	\$605,000	\$58,140	\$40,500
ECF NBHD - 7R700 Series	2,360	\$2,500	\$316,000	\$55,570	\$50,000
ECF NBHD - CND Series	45	\$88,000	\$1,750,000	\$362,150	\$297,525

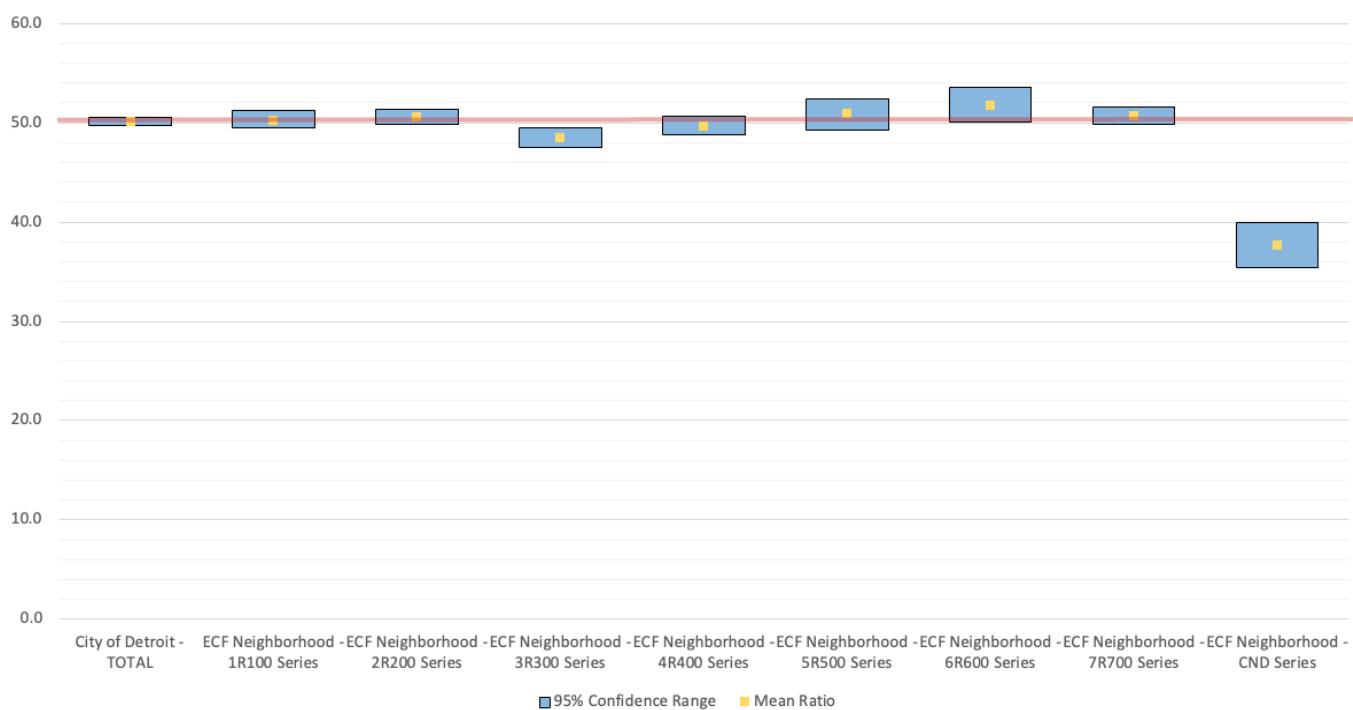
Table 3 shows the statistical results from a broader range considering the mean, or average, sales ratio results. Outliers were removed for this part of the analysis as the mean can be heavily influenced by their presence. Confidence intervals were also considered when reviewing assessment level.

**TABLE 3. City of Detroit and ECF Neighborhood Series Mean Statistical Results**

ECF Group	Sale Count	Outliers Removed	Sale Count (Outliers Removed)	Mean Ratio	95% Lower Confidence	95% Upper Confidence
City of Detroit - TOTAL	12,498	496	12,002	50.1	49.7	50.5
ECF NBHD - 1R100 Series	2,433	93	2,340	50.3	49.5	51.2
ECF NBHD - 2R200 Series	2,476	93	2,383	50.6	49.8	51.4
ECF NBHD - 3R300 Series	1,664	73	1,591	48.5	47.5	49.5
ECF NBHD - 4R400 Series	2,047	76	1,971	49.7	48.8	50.6
ECF NBHD - 5R500 Series	678	28	650	50.9	49.3	52.4
ECF NBHD - 6R600 Series	795	28	767	51.8	50.1	53.6
ECF NBHD - 7R700 Series	2,360	91	2,369	50.7	49.8	51.6
ECF NBHD - CND Series	45	6	39	37.7	35.4	40.0

Chart 3 shows where the mean ratio falls in relation to the 50.0 target along with the corresponding confidence interval first for the City of Detroit followed by the ECF Neighborhood Series Groups. The “YELLOW” point indicates the mean ratio, the “BLUE” bar depicts the confidence range, and the “RED” line represents the target ratio.

### CHART 3. Mean Summary with Confidence Interval Range



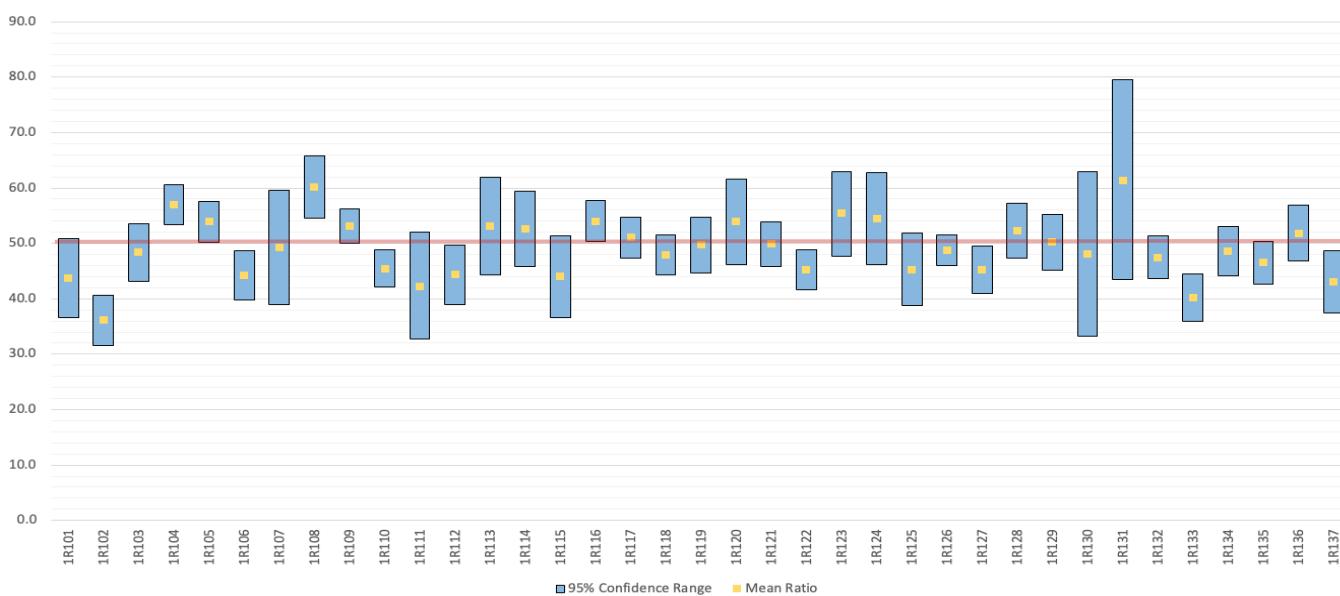
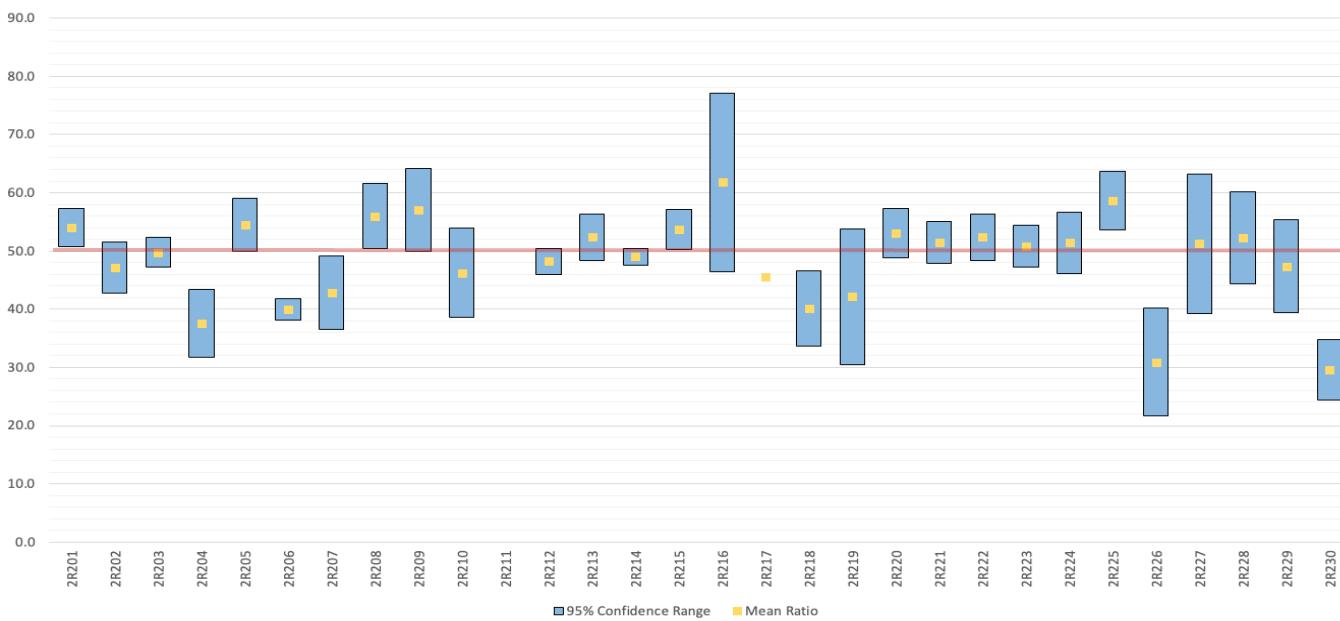
As can be seen in *Table 3* and *Chart 3*, the average sales-to-assessment ratio for the City of Detroit is 50.1. This complies with Michigan Law.

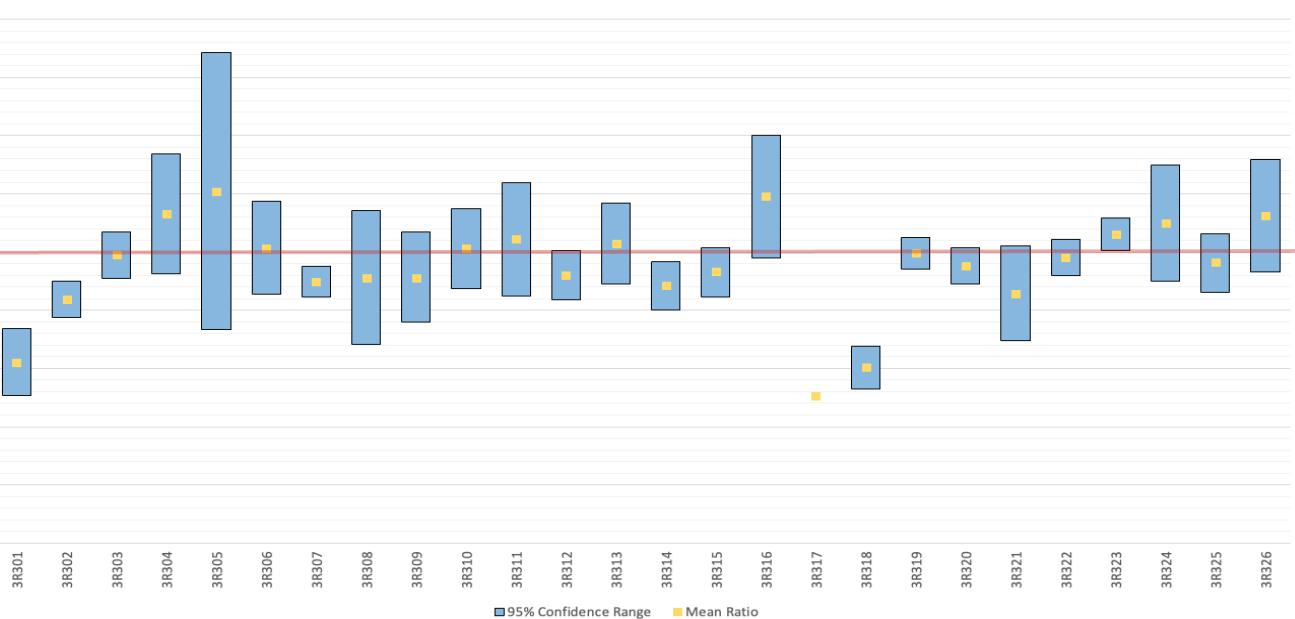
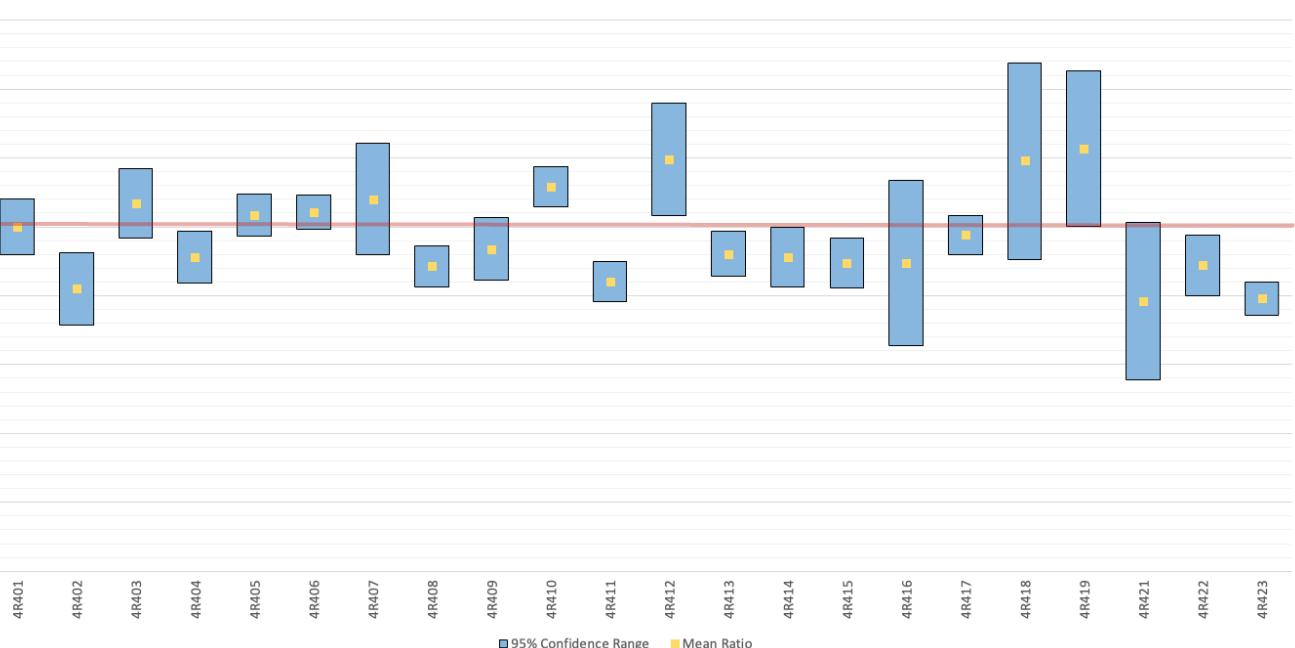
Furthermore, the indicated confidence interval ranges between 49.7 and 50.5. This means that with 95% confidence the true mean ratio for the population is between 49.7 and 50.5. This confidence range being on both sides of the 50.0 target ratio is another indication that the assessor's office is compliant with Michigan State law.

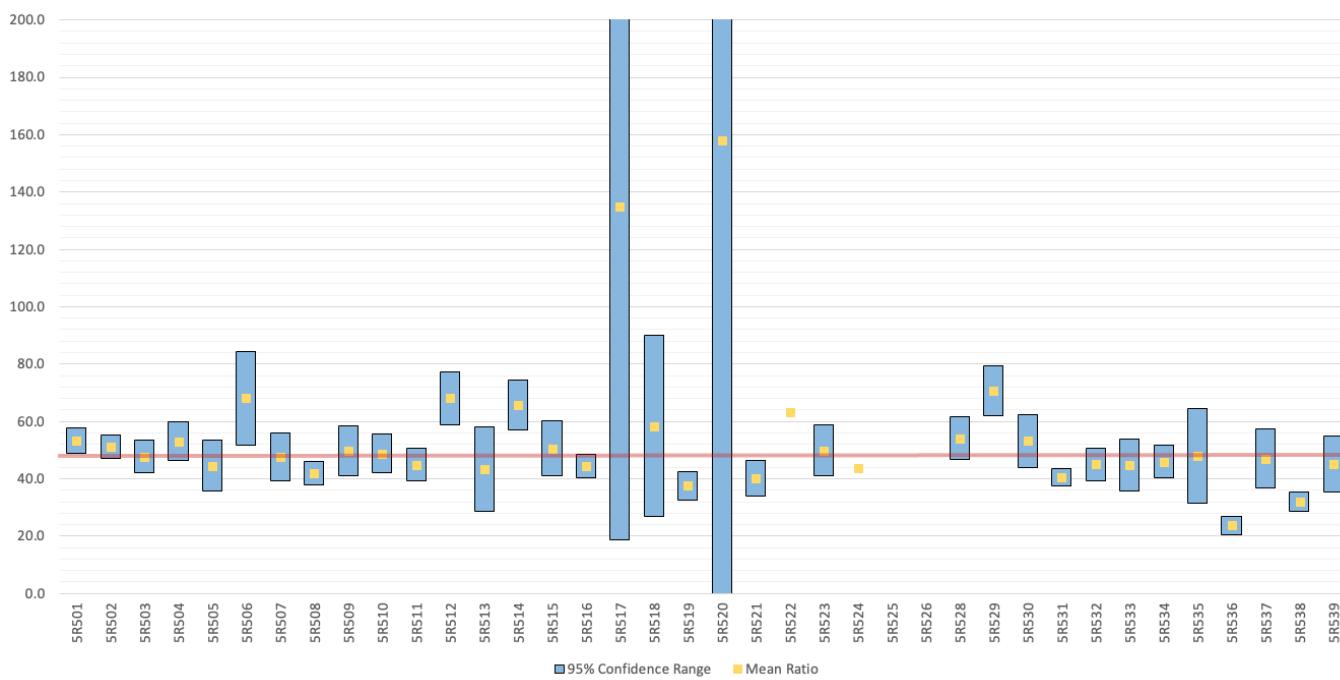
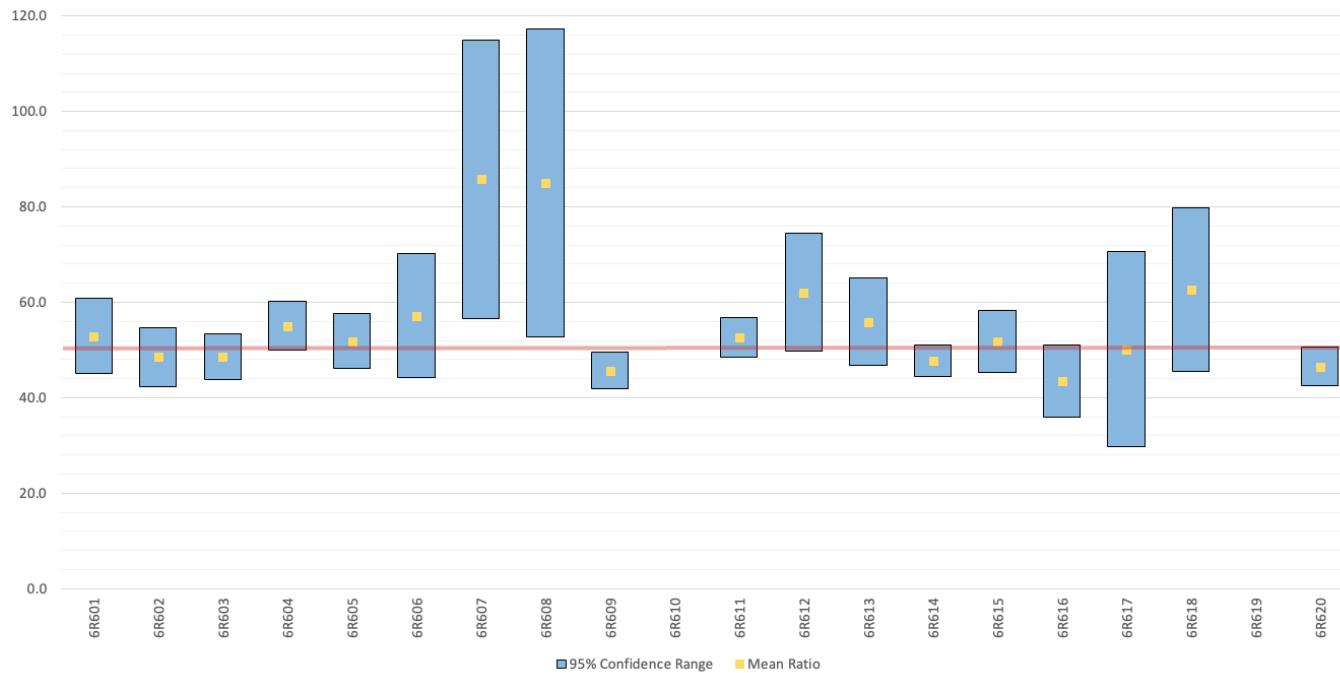
The indicated mean is +0.1 higher than the State's established target level of 50.0. With the confidence interval in mind, PCSIAAO finds that the City of Detroit has met its legal and statutory obligation to assess residential properties at the required 50.0 of True Cash Value.

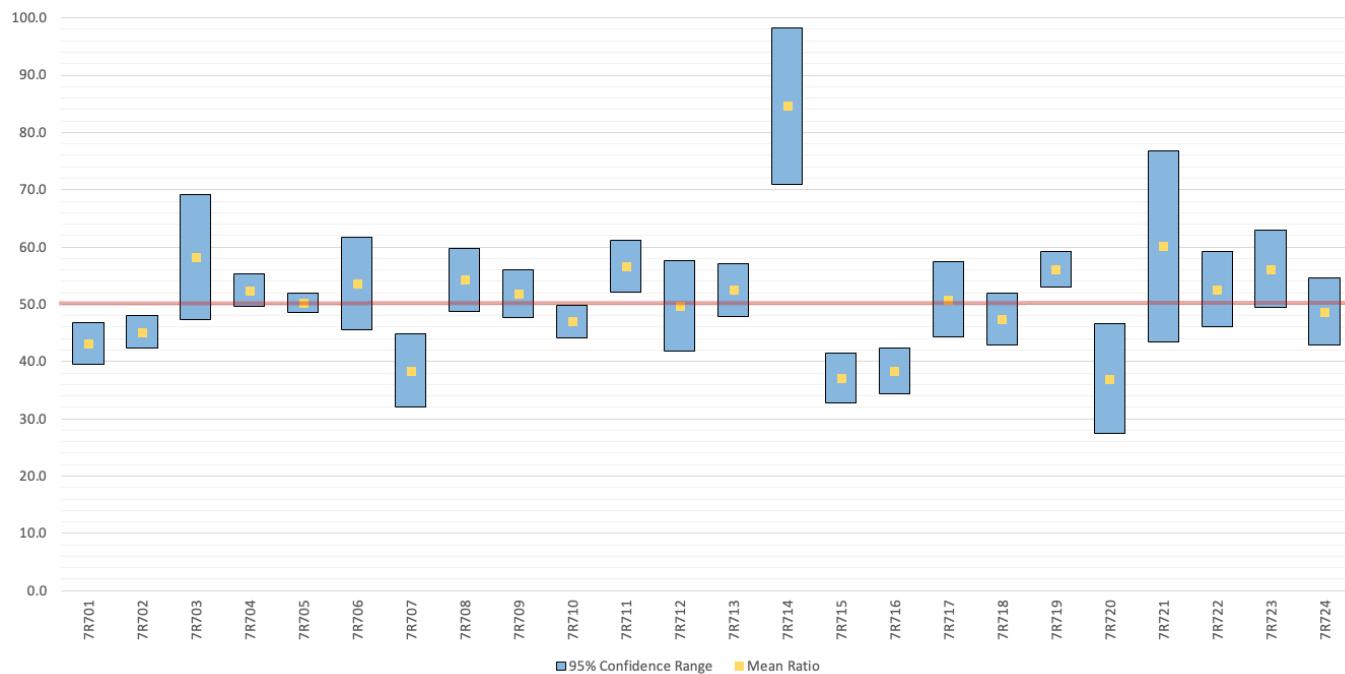
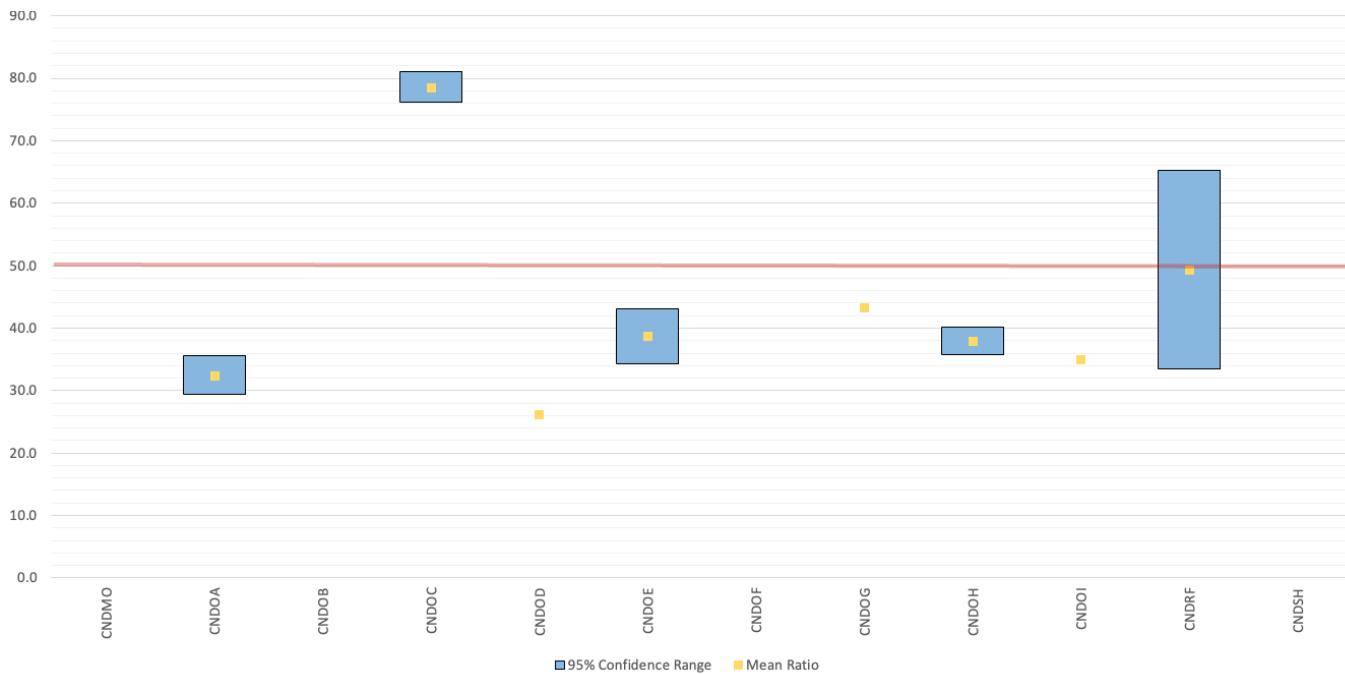
Similar conclusions can be made when breaking down the data further into ECF Neighborhood Series groups. Most of the groups indicate an average that is around the 50.0 target with confidence interval on both sides of 50.0. The exceptions to this are the 3R300 Series group, the 6R600 Series group, and the CND Series group, with the CND Series group indicating the lowest level of assessment that is at best 10 basis points from the target.

*Chart 4 through Chart 11* further stratify the data into individual ECF Neighborhood Groups. Again, the "YELLOW" point indicates the mean ratio, the "BLUE" bar depicts the confidence range, and the "RED" line represents the target ratio. Individual ECF statistical results can be found in the appendix.

**CHART 4. 1R100 Series - Mean with Confidence Interval Range****CHART 5. 2R200 Series - Mean with Confidence Interval Range**

**CHART 6. 3R300 Series - Mean with Confidence Interval Range****CHART 7. 4R400 Series - Mean with Confidence Interval Range**

**CHART 8. 5R500 Series - Mean with Confidence Interval Range****CHART 9. 6R600 Series - Mean with Confidence Interval Range**

**CHART 10. 7R700 Series - Mean with Confidence Interval Range****CHART 11. CND Series - Mean with Confidence Interval Range**

There were some ECF segments that were not represented as there were no sales within the given time frame. These include: 2R211, 5R525, 5R526, 6R610, 6R619, CNDMO, CNDOB, CNDOF, and CNDSH.

Some of the groups do not contain a representative sample and their results should be considered inconclusive due to being under represented in the study. These strata contained only one to five sales. These segments include: 2R206, R2R217, 3R302, 3R317, 5R505, 5R516, 5R517, 5R518, 5R519, 5R520, 5R522, 5R524, 5R537, 6R609, 6R614, 6R617, 7R714, CNDOC, CNDOD, CNDOG, CNDOI, and CNDRF.

For future internal analysis and sales ratio study purposes, the jurisdiction should review and consider redrawing ECF boundaries and/or consolidating similar properties into larger market areas if a lack of sales within certain ECFs is a reoccurring problem. Alternatively, staff may consider grouping existing similar ECFs together for the purposes of a similar statistical analysis.

It is expected to see more variation with additional stratification taking place, however, even when stratified into individual ECF Neighborhood Groups many of the individual segments indicate mean ratios and confidence ranges encompassing the 50.0 target ratio.

Nevertheless, there are some where the tails of the confidence range do not overlap the 50.0 target. These indicate results that may be either above or below the target. Assuming an adequate sample was available for the analysis, these are the market segments that should be further investigated by staff.

## STATISTICAL ANALYSIS CONSIDERING IAAO AND INDUSTRY STANDARDS

IAAO's *Standard on Ratio Studies* outlines industry standards when it comes to conducting a ratio analysis. The standard states that both measures of assessment level and variability should be considered. Assessment level measuring the "accuracy" of the appraisal assignment and variability measuring its "uniformity."

The standard recommends the use of median in measuring appraisal level saying on page 13:

*"The median always divides the data into two equal parts and is less affected by extreme ratios than the other measures of central tendency. Because of these properties, the median is the generally preferred measure of central tendency for evaluating overall appraisal level."*

When reviewing uniformity, the ratio standard recommends using the Coefficient of Dispersion (COD) to measure the dispersion of the data about the median ratio. The standard further states on page 13: *"The COD has the desirable feature that its interpretation does not depend on the assumption that the ratios are normally distributed."* The COD is calculated by referencing the median sales ratio, it should not be calculated with mean ratio.

Vertical equity should also be considered when conducting a ratio analysis. This is done with Price Related Differential (PRD) calculation. Vertical inequities occur when systematic differences exist in the relative valuation of low- and high-value properties. Per IAAO's *Standard on Ratio Studies* on page 14:

*"When low-value properties are appraised at greater percentages of market value than high-value properties, assessment regressivity is indicated. ... An index statistic for measuring vertical equity is the PRD, which is calculated by dividing the mean ratio by the weighted mean ratio. This statistic should be close to 1.00. Measures considerably above 1.00 tend to indicate assessment regressivity; measures below 1.00 suggest assessment progressivity."*

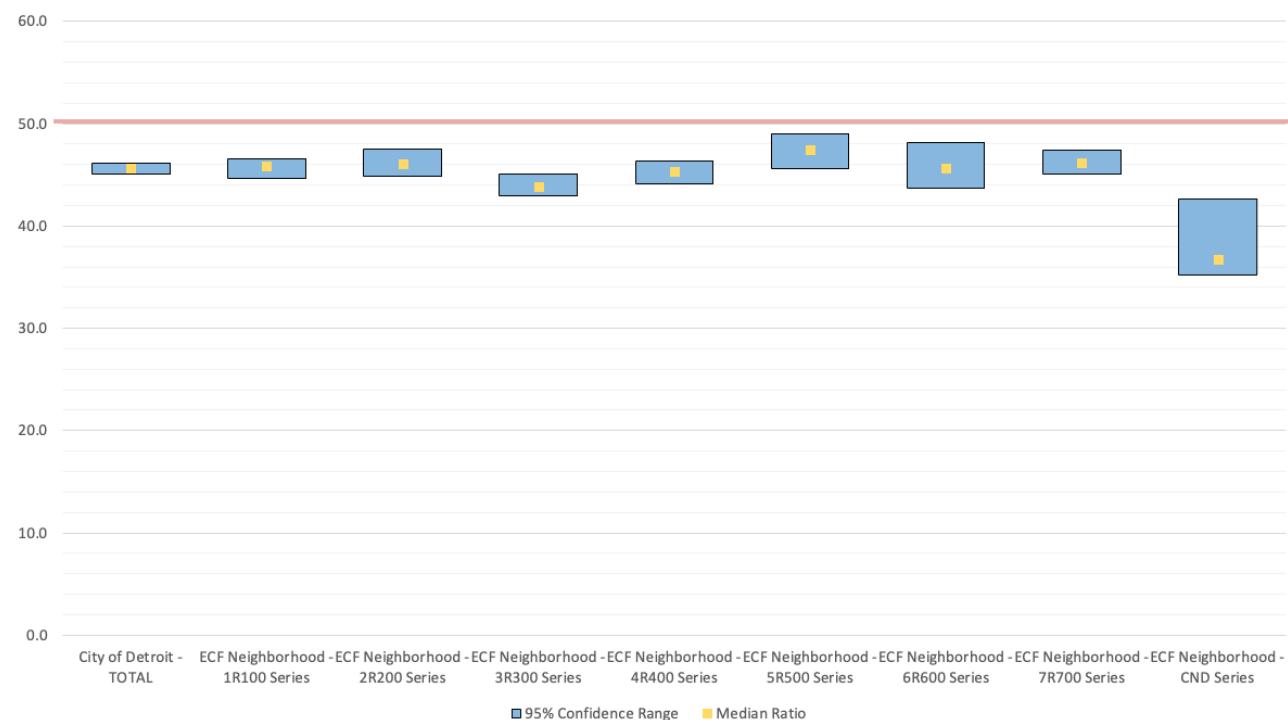
For this report, all three of these calculations (Median, COD, & PRD) were conducted and reviewed. Although, laws specific to the jurisdiction do not require these statistics to be considered; these calculations can give further insight into the overall performance of the assessment process. Local laws always take precedence over industry standards and norms when it comes to measuring assessment performance.

*Table 4* gives a summary of industry standard statistics for the City of Detroit, as well as the broader ECF Neighborhood Groups. The table displays the median sale ratio, along with confidence intervals of the assessment level, COD, and PRD.

ECF Group	Median Ratio	95% Lower Confidence	95% Upper Confidence	COD	PRD
City of Detroit - TOTAL	45.7	45.1	46.1	36.6%	1.14
ECF NBHD - 1R100 Series	45.9	44.7	46.6	35.7%	1.14
ECF NBHD - 2R200 Series	46.1	44.9	47.5	34.8%	1.12
ECF NBHD - 3R300 Series	43.9	43.0	45.1	37.0%	1.15
ECF NBHD - 4R400 Series	45.3	44.1	46.4	37.3%	1.15
ECF NBHD - 5R500 Series	47.5	45.6	49.0	33.8%	1.11
ECF NBHD - 6R600 Series	45.7	43.7	48.2	43.3%	1.21
ECF NBHD - 7R700 Series	46.2	45.1	47.4	37.5%	1.16
ECF NBHD - CND Series	36.7	35.2	42.6	15.3%	1.05

*Chart 12* demonstrates the median assessment ratio along with the confidence interval range and how they compare to the 50.0 target. Displayed first are the results for the City of Detroit followed by the ECF Neighborhood Series Groups. The “YELLOW” point indicates the median ratio, the “BLUE” bar depicts the confidence range, and the “RED” line represents the target ratio.

**CHART 12. Median Summary with Confidence Interval Range**



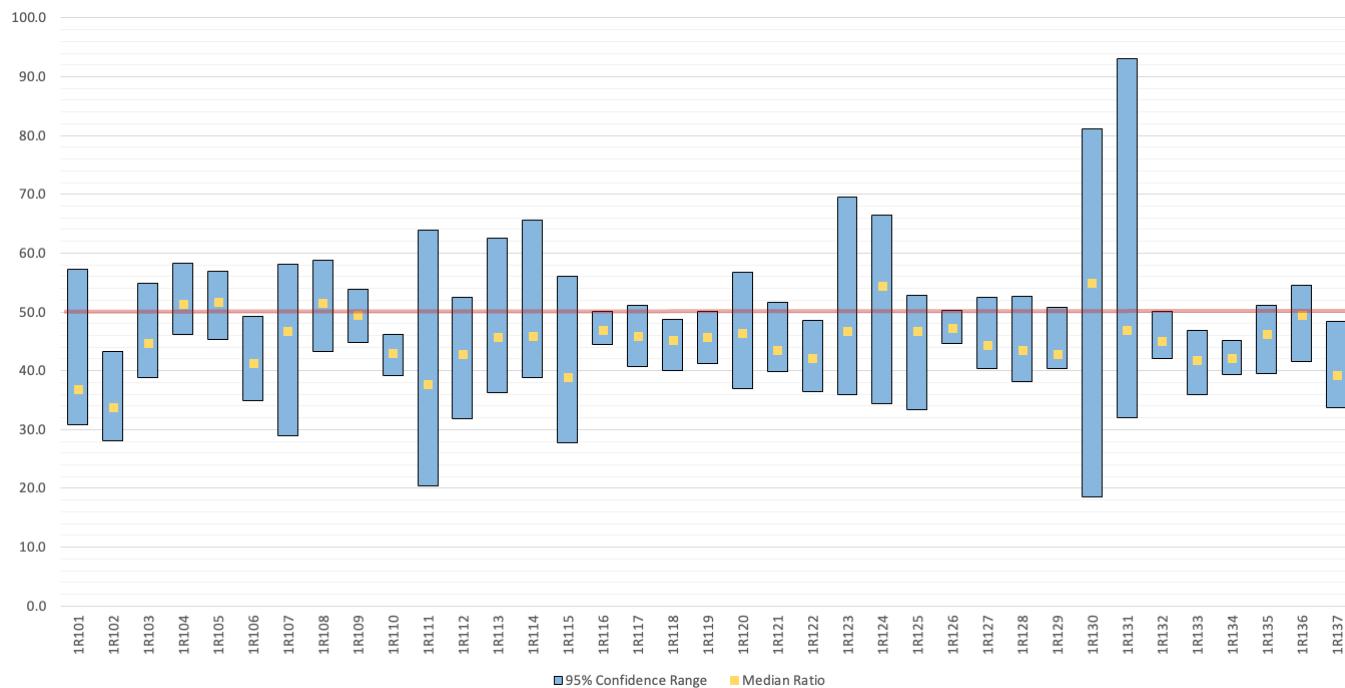
As is evident in *Table 4* and *Chart 12*, the median sales-to-assessment ratio for the City of Detroit is 45.7. In fact, the median ratio for all of the stratified groups is below 50.0. Suggesting values are under assessed. Furthermore, the indicated confidence interval for the city overall ranges between 45.1 and 46.1. This means that with 95% confidence the true median ratio is between 45.1 and 46.1. Again, further suggesting that with 95% confidence the true median for the population falls below the 50.0.

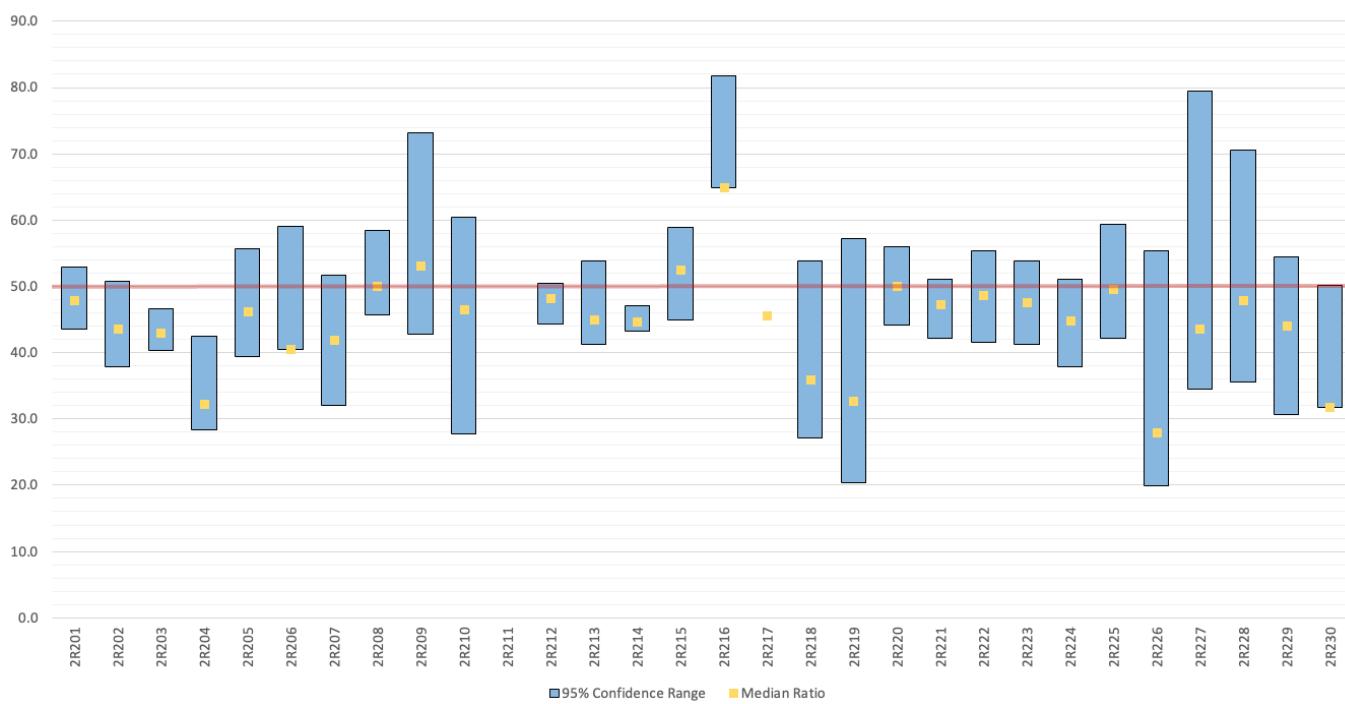
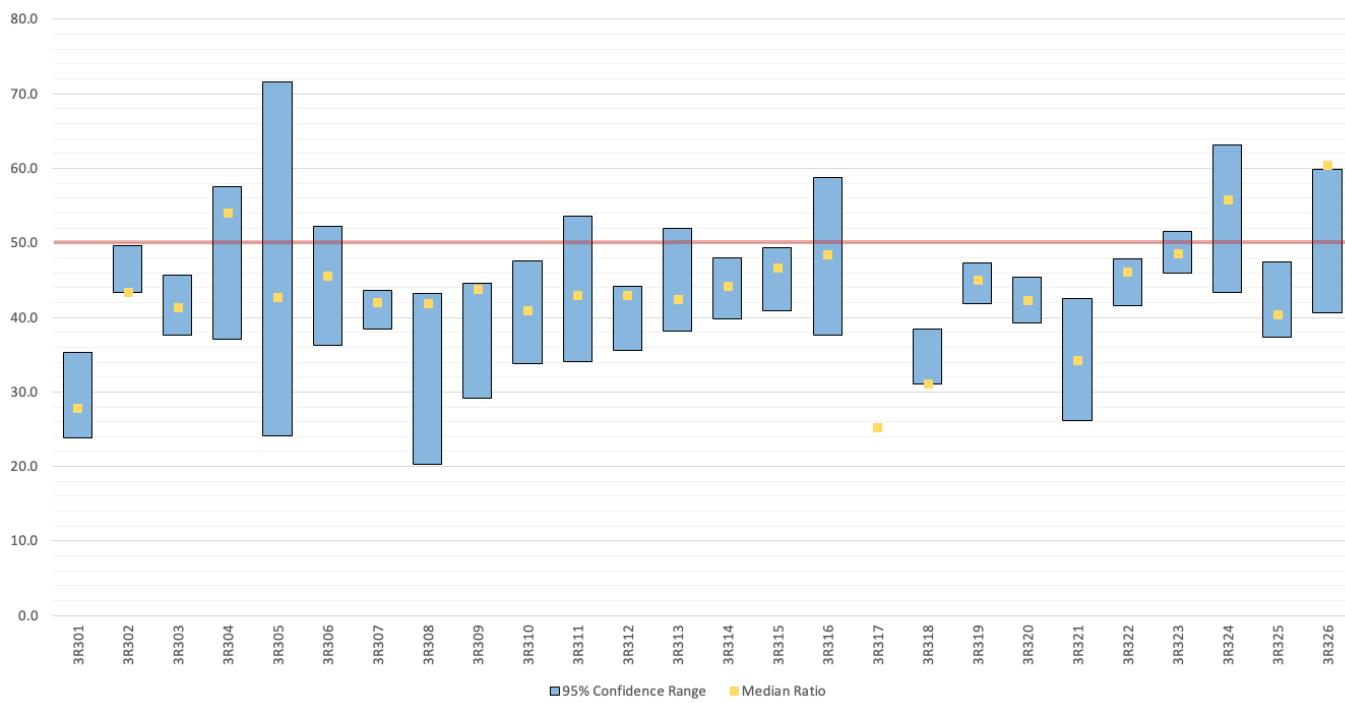
IAAO standards allow for a median level of assessment to be +/-10% of the target level, which would be 45.0 to 55.0. The median and the confidence intervals for the City of Detroit all fall within this allowable standard range.

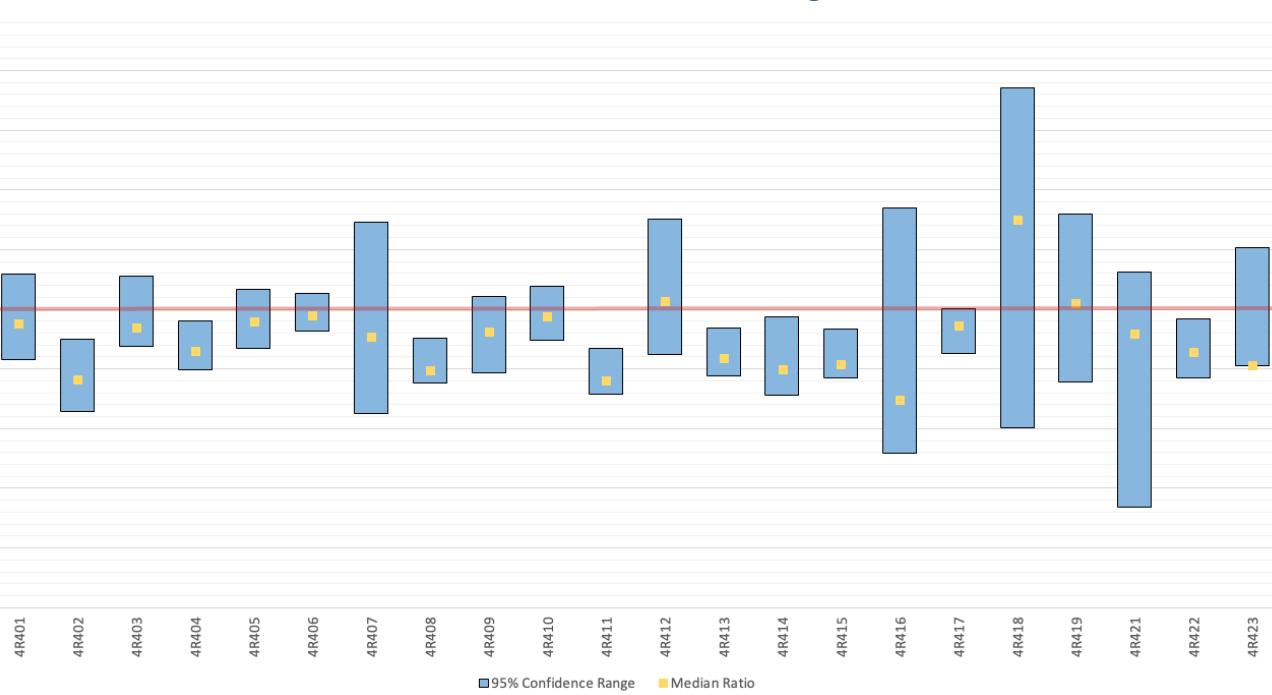
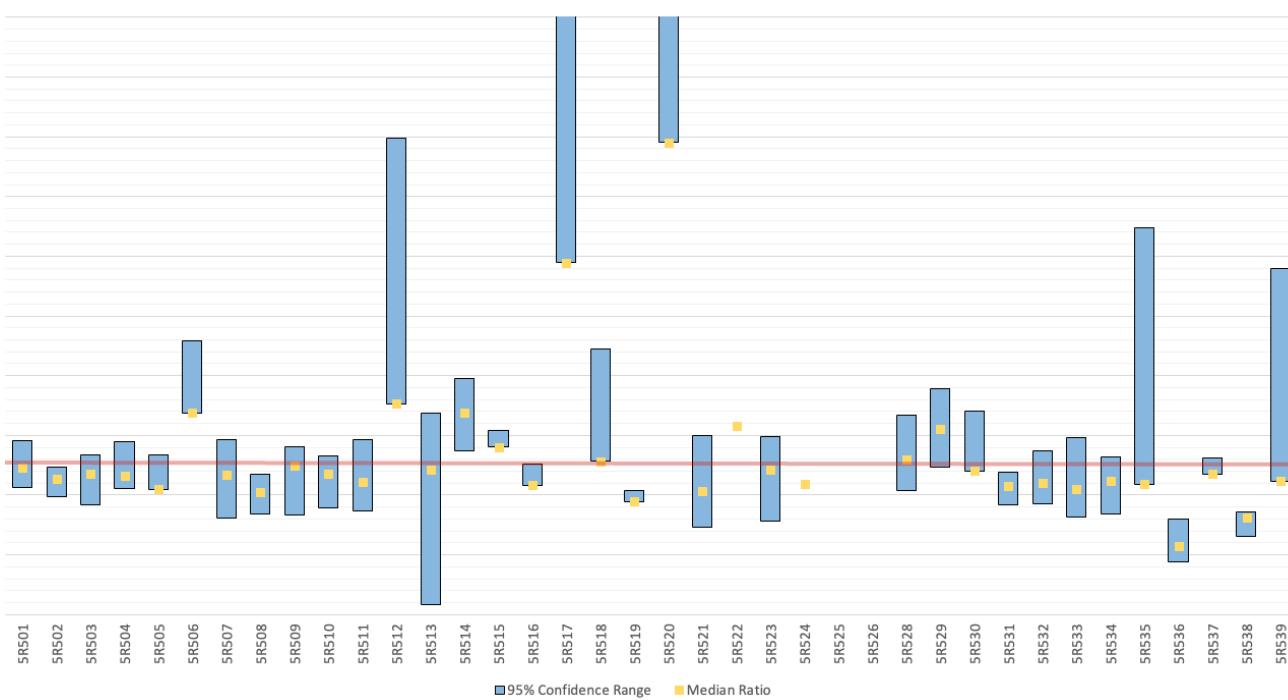
Similar conclusions can be made when breaking down the data further into ECF Neighborhood Series groups. All groups indicate a median ratio that is below 50.0 with confidence intervals also below 50.0.

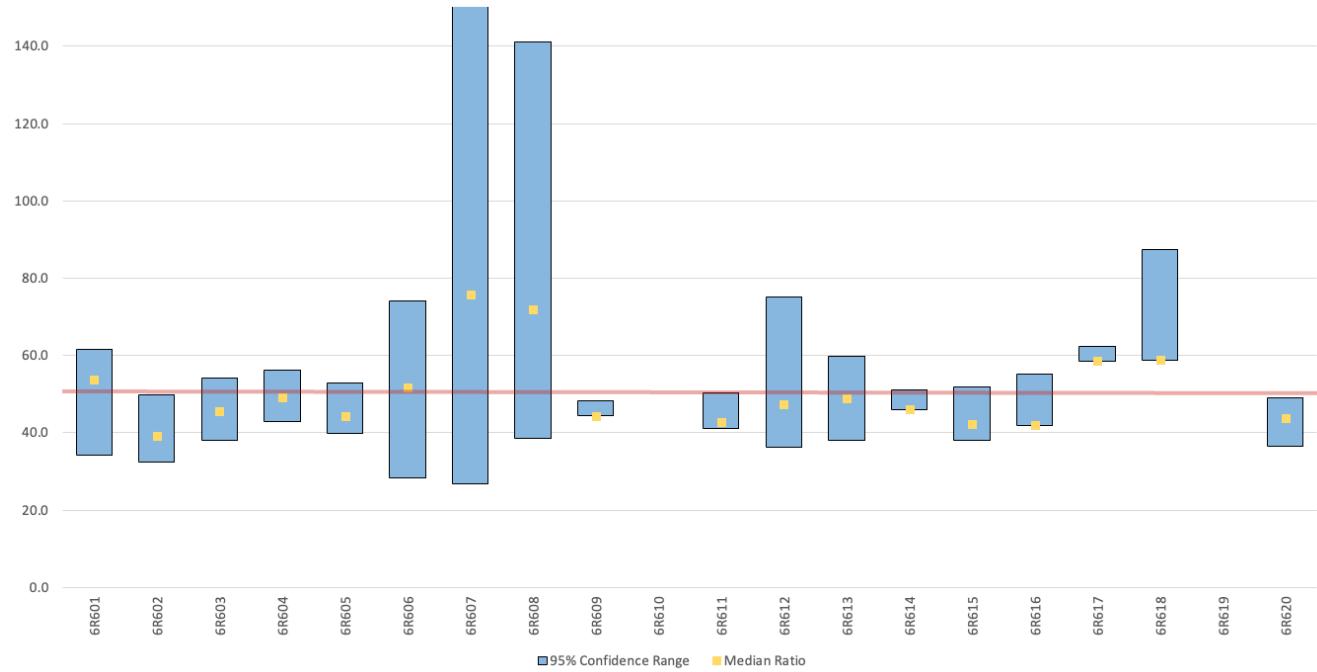
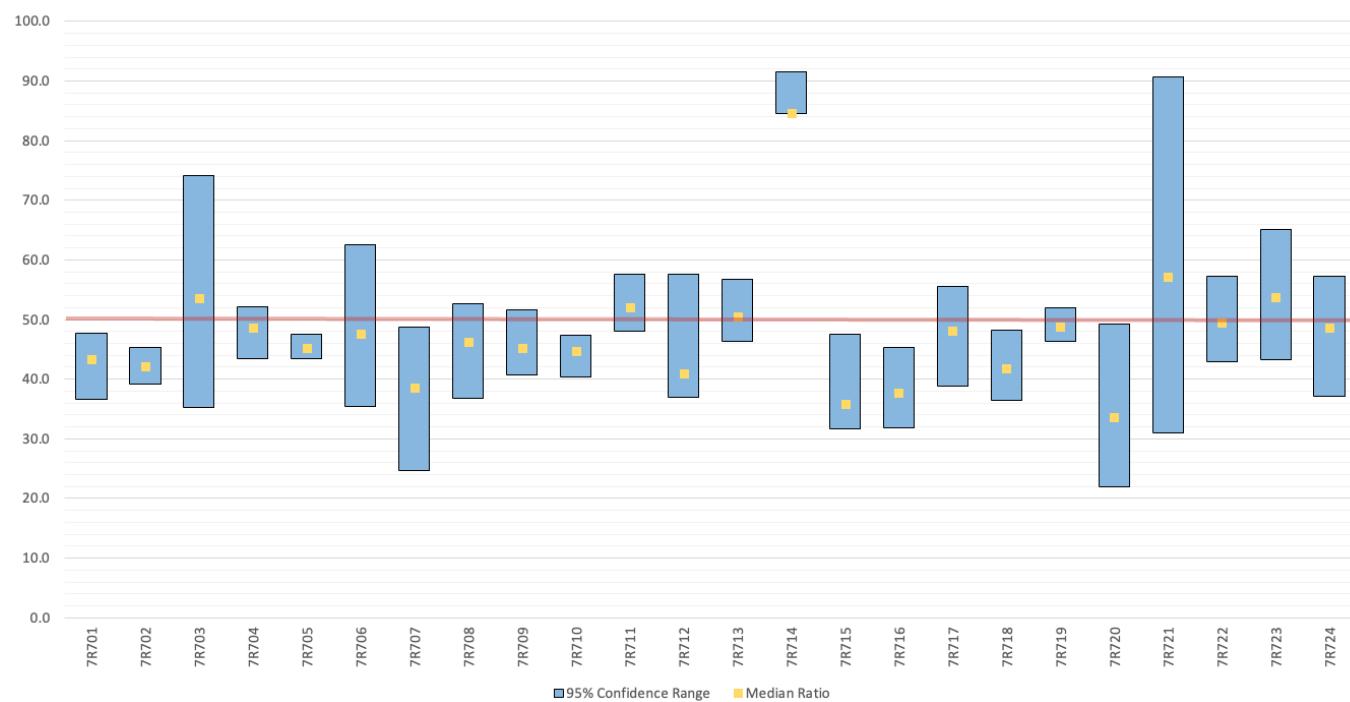
*Chart 13* through *Chart 20* further stratify the data into individual ECF Neighborhood Groups. Again, the “YELLOW” point indicates the mean ratio, the “BLUE” bar depicts the confidence range, and the “RED” line represents the target ratio. Individual statistical results for each ECF Neighborhood can be found in the appendix.

### CHART 13. 1R100 Series - Median with Confidence Interval Range



**CHART 14. 2R200 Series - Median with Confidence Interval Range****CHART 15. 3R300 Series - Median with Confidence Interval Range**

**CHART 16. 4R400 Series - Median with Confidence Interval Range****CHART 17. 5R500 Series - Median with Confidence Interval Range**

**CHART 18. 6R600 Series - Median with Confidence Interval Range****CHART 19. 7R700 Series - Median with Confidence Interval Range**

## CHART 20. CND Series - Median with Confidence Interval Range



As stated earlier when reviewing the mean ratio, there were some segments that were not represented as there were no sales within the given time frame to consider. These include: 2R211, 5R525, 5R526, 6R610, 6R619, CNDMO, CNDOB, CNDOF, and CNDSH.

Furthermore, as stated earlier, some of the groups do not contain a representative sample and their results should be considered inconclusive due to being under represented in the study. These segments include: 2R206, R2R217, 3R302, 3R317, 5R505, 5R516, 5R517, 5R518, 5R519, 5R520, 5R522, 5R524, 5R537, 6R609, 6R614, 6R617, 7R714. CNDOC, CNDOD, CNDOG, CNDOI, and CNDRF.

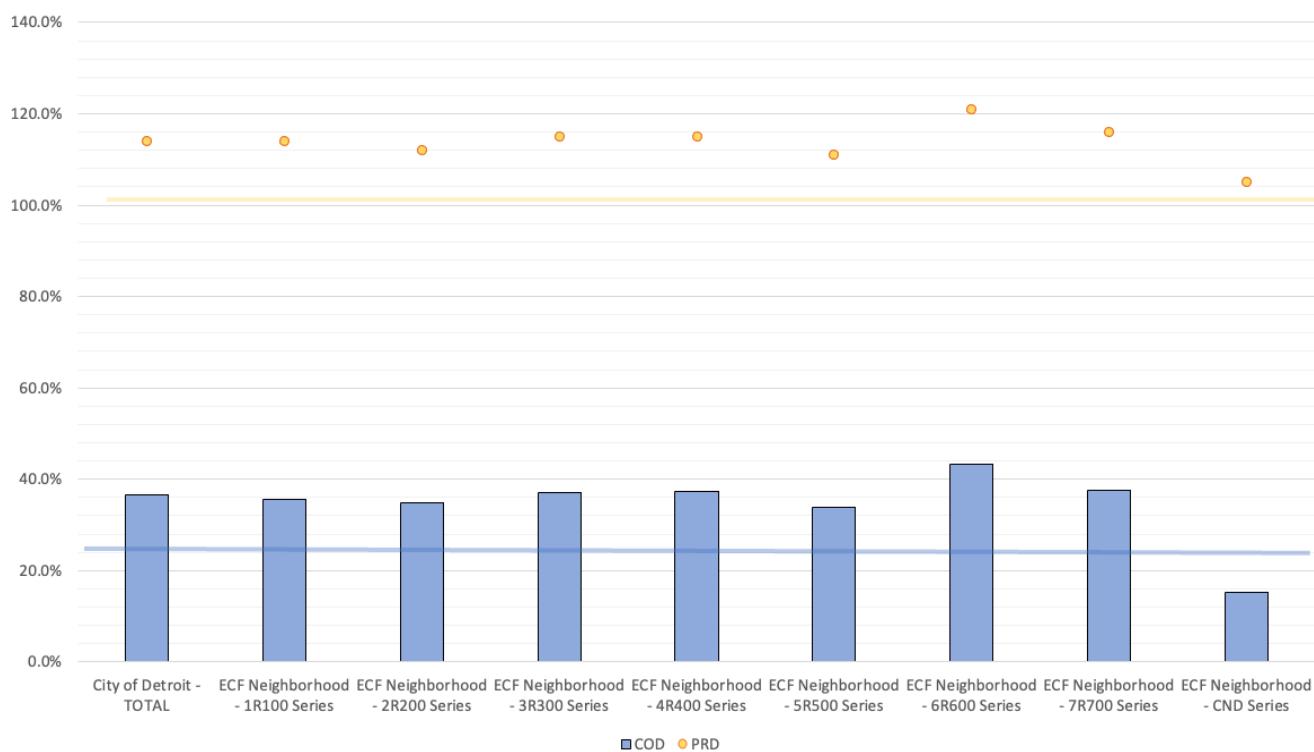
When conducting future internal analysis and sales ratio study purposes, the jurisdiction should review and consider redrawing ECF boundaries and/or consolidating similar properties into larger market areas if a lack of sales within certain ECFs is a reoccurring problem. Alternatively, staff may consider grouping existing similar ECFs together for the purpose of a similar statistical analysis.

It is expected to see additional variation when more narrowly stratifying the data. When further stratifying the data into individual ECF Neighborhood Groups many of the individual segments indicate median ratios and confidence ranges encompassing the 50.0 ratio.

Yet there are some where the tails of the confidence range do not overlap 50.0. These indicate results that may be either above or below that level, in some cases significantly. Assuming an adequate sample was available for the analysis, these market segments should be further investigated by staff.

Chart 21 depicts the COD and PRD metrics for the City of Detroit and the broader ECF Neighborhood Series groups. The “BLUE” bars illustrate the COD while the “BLUE” line illustrates the IAAO standard as to where an acceptable COD should fall, which is between 5.0% and 20.0%. Meanwhile, the “YELLOW” dots represent the PRD, while the “YELLOW” line illustrates the desired result for the PRD. Per IAAO standards the ideal PRD is 1.00 with and acceptable range being between 0.98 and 1.03. Individual statistical results for each ECF Neighborhood can be found in the appendix.

## CHART 21. COD and PRD Series Summary

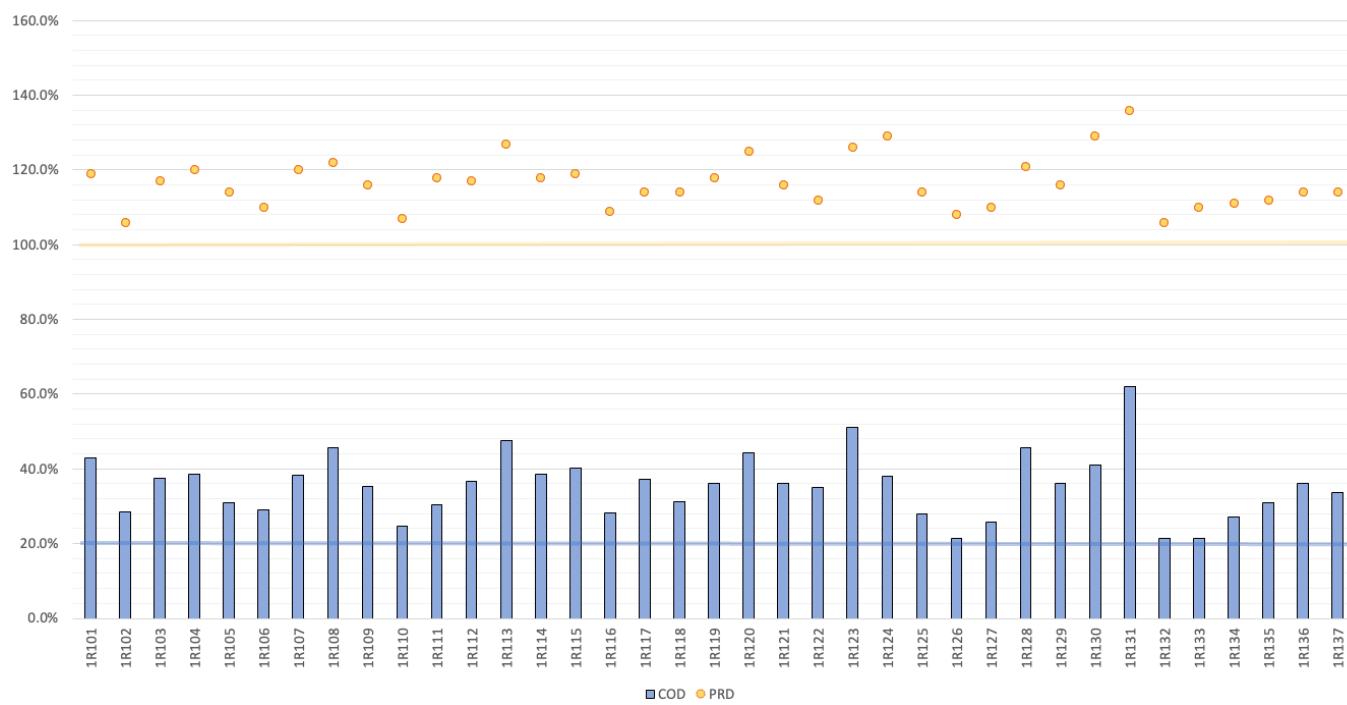
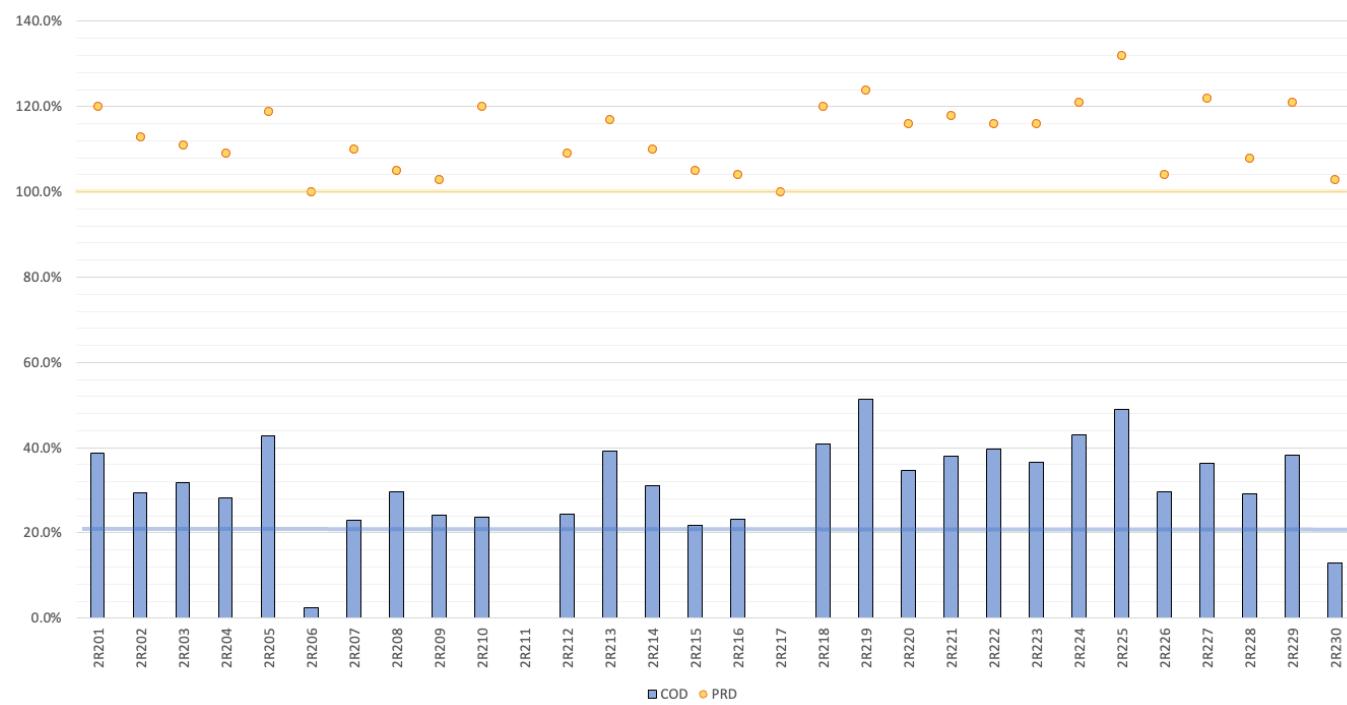


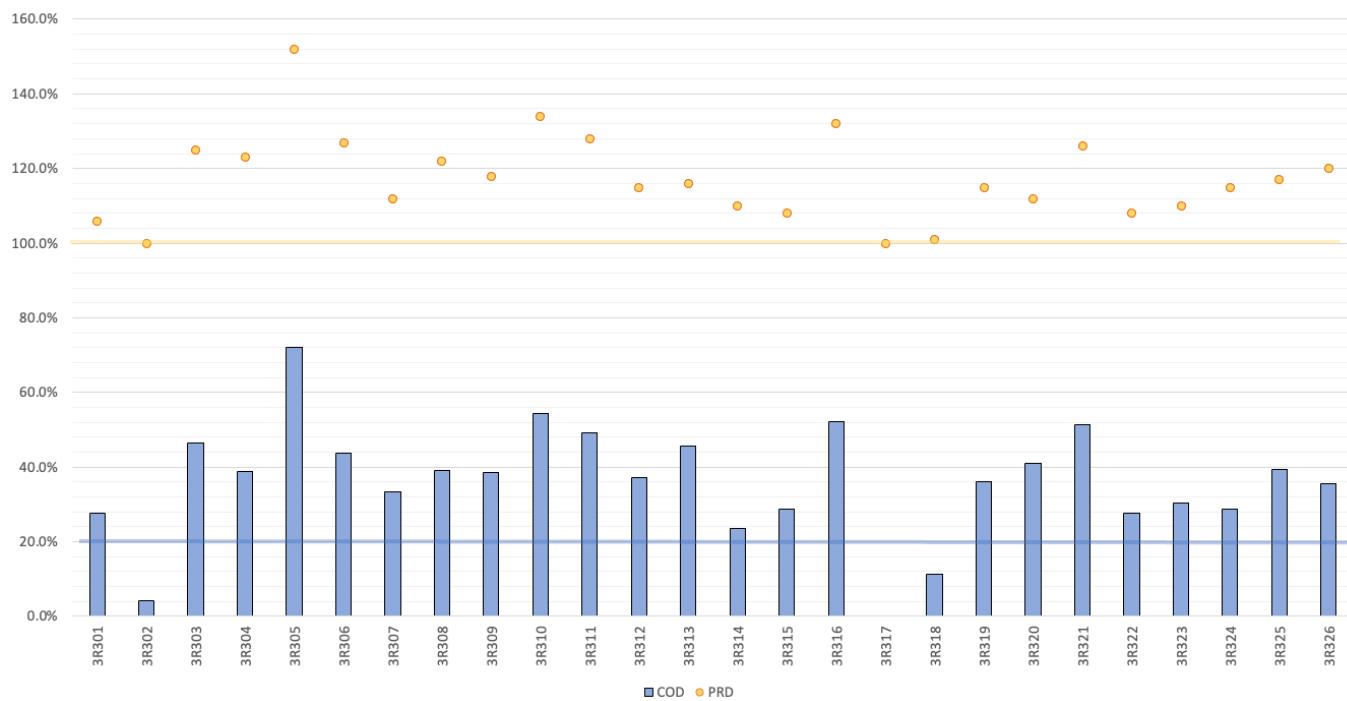
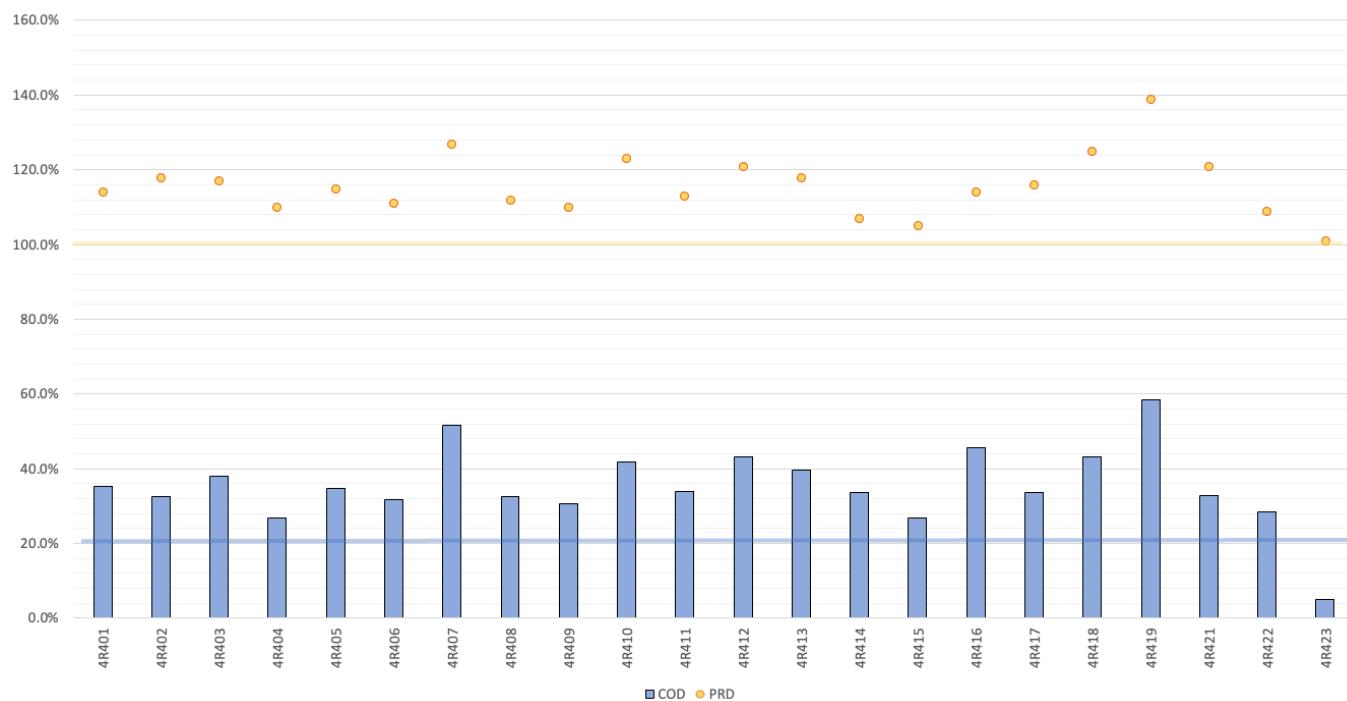
The information illustrated in *Chart 21*, along with *Table 4*, show the overall COD for the City of Detroit is 36.6%, indicating that there is a significant amount of dispersion among the data. Per IAAO's *Standard on Ratio Studies* the expected COD for the city should be at, or ideally, below 20.0%.

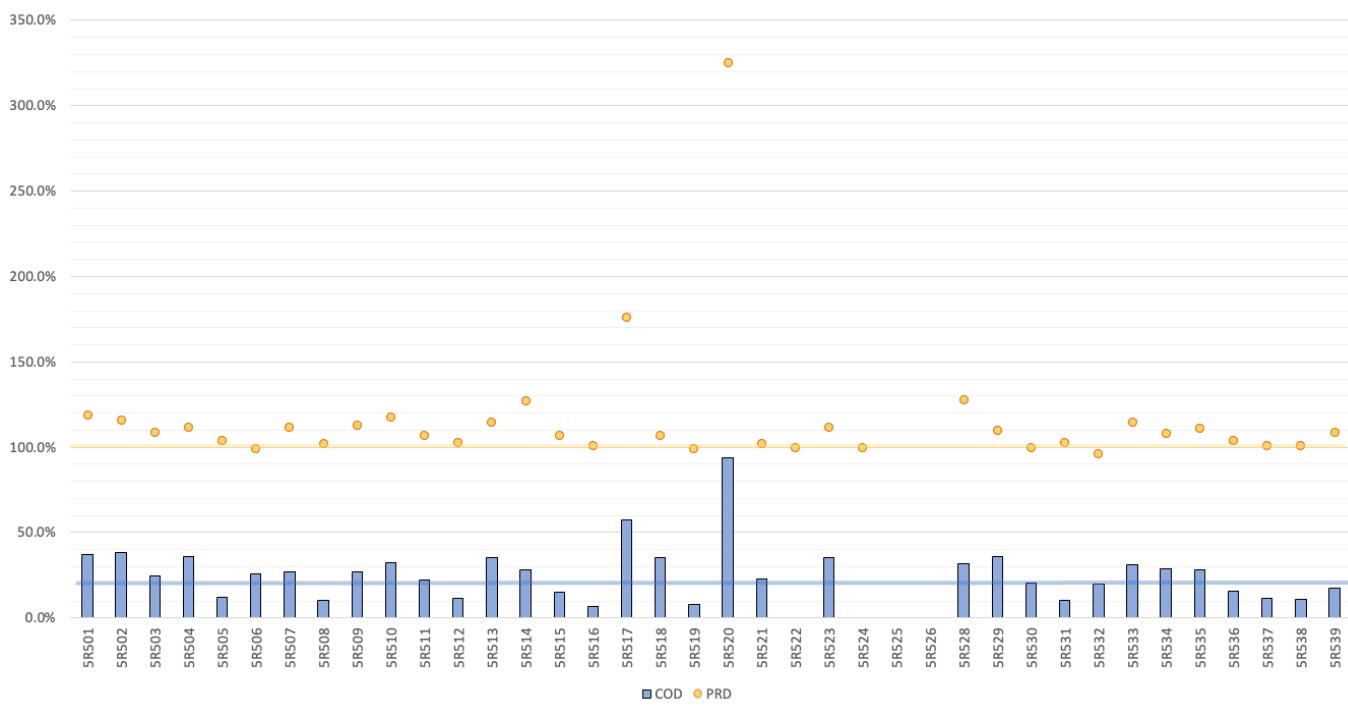
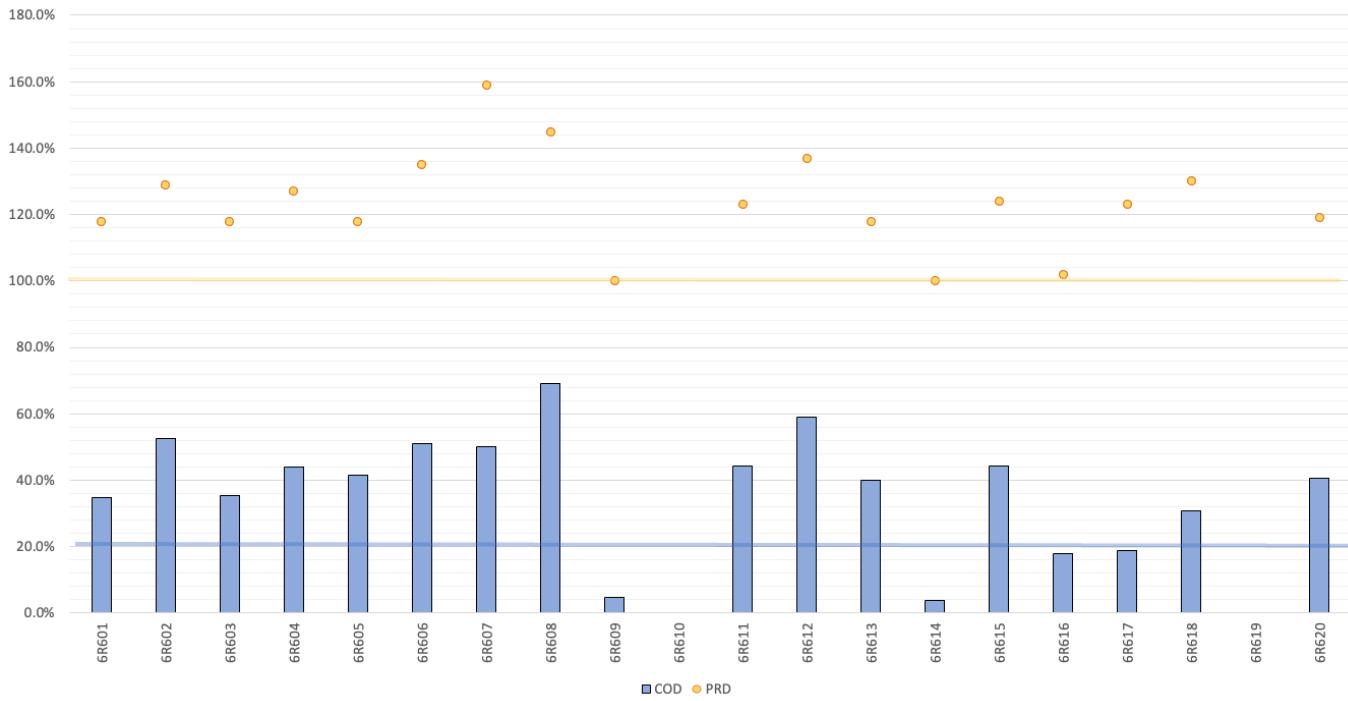
The only group below the 20.0% threshold is the CND Series. This set of data indicates a COD of 15.3% for this particular group. Demonstrating that there is an acceptable amount of uniformity for this group.

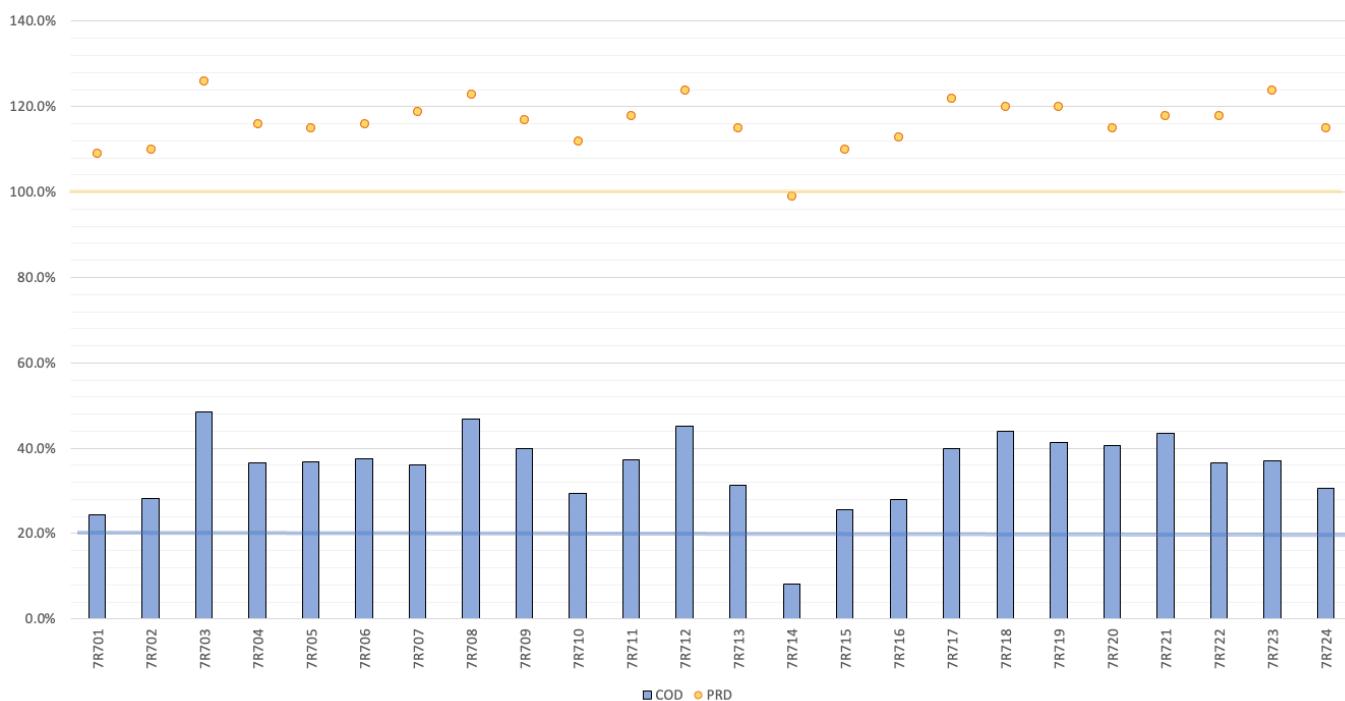
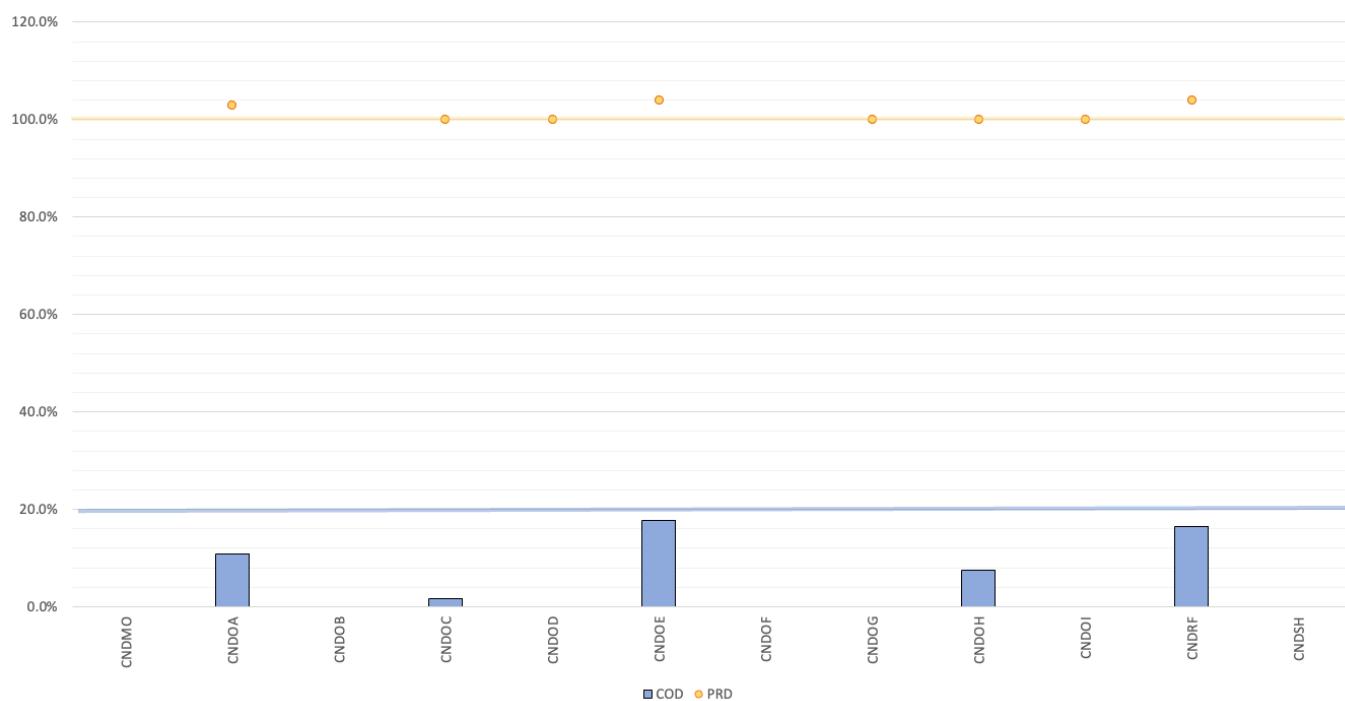
The overall PRD for the City of Detroit is 1.14. This places the city's performance 14 basis points above the IAAO *Standard on Ratio Studies* desired rate of 1.00 and is well above the acceptable industry upper limit of 1.03. This suggests that the city's assessments are regressive in nature, meaning that higher value properties are valued relatively lower as compared to the values assigned to lower value properties.

*Chart 22* through *Chart 28* further stratifies the data into individual ECF Neighborhood Groups. Again, the "BLUE" bars demonstrate the COD, while the "BLUE" line illustrates the acceptable industry standard for this particular jurisdiction. The "YELLOW" dots represent the PRD, while the "YELLOW" line is set at the desired result of 1.00. Specific statistical results can be found in the appendix.

**CHART 22. 1R100 Series - COD and PRD****CHART 23. 2R200 Series - COD and PRD**

**CHART 24. 3R300 Series - COD and PRD****CHART 25. 4R400 Series - COD and PRD**

**CHART 26. 5R500 Series - COD and PRD****CHART 27. 6R600 Series - COD and PRD**

**CHART 28. 7R700 Series - COD and PRD****CHART 28. CND Series - COD and PRD**

As stated earlier, there were some segments that were not represented as there were no sales within the given time frame to consider. These include: 2R211, 5R525, 5R526, 6R610, 6R619, CNDMO, CNDOB, CNDOF, and CNDSH.

Furthermore, some of the groups do not contain a representative sample and their results should be considered inconclusive due to being under represented in the study. These segments include: 2R206, R2R217, 3R302, 3R317, 5R505, 5R516, 5R517, 5R518, 5R519, 5R520, 5R522, 5R524, 5R537, 6R609, 6R614, 6R617, 7R714. CNDOC, CNDOD, CNDOG, CNDOI, and CNDRF.

Again, if conducting future analysis and sales ratio studies, the jurisdiction should review and consider redrawing ECF boundaries while possibly consolidating similar properties into larger market areas if there continues to be a lack of sales within certain ECFs. Staff may consider grouping existing similar ECFs together for the purpose of a similar statistical analysis.

The above charts indicate that the CODs in the majority of the ECF Neighborhoods are rather high and are above the acceptable standard. Only 34 out of 209 groups have CODs below 20.0%. Of those 34 groups many of them have such few sales that they are not representative of the population and their results should therefore be considered inconclusive.

After further breakdown of the CND series, all of the ECF Neighborhoods with adequate representation indicate acceptable CODs below 20.0%.

The majority of the groups reviewed indicated PRD's well above what the industry considers acceptable. Only 30 of the 209 groups had PRDs with the acceptable range of 0.98 and 1.03. Which further suggests that regressivity exists in many of the city's ECFs meaning that higher value properties are valued relatively lower as compared to the values assigned to lower value properties.

## Step 7 - Evaluation of the Ratio Study Results

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### **The key findings of the statistical analysis are as follows:**

- The Assessor's Office for the City of Detroit is compliant with Michigan State law by having an overall mean (average) level of assessment equal to 50.1 with a 95% confidence level ranging between 49.7 and 50.5.
- The indicated mean is +0.1 higher than the State's established target level, however the confidence interval range of this analysis falls between 49.7 and 50.5. This indicates one can reliably assume, with 95% confidence, that the true mean ratio falls between 49.7 and 50.5. With the confidence interval in mind, PCSIAAO finds that the City of Detroit has met its legal and statutory obligation to assess residential properties at the required 50.0 of True Cash Value.
- The Assessor's Office for the City of Detroit does meet IAAO industry standards when considering the median level of assessment which was 45.7 with a 95% confidence level ranging between 45.1 and 46.1. IAAO standards allow for a median level of assessment to be +/-10% of the target level, which would be 45.0 to 55.0. The median and the confidence intervals all fall within this allowable standard range.
- The Assessor's Office for the City of Detroit does not meet the IAAO industry standards when considering uniformity measures, such as the Coefficient of Dispersion (COD) and the Price Related Differential. The overall COD was 36.6% while the industry standard for the jurisdiction should fall between 5.0% and 20.0%. The overall PRD was calculated at 1.14 while the acceptable range per industry standards is between 0.98 and 1.03.

- The jurisdiction has no obligation to achieve industry standards. The jurisdiction only has an obligation to comply with Michigan State law. Thus, the statistical analysis considering IAAO and industry standards should carry no weight in determining the jurisdiction's compliance with applicable laws.
- Although assessors in the State of Michigan are not required to test for COD or PRD nor are they required to have results within any established parameters. PCSIAAO recommends city staff incorporate these statistical measures in their business practices and adopt industry parameters consistent for their jurisdiction.
- Industry standards for the COD and PRD should be considered by the jurisdiction in developing appraisal models, neighborhood assignment, assessing property values, future ratio performance studies, and improving overall uniformity within the jurisdiction as well as the various market segments.
- Considering the median ratio, COD performance, and the PRD analysis is not a required statistic per Michigan State law but needs further investigation to determine the cause of this apparent disparate treatment of low and high value property assessments in the city.
- When conducting future analysis and sales ratio studies, the jurisdiction should review and consider redrawing ECF boundaries while possibly consolidating similar properties into larger market areas if there continues to be a lack of sales within certain ECFs. Staff may consider grouping existing similar ECFs together for the purpose of a similar statistical analysis.
- While not directly controlled by the staff in the City's Assessor's Office, the sales verification and validation processes in the City, County, and State should include a review and analysis of all market transactions, regardless of the type of deed utilized in the property transfer. As discussed previously in this report, a revision of this practice will require cooperation and concessions made by multiple levels of government, however, finding a solution that allows the city's assessment staff the ability to fully review and verify the terms of sale for all property transfers throughout its jurisdiction is the best way to serve the entire community of Detroit. Routinely removing a significant portion of the sales transaction file creates a scenario where estimates of market value could be unduly influenced upwards.

# APPENDIX

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Additional Statistics

## STATISTICAL RESULTS FOR CITY OF DETROIT

## STATISTICAL RESULTS FOR 1R100 SERIES ECF NEIGHBORHOOD

ECA Neighborhood - 1R100 Series	Parcel Count	Number of Sales	Outliers Trimmed	Number of Sales (Outliers Removed)	Minimum Sale Price	Maximum Sale Price	Average Sale Price	Median Sale Price	Minimum Ratio	Maximum Ratio	Minimum Ratio (Outliers Ratio)	Maximum Ratio (Outliers Removed)	Median Ratio	Lower Median Confidence Interval	Upper Median Confidence Interval	Coefficient of Dispersion (COD)	Arithmetic Mean Ratio (All)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Arithmetic Mean Ratio (Outliers Removed)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Weighted Mean Ratio	Standard Deviation	Coefficient of Variation (COV)	Price-Related Differential			
					50,159	2,433	93	2,340	\$ 4,000	\$ 845,000	\$ 83,132	\$ 69,000	8,719,07	8,710,92	45,944.7	46,66	35,7%	53,3	52,3	54,3	50,3	49,5	51,2	44,2	20,5	40,8%	1,14		
					556	26	-	26	\$ 16,000	\$ 140,000	\$ 70,285	\$ 67,000	21,1	79,4	21,1	79,4	36,8	50,9	43,7	36,6	50,9	36,8	42,6%	11,9	33,2%	12,0	12,0		
IR101	IR101-FIVE POINTS-GROUP A (8001A)	552	27	1	26	\$ 20,000	\$ 100,000	\$ 54,958	\$ 53,000	21,7	84,4	21,7	68,2	33,8	28,1	43,3	32,2	43,5	36,1	39,7	34,0	12,0	12,0	42,2%	1,17				
					1,565	66	7	59	\$ 18,000	\$ 214,000	\$ 96,100	\$ 90,000	20,8	143,0	20,8	106,2	44,7	38,9	54,8	37,6%	57,1	49,3	64,8	48,4	43,1	55,6	41,2	20,6	42,2%
IR103	IR103-BERG-LAHR-GROUP A (8003A)	3,292	168	-	168	\$ 18,000	\$ 200,000	\$ 76,786	\$ 69,750	14,1	117,6	14,1	117,6	51,4	46,1	58,3	38,6%	57,0	53,4	60,6	57,0	53,4	60,6	47,4	24,0	42,1%	1,20		
					2,145	117	5	112	\$ 15,213	\$ 139,000	\$ 58,704	\$ 55,700	24,2	135,4	24,2	104,8	51,8	45,5	57,0	37,6%	58,8	52,4	61,2	53,9	50,2	57,6	47,3	20,1	37,4%
IR105	IR105-OHAIR PARK-GROUP A (8005A)	708	47	3	44	\$ 24,505	\$ 122,500	\$ 66,804	\$ 65,000	25,4	121,5	25,4	83,5	41,4	34,9	49,3	29,1%	48,2	41,1	54,4	44,2	39,8	47,8	40,0	41,0	11,0			
					470	20	1	19	\$ 18,500	\$ 399,000	\$ 105,040	\$ 88,450	24,4	165,1	24,4	94,4	46,8	29,0	58,1	38,3%	55,1	40,1	70,1	49,3	39,0	59,6	41,1	22,9	46,5%
IR107	IR107-MELVERN HILL-GROUP A (8006A)	2,939	111	1	110	\$ 13,500	\$ 230,000	\$ 52,260	\$ 48,750	20,0	150,9	20,0	137,7	51,6	43,2	58,8	45,8%	61,0	55,2	66,8	60,2	54,6	65,8	49,2	29,9	49,7%	1,21		
					1,965	197	5	192	\$ 22,800	\$ 202,500	\$ 81,192	\$ 70,000	13,4	139,4	13,4	113,6	49,5	44,8	53,8	35,2%	55,1	51,6	58,5	53,1	50,1	56,2	45,9	21,6	40,7%
IR109	IR109-EVERGREEN-OUTER DRIVE-GROUP A (8009A)	908	69	3	66	\$ 22,000	\$ 157,500	\$ 78,580	\$ 72,500	19,7	104,9	19,7	104,9	43,1	39,1	46,2	48,4	42,3	37,7	42,3	32,7	52,0	42,3	32,7	52,0	36,0	15,6	36,8%	1,18
					1,911	110	-	27	\$ 35,000	\$ 198,000	\$ 98,630	\$ 80,000	22,6	112,3	22,6	91,3	39,0	37,7	56,1	40,2%	44,0	36,6	51,4	44,0	36,6	51,4	36,8	19,7	44,1%
IR111	IR111-OAK GROVE-GROUP A (8011A)	2,128	102	3	99	\$ 64,000	\$ 355,000	\$ 184,119	\$ 177,000	31,0	134,9	31,0	104,3	46,9	44,4	50,1	28,1%	56,1	51,8	60,3	54,0	50,4	57,7	49,7	18,6	34,3%	1,09		
					1,717	137	6	132	\$ 21,000	\$ 160,000	\$ 76,769	\$ 67,000	8,7	117,5	8,7	117,4	46,0	40,7	51,2	37,3%	53,9	49,6	58,2	51,1	47,4	54,8	44,9	21,7	42,5%
IR113	IR113-RIVERDALE-GROUP A (8013A)	1,330	98	2	96	\$ 4,000	\$ 74,042	\$ 65,000	\$ 20,9	120,5	99,5	45,3	40,0	46,8	31,8	49,4	45,4	53,3	48,7	49,7	49,7	49,7	49,7	49,7	49,7	49,7	49,7	49,7	
					3,432	75	4	71	\$ 14,050	\$ 130,000	\$ 65,691	\$ 61,800	23,1	130,9	23,1	105,3	45,7	41,3	50,1	36,2	53,3	47,4	59,2	47,7	44,6	52,0	42,0	21,7	51,0%
IR114	IR114-RIVERDALE-GROUP B (8013B)	726	43	-	43	\$ 25,000	\$ 239,900	\$ 119,354	\$ 108,000	23,0	111,5	23,0	111,5	46,4	37,0	56,7	44,3%	53,9	46,2	61,6	53,9	46,2	61,6	53,9	46,2	61,6	53,9	46,2	61,6
					1,755	100	2	98	\$ 18,000	\$ 213,000	\$ 82,289	\$ 77,000	23,9	125,9	23,9	108,2	43,5	39,9	51,7	36,0%	51,3	47,0	55,7	49,9	45,9	53,8	43,1	20,1	40,7%
IR121	IR121-CHARYST/MARYS-GROUP B (9019B)	1,301	95	5	90	\$ 12,000	\$ 142,000	\$ 63,157	\$ 63,000	20,4	121,1	20,4	105,4	40,5	36,4	46,8	46,8	48,7	44,1	53,2	45,3	47,2	47,2	47,2	47,2	47,2	47,2	47,2	
					1,682	54	3	51	\$ 7,100	\$ 110,000	\$ 48,758	\$ 40,000	24,9	182,5	24,9	143,4	46,7	46,7	60,9	69,5	61,1%	61,5	61,1%	61,5	54,4	47,7	51,6	47,2	21,7
IR124	IR124-BRIGHTMOOR-GROUP D (8015D)	3,437	33	-	33	\$ 12,000	\$ 80,000	\$ 32,433	\$ 24,500	21,1	97,2	21,1	97,2	54,4	34,4	66,5	38,0%	54,5	46,2	62,8	54,5	46,2	62,8	54,5	46,2	62,8	54,5	46,2	62,8
					534	26	2	24	\$ 25,000	\$ 165,000	\$ 90,459	\$ 76,500	24,1	94,6	24,1	90,0	46,8	33,4	52,8	27,9%	49,1	41,2	57,0	45,3	38,8	51,8	39,7	16,3	36,0%
IR126	IR126-ROSEDALE PARK-GROUP A (8026A)	1,738	8	90	\$ 29,400	\$ 845,000	\$ 170,532	\$ 166,500	\$ 95,700	14,7	190,7	14,7	190,7	88,4	47,4	44,6	50,2	23,1%	55,3	49,7	60,7	48,8	46,5	51,5	45,1	37,1	27,1%	31,7%	1,10
					782	44	2	42	\$ 20,000	\$ 240,000	\$ 92,421	\$ 91,500	19,9	80,9	19,9	80,9	44,4	42,5	52,5	25,7%	47,7	42,3	53,0	45,2	40,9	41,6	41,3	14,3	31,1%
IR128	IR128-HUBBELL-LYNDON-GROUP A (9023A)	2,225	105	3	102	\$ 14,000	\$ 190,000	\$ 57,780	\$ 50,000	22,3	152,3	22,3	122,6	43,6	38,2	52,7	45,7%	54,8	49,2	60,4	52,3	47,4	57,2	43,1	25,4	48,6%	1,21		
					828	62	1	61	\$ 27,500	\$ 135,000	\$ 72,217	\$ 66,171	26,2	117,2	26,2	105,6	42,9	40,3	50,8	36,0%	51,3	45,9	56,7	50,2	45,1	55,3	43,3	20,3	40,4%
IR130	IR130-BRIGHTMOOR-GROUP H (8015H)	902	9	1	8																								

## STATISTICAL RESULTS FOR 2R200 SERIES ECF NEIGHBORHOOD

EFC Neighborhood - 2B200 Series	Parcel Count	Number of Sales	Outliers Trimmed	Number of Sales (Outliers Removed)	Minimum Sale Price	Maximum Sale Price	Average Sale Price	Median Sale Price	Minimum Ratio	Maximum Ratio	Minimum Ratio (Outliers Ratio)	Maximum Ratio (Outliers Removed)	Median Ratio	Lower Median Confidence Interval	Upper Median Confidence Interval	Coefficient of Dispersion (COD)	Arithmetic Mean Ratio (All)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Arithmetic Mean Ratio (Outliers Removed)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Weighted Mean Ratio	Standard Deviation	Coefficient of Variation (COV)	Price-Related Differential							
ZR201 ZR201-GREENFIELD-GROUP A (9032A)	43,775	2,476	93	2,383	\$ 8,000	\$ 4,900,000	\$ 107,383	\$ 80,000	18.1	279.8	18.1	108.0	46.1	44.9	47.5	34.8%	53.3	52.4	54.3	45.3	20.0	39.5%	1.12										
ZR202 ZR202-GREENFIELD-GROUP B (9032B)	3,248	195	1	194	\$ 15,000	\$ 250,000	\$ 65,272	\$ 55,000	21.5	128.6	21.5	114.9	47.9	43.6	52.9	38.8%	54.4	52.4	54.7	50.6	49.8	51.4	45.3	20.0	39.5%	1.12							
ZR203 ZR203-SCHAFFER-TRI-POINT-GREENWICH (9033A)	781	53	1	52	\$ 25,000	\$ 181,000	\$ 94,639	\$ 85,000	23.7	122.0	23.7	92.8	43.7	37.8	50.7	29.5%	58.5	43.4	53.6	47.1	42.7	51.5	41.6	16.1	34.3%	1.13							
ZR204 ZR204-SCHULZ-GRUOP D (9040D)	3,481	193	5	188	\$ 23,000	\$ 244,000	\$ 114,857	\$ 120,000	20.6	171.6	20.6	97.7	43.0	40.4	46.6	31.7%	51.7	32.3	48.2	42.4	28.2%	40.0	37.3	42.4	34.5	13.0	46.2%	1.19					
ZR205 ZR205-PENBROKE-GROUP A (0039A)	385	22	1	21	\$ 62,500	\$ 230,000	\$ 162,763	\$ 182,500	25.1	90.3	25.1	73.3	28.3	24.7	32.4	28.2%	40.0	37.3	42.4	37.6	13.4	42.4	34.5	13.0	36.2%	1.19							
ZR206 ZR206-PENBROKE-GROUP F (0039F)	2,468	119	-	119	\$ 16,000	\$ 186,500	\$ 57,032	\$ 57,000	23.4	118.7	23.4	118.7	46.2	39.4	55.6	42.9%	54.5	49.7	59.0	54.5	49.7	59.0	49.7	17.2	52.3	44.7	18.1	36.4%	1.11				
ZR207 ZR207-PENBROKE-GROUP C (0039C)	78	4	1	3	\$ 137,000	\$ 210,000	\$ 174,250	\$ 175,000	39.0	53.1	39.0	41.8	40.5	40.5	59.1	2.4%	44.8	33.5	54.2	40.0	38.2	41.8	40.0	1.5	3.9%	1.00							
ZR208 ZR208-GREEN ACRES-GROUP A (0044A)	1,197	50	20	48	\$ 50,000	\$ 355,000	\$ 200,640	\$ 198,500	27.1	115.5	27.1	102.8	50.1	45.7	58.5	29.6%	58.2	52.1	64.4	56.0	35.1	61.5	57.1	19.7	35.1%	1.05							
ZR209 ZR209-SHERWOOD FOREST-GROUP A (0045A)	682	17	-	17	\$ 285,000	\$ 533,000	\$ 399,757	\$ 375,000	35.5	80.8	35.5	80.8	53.2	42.8	73.5	24.2%	57.1	49.9	64.2	55.6	25.2	46.2	55.6	15.0	26.3%	1.03							
ZR210 ZR210-PALMER WOODS-GROUP A (0046A)	452	12	-	12	\$ 350,000	\$ 4,900,000	\$ 105,429	\$ 707,500	24.1	63.1	24.1	63.1	46.5	27.8	60.4	23.7%	46.2	38.6	53.9	46.2	38.6	53.9	38.6	13.5	29.3%	1.20							
ZR211 ZR211-PENROSE-GROUP A (1038A)	1,232	-	-	\$	\$	\$	\$	\$	1,232	-	-	\$	\$	\$	\$	1,232	24.4	133.8	24.4	88.7	48.3	44.3	50.5	29.3%	52.9	48.8	57.0	48.2	25.2	46.2%	1.19		
ZR212 ZR212-COLLEGE PARK-GROUP A (9034A)	3,213	181	13	168	\$ 20,000	\$ 170,000	\$ 70,978	\$ 67,000	24.4	133.8	24.4	133.8	44.3	43.3	50.5	24.3%	52.4	49.4	55.4	48.2	46.0	50.4	44.6	14.4	29.9%	1.09							
ZR213 ZR213-WINSHIP-GROUP A (9035A)	2,579	118	1	117	\$ 29,050	\$ 215,000	\$ 100,623	\$ 97,250	22.2	116.8	22.2	113.7	45.0	41.3	53.8	22.9%	44.8	37.7	51.8	42.8	36.5	49.1	38.9	13.3	31.1%	1.10							
ZR214 ZR214-SCHULZE-BAGLEY A,B,(0040A)	7,539	550	27	523	\$ 20,000	\$ 380,000	\$ 133,170	\$ 127,350	20.3	230.5	20.3	101.4	44.7	43.2	47.1	31.0%	52.4	50.4	54.3	49.0	47.5	50.5	44.7	17.5	35.9%	1.10							
ZR215 ZR215-UNIVERSITY DISTRICT-GROUP A (0049A)	1,515	63	1	62	\$ 140,000	\$ 520,000	\$ 310,664	\$ 295,000	31.1	96.4	31.1	93.2	52.5	44.9	58.9	21.8%	52.4	49.4	55.4	48.2	46.0	50.4	44.4	14.4	29.9%	1.09							
ZR216 ZR216-DETROIT GOLF-GROUP A (0050A)	186	6	-	6	\$ 320,000	\$ 740,000	\$ 613,500	\$ 662,500	34.8	81.8	34.8	81.8	64.9	64.9	81.8	23.2%	61.8	46.5	77.1	61.1	46.5	77.1	59.6	19.1	30.9%	1.04							
ZR217 ZR217-PALMER PARK-GROUP A (0051A)	19	1	-	1	\$ 205,000	\$ 205,000	\$ 205,000	\$ 205,000	45.6	45.6	45.6	45.6	45.6	45.6	56.4	40.8%	52.4	48.4	56.4	44.6	22.0	42.0%	1.17										
ZR218 ZR218-GRINDALE FARMS-GROUP A (1052A)	1,416	29	2	27	\$ 16,000	\$ 300,000	\$ 68,181	\$ 55,000	18.1	130.6	18.1	79.4	36.0	27.2	53.8	40.8%	46.1	36.0	56.1	40.2	33.7	46.6	33.4	17.1	42.5%	1.20							
ZR219 ZR219-UNIVERSITY DISTRICT-GROUP B (0049B)	176	15	-	15	\$ 50,000	\$ 345,000	\$ 166,827	\$ 160,000	19.5	88.1	19.5	88.1	33.2	20.7	56.2	51.3%	42.2	30.5	53.8	34.1	23.1	54.7%	1.24										
ZR220 ZR220-HARMONY VILLAGE GROUP B (0042D)	1,331	102	2	100	\$ 20,000	\$ 150,000	\$ 72,259	\$ 65,000	18.4	126.3	18.4	108.0	50.0	44.1	56.2	34.7%	54.2	49.5	59.0	53.1	49.7	53.0	45.0	10.5%	1.16								
ZR221 ZR221-LITZGERALD-GROUP A (0043A)	2,557	157	8	149	\$ 12,500	\$ 245,000	\$ 80,279	\$ 73,500	21.9	146.5	21.9	117.6	47.3	42.2	51.1	37.9%	51.7	50.3	57.1	51.1	33.6	57.3	51.1	13.6	25.3%	1.05							
ZR222 ZR222-HARMONY VILLAGE GROUP A (0042A)	134	5	129	5	\$ 14,000	\$ 168,000	\$ 65,280	\$ 61,500	20.5	128.2	20.5	117.5	48.7	41.6	55.3	39.6%	55.1	50.6	59.5	52.4	48.4	56.3	45.1	22.7	43.4%	1.16							
ZR223 ZR223-FITZGERALD GROUP C,D,(0043C)	2,560	136	7	129	\$ 15,000	\$ 190,000	\$ 74,367	\$ 69,500	20.7	134.9	20.7	104.6	47.6	41.3	52.8	43.0%	54.1	50.0	58.3	50.8	47.2	54.4	43.6	20.7	40.7%	1.16							
ZR224 ZR224-HARMONY VILLAGE GROUP B,E (0042B)	2,463	87	3	84	\$ 9,500	\$ 116,000	\$ 51,137	\$ 51,000	21.0	117.4	21.0	117.4	43.9	37.9	51.1	36.5%	54.1	46.1	60.2	51.4	46.1	60.2	45.2	25.0	48.7%	1.24							
ZR225 ZR225-MARTIN - PILGRIM - DEKTER (0053A)	4,711	144	2	142	\$ 8,000	\$ 300,000	\$ 78,063	\$ 66,000	19.2	279.8	19.2	147.0	49.6	42.2	59.3	49.1%	60.7	54.8	66.7	58.6	53.6	63.6	44.3	30.4	51.8%	1.22							
ZR226 ZR226-OKMAN BLVD COMMUNITY-GROUP F (6199F)	329	8	1	20,000	\$ 97,000	\$ 58,500	\$ 56,000	18.9	114.2	18.9	114.2	55.3	27.9	19.9	55.3	29.7%	41.3	19.4	63.3	30.9	21.6	40.2	29.6	12.6	40.7%	1.04							
ZR227 ZR227-OKMAN BLVD COMMUNITY-GROUP E (6199E)	182	11	-	11	\$ 15,000	\$ 295,000	\$ 136,827	\$ 106,000	28.2	81.0	28.2	81.0	43.6	34.5	79.5	36.3%	51.3	39.3	63.2	51.3	39.3	63.2	48.2	20.2	39.4%	1.22							
ZR228 ZR228-DEKTER-LINWOOD (6100A)	484	17	-	17	\$ 30,000	\$ 86,000	\$ 51,309	\$ 50,000	28.7	76.9	28.7	76.9	40.8	35.6	60.1	29.2%	52.2	44.3	60.1	52.2	44.3	60.1	48.2	16.6	31.7%	1.21							
ZR229 ZR229-OAKMAN BLVD COMMUNITY-GROUP A (6199A)	696	28	-	28	\$ 23,000	\$ 140,000	\$ 50,946	\$ 42,450	18.4	99.7	18.4	99.7	44.1	30.7	54.4	38.2%	47.3	39.4	55.3	47.3	39.4	55.3	43.1	21.5	45.5%	1.21							
ZR230 ZR230-DEXTER-LINWOOD (6100A)	150	6	1	5	\$ 43,000	\$ 73,100	\$ 58,767	\$ 57,000	20.6	36.3	20.6	36.3	31.8	31.8	50.1	13.0%	33.0	25.1	40.9	29.6	24.4	34.8	28.8	5.9	20.0%	1.03							

## STATISTICAL RESULTS FOR 3R300 SERIES ECF NEIGHBORHOOD

ECF Neighborhood - 3R300 Series
3R301 3R301-NOLAN-GROUP A (1056A)
3R302 3R302-GRINDALE FARMS-GROUP A (1052A)
3R303 3R303-NOLAN-GROUP B (1056B)
3R304 3R304-CADILLAC HEIGHTS-GROUP A (1060A)
3R305 3R305-NORTH CAMPAGU-GROUP A (1061A)
3R306 3R306-CAMPAGU/BANGALATOWN-GROUP A (1062A)
3R307 3R307-BUTLER-PERSHING (1036A)
3R308 3R308-NOLAN GROUP B (1056B)
3R309 3R309-DAVISON-GROUP A (1068A)
3R310 3R310-BUFFALO-GROUP A (1069A)
3R311 3R311-FARWELL-GROUP C (1065C)
3R312 3R312-FARWELL-GROUP A (1065A)
3R313 3R313-KRAINZ WOODS-GROUP A (1067A)
3R314 3R314-SHERWOOD A.B. (1071A)
3R315 3R315-NORTONTOWN-GROUP A (1072A)
3R316 3R316-GRANT-GROUP A (1070A)
3R317 3R317-AIRPORTS-SUB-GROUP C (1080C)
3R318 3R318-COMMER GREEK-GROUP A (2073A)
3R319 3R319-PULASKI-GROUP A (2007A)
3R320 3R320-MOUNT OLIVET (2076A)
3R321 3R321-VON STEUBEN-GROUP B (2077B)
3R322 3R322-MOHICAN REGENT-GROUP A (2075A)
3R323 3R323-EGGENT PARK-GROUP A (2079A)
3R324 3R324-EGGENT PARK-GROUP C (2079C)
3R325 3R325-REGENT PARK-GROUP B (2079B)
3R326 3R326-AIRPORTS-SUB-GROUP A (1080A)

Parcel Count
Number of Sales
Outliers Trimmed
Number of Sales (Outliers Removed)
Minimum Sale Price
Maximum Sale Price
Average Sale Price
Median Sale Price
Minimum Ratio
Maximum Ratio
Minimum Ratio (Outliers Ratio)
Maximum Ratio (Outliers Removed)
Median Ratio
Lower Median Confidence Interval
Upper Median Confidence Interval
Coefficient of Dispersion (COD)
Arithmetic Mean Ratio (All)
95% Confidence Interval - Lower
95% Confidence Interval - Upper
Arithmetic Mean Ratio (Outliers Removed)
95% Confidence Interval - Lower
95% Confidence Interval - Upper
Weighted Mean Ratio
Standard Deviation
Coefficient of Variation (COV)
Price-Related Differential

## STATISTICAL RESULTS FOR 4R400 SERIES ECF NEIGHBORHOOD

ECF Neighborhood - 4R400 Series	Parcel Count	Number of Sales	Outliers Trimmed	Number of Sales (Outliers Removed)	Minimum Sale Price	Maximum Sale Price	Average Sale Price	Median Sale Price	Minimum Ratio	Maximum Ratio	Minimum Ratio (Outliers Ratio)	Maximum Ratio (Outliers Removed)	Median Ratio	Lower Median Confidence Interval	Upper Median Confidence Interval	Coefficient of Dispersion (COD)	Arithmetic Mean Ratio (All)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Arithmetic Mean Ratio (Outliers Removed)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Weighted Mean Ratio	Standard Deviation	Coefficient of Variation (COV)	Price-Related Differential
4R401 4R401-LASALLE - GRATIOT (2081A)	53,683	2,047	76	1,971	\$ 4,000	\$ 325,000	\$ 67,659	\$ 57,000	5.5	234.2	5.5	110.5	45.3	44.1	46.4	37.3%	52.8	51.7	53.9	49.7	48.8	50.6	43.0	21.1	42.5%	1.15
4R402 4R402-MAPLERIDGE-GROUP A (2084A)	3,420	96	6	90	\$ 8,500	\$ 103,000	\$ 52,061	\$ 49,450	21.9	136.6	21.9	95.3	47.7	41.5	55.9	35.3%	54.6	49.4	59.7	50.0	46.0	54.0	43.8	19.5	38.9%	1.14
4R403 4R403-MAPLERIDGE-GROUP C (2084C)	3,712	39	2	37	\$ 8,000	\$ 95,000	\$ 35,010	\$ 35,000	17.6	113.7	17.6	85.9	38.2	32.8	44.9	32.4%	44.5	37.6	51.4	41.0	35.8	46.3	34.9	16.3	39.7%	1.18
4R404 4R404-MOROSE-MORANG-GROUP B (2085B)	1,296	93	7	86	\$ 12,500	\$ 113,000	\$ 51,170	\$ 50,000	18.3	151.7	18.3	122.1	47.0	43.8	55.6	37.9%	59.7	53.2	65.2	53.4	48.4	58.4	45.8	23.7	44.3%	1.17
4R405 4R405-MOROSS-MORANG-GROUP A (2085A)	760	64	2	62	\$ 18,680	\$ 126,000	\$ 49,677	\$ 47,618	22.9	124.7	22.9	89.8	43.0	39.9	48.0	31.2	52.6	45.6	41.9	49.3	41.6	37.4	43.2%	1.18		
4R406 4R406-DENBY - YORKSHIRE (2086A)	1,958	179	2	177	\$ 19,900	\$ 140,600	\$ 58,906	\$ 53,000	22.3	118.4	22.3	104.4	48.0	43.4	53.3	34.8%	52.4	49.2	55.6	51.7	48.6	54.7	45.1	20.9	40.4%	1.15
4R407 4R407-FEDEN GARDENS-GROUP A (2083A)	1,928	240	7	233	\$ 13,500	\$ 1,350,000	\$ 59,650	\$ 58,500	20.1	142.3	20.1	106.4	49.0	46.3	52.7	31.6%	54.2	51.3	57.1	52.1	49.6	54.6	46.8	19.6	37.6%	1.11
4R408 4R408-OUTER DRIVE-HAYES-GROUP A (2088A)	2,170	49	49	9,500	\$ 155,000	\$ 52,740	\$ 48,000	\$ 22.8	135.6	22.8	135.6	45.4	32.5	51.6%	54.0	48.0	52.2	56.0	46.0	52.2	47.7	28.7	53.2%	1.27		
4R409 4R409-YORKSHIRE WOODS-GROUP B (2087B)	2,199	139	10	129	\$ 15,159	\$ 122,000	\$ 55,338	\$ 53,000	20.8	137.5	20.8	137.5	49.7	39.8	57.4	32.5%	54.9	48.0	52.8	44.3	41.3	47.3	39.6	17.9	51.1%	1.18
4R410 4R410-CORNERSTONE VILLAGE-GROUP A (3093A)	702	55	4	51	\$ 19,000	\$ 125,000	\$ 55,871	\$ 50,000	20.9	129.9	20.9	87.4	46.2	39.4	52.1	30.5%	51.6	45.3	57.9	46.8	42.2	51.4	42.6	16.8	35.9%	1.10
4R411 4R411-CENTER - WADE (2088C)	3,968	289	5	284	\$ 11,000	\$ 200,000	\$ 72,792	\$ 60,000	23.9	234.2	23.9	130.6	48.8	44.8	53.9	41.8%	57.6	54.3	63.0	55.8	52.9	58.7	54.5	25.2	45.2%	1.23
4R412 4R412-CHANDLER PARK-GROUP A (3093A)	5,048	145	10	135	\$ 10,000	\$ 114,000	\$ 46,792	\$ 45,000	18.8	126.3	18.8	91.1	35.7	35.4	43.0%	34.0%	46.5	42.7	50.3	42.0	39.2	44.9	37.1	16.9	40.2%	1.13
4R413 4R413-MORNINGSIDE-GROUP A (3096A)	1,854	44	-	44	\$ 11,000	\$ 70,000	\$ 35,338	\$ 30,000	21.5	137.2	21.5	137.2	41.4	42.5	51.1	43.3%	59.8	51.7	68.0	59.8	51.7	68.0	49.7	28.7	53.2%	1.27
4R414 4R414-EAST ENGLISH VILLAGE-GROUP B (3097B)	2,221	170	6	164	\$ 16,000	\$ 225,000	\$ 77,950	\$ 69,200	11.4	154.4	11.4	103.9	41.8	38.8	46.9	39.7%	48.9	45.1	52.8	46.1	42.0	52.1	47.7	28.7	53.2%	1.27
4R415 4R415-EAST ENGLISH VILLAGE-GROUP A (3097A)	1,069	63	1	62	\$ 50,000	\$ 279,500	\$ 126,169	\$ 120,000	6.2	98.0	6.2	84.2	40.8	35.6	48.7	33.5%	46.5	41.9	51.5	45.6	41.3	47.3	39.6	17.9	51.1%	1.18
4R416 4R416-GOD CREEK-GROUP A (3095A)	1,361	73	7	66	\$ 40,000	\$ 319	\$ 165,110	\$ 166,000	23.7	161.3	23.7	88.6	40.8	35.5	46.7	26.9%	51.5	45.5	57.5	44.7	41.1	48.3	42.4	14.9	33.3%	1.10
4R417 4R417-MORNINGSIDE-GROUP B (3096B)	2,578	13	-	13	\$ 55	\$ 69,000	\$ 38,359	\$ 31,000	25.8	98.8	25.8	96.8	34.8	30.5	46.7	44.2%	48.4	32.8	58.8	44.8	32.8	58.8	40.2	21.2	45.2%	1.23
4R418 4R418-BIXON CREEK-GROUP B (3095B)	3,397	169	9	160	\$ 4,000	\$ 270,000	\$ 82,319	\$ 71,000	22.3	203.8	22.3	104.7	47.2	42.6	50.1	33.5%	54.0	49.6	58.4	48.8	45.9	51.7	47.0	19.0	38.9%	1.16
4R419 4R419-GRATIOT - EAST - MACK (3091A)	4,362	19	-	19	\$ 10,900	\$ 135,000	\$ 38,447	\$ 35,000	8.4	104.0	8.4	104.0	40.8	36.0	47.1	32.8%	59.6	45.3	73.8	59.6	45.3	73.8	47.5	31.6	53.1%	1.25
4R420 4R420-CONNER - JEFFERSON - MARINA GROUP (3092A)	6,127	43	1	42	\$ 6,250	\$ 75,900	\$ 31,167	\$ 30,000	5.5	217.4	5.5	124.2	51.1	37.8	56.3	54.8%	65.1	59.1	78.2	61.4	50.1	72.7	44.3	17.3	60.8%	1.14
4R421 4R421-CONNER - JEFFERSON - MARINA GROUP (3092A)	1,096	9	-	9	\$ 15,000	\$ 72,680	\$ 38,179	\$ 30,167	16.8	91.9	16.8	91.9	46.9	36.8	56.3	32.8%	59.2	51.7	77.8	59.2	51.7	77.8	40.2	21.2	55.4%	1.14
4R422 4R422-JEFFERSON CHALMERS-GROUP A (3099A)	2,281	50	4	46	\$ 22,000	\$ 220,000	\$ 99,245	\$ 90,500	24.6	136.0	24.6	84.4	42.9	38.5	48.4	28.4%	50.3	43.2	57.3	44.4	40.0	48.8	40.9	15.3	34.5%	1.09
4R423 4R423-VICTORIA PARK (3100A)	176	6	1	-	\$ 205,000	\$ 325,000	\$ 261,283	\$ 265,000	36.7	43.2	40.5	40.6	60.4	51.7	43.1	36.0	50.1	39.6	37.2	42.0	39.3	2.7	6.9%	1.01		

## STATISTICAL RESULTS FOR 5R500 SERIES ECF NEIGHBORHOOD

ECF Neighborhood - 5R500 Series									
Parcel Count									
Number of Sales									
Outliers Trimmed									
Number of Sales (Outliers Removed)									
44,519	678	28	650	\$ 3,500	\$ 1,395,000	\$ 130,337	\$ 65,000	3.3	731.6
4,809	105	1	104	\$ 3,500	\$ 190,000	\$ 57,949	\$ 50,000	22.3	731.9
4,347	109	-	109	\$ 14,000	\$ 125,000	\$ 51,207	\$ 45,000	9.8	109.4
392	28	1	27	\$ 155,000	\$ 640,000	\$ 376,130	\$ 363,950	25.0	94.1
671	42	2	40	\$ 45,000	\$ 460,000	\$ 266,594	\$ 254,000	20.3	107.8
86	3	-	3	\$ 145,000	\$ 366,500	\$ 267,833	\$ 292,000	38.4	53.6
165	6	-	6	\$ 142,461	\$ 321,000	\$ 211,994	\$ 202,250	45.9	91.5
792	14	-	14	\$ 27,000	\$ 165,000	\$ 78,845	\$ 75,500	23.2	82.6
177	8	-	8	\$ 300,000	\$ 849,900	\$ 515,188	\$ 537,500	33.8	52.9
282	16	-	16	\$ 90,311	\$ 850,000	\$ 276,500	\$ 182,500	25.1	88.0
1,341	34	-	34	\$ 28,000	\$ 74,018	\$ 61,250	\$ 49.8	33.2	58.5
652	18	2	16	\$ 25,000	\$ 320,000	\$ 154,100	\$ 107,500	28.6	117.7
1,474	6	1	5	\$ 20,000	\$ 100,000	\$ 68,333	\$ 70,000	57.3	154.2
135	9	-	9	\$ 74,000	\$ 1,395,000	\$ 424,556	\$ 340,000	3.3	74.5
2,348	31	4	27	\$ 14,000	\$ 850,000	\$ 130,650	\$ 95,000	19.3	247.0
117	7	-	7	\$ 30,000	\$ 155,000	\$ 86,571	\$ 88,000	25.9	61.5
65	4	-	4	\$ 20,000	\$ 220,000	\$ 230,750	\$ 225,000	40.5	50.5
59511	5R511-PETY HILL-GROUP A (4107A)								
59512	5R512-NORTHEMND NEIGHBORHOOD-GROUP A (4111A)								
59513	5R513-ARDEN PARK-GROUP A (4119A)								
59514	5R514-NORTH - MILWAUKEE - MEDBURY (4120A)								
59515	5R515-WEST VIRGINIA PARK-GROUP A (6110A)								
59516	5R516-VIRGINIA PARK (5114A)								
59517	5R517-HENRY FORD AC (5112A)								
59518	5R518-VIRGINIA PARK-GROUP A (4111A)								
59519	5R519-NEW CENTER COMMONS-GROUP A (4113A)								
59520	5R520-TECH TOWN-GROUP A (4117A)								
59521	5R521-NW GOLDBERG - ELUAH (6115A)								
59522	5R522-CULTURAL TOWNSHIP-GROUP A (4124A)								
59523	5R523-POLEWOOD TOWNSHIP-EAST-GROUP A (4125A)								
59524	5R524-BREWSTER DOUGLAS (4130A)								
59525	5R525-BREWSTER DOUGLAS (4130A)								
59526	5R526-LAFAYETTE GROUP - GRAND (3192A)								
59528	5R528-GRATIOT - EAST (MACK (3091A)								
59529	5R529-ISLANDVIEW A (3141A)								
59530	5R530-WEST VILLAGE-GROUP A (3142A)								
59531	5R531-PINECREST VILLAGE-GROUP A (3140A)								
59532	5R532-INDIAN VILLAGE-GROUP A (3143A)								
59533	5R533-GRATIOT - EAST (MACK (3091A)								
59534	5R534-GRATIOT - EAST (MACK (3091A)								
59535	5R535-JOSEPH BERRY SUB-GROUP A (3148A)								
59536	5R536-COMMER - JEFFERSON - MARINA GROUP (3092A)								
59537	5R537-ELMWOOD PARK (3147A)								
59538	5R538-MIDWEST GROUP A,D. (6152A)								
59539	5R539-AIRPORT SUB-GROUP A (1080A)								
4,800	30	1	29	\$ 13,654	\$ 320,000	\$ 68,805	\$ 41,750	23.8	205.5
3,092	40	-	40	\$ 30,000	\$ 185,000	\$ 73,258	\$ 66,500	32.3	144.6
378	7	-	7	\$ 185,000	\$ 540,000	\$ 357,857	\$ 350,000	36.8	68.2
877	15	3	12	\$ 11,000	\$ 168,000	\$ 63,233	\$ 55,000	30.0	223.7
568	16	1	15	\$ 169,000	\$ 815,000	\$ 540,056	\$ 549,950	21.4	118.8
2,027	17	2	15	\$ 5,000	\$ 82,000	\$ 37,176	\$ 37,000	21.4	103.3
3,245	29	-	29	\$ 7,538	\$ 145,000	\$ 47,467	\$ 41,000	23.2	76.5
173	7	1	6	\$ 200,000	\$ 630,000	\$ 409,857	\$ 389,000	25.7	129.4
451	9	1	8	\$ 20,000	\$ 95,000	\$ 51,778	\$ 45,000	17.6	78.1
49	2	-	2	\$ 200,000	\$ 249,000	\$ 224,500	\$ 41.8	24.2	54.8
1,037	8	-	8	\$ 19,000	\$ 45,000	\$ 38,325	\$ 42,500	26.1	40.8
1,012	6	1	5	\$ 8,900	\$ 39,500	\$ 22,317	\$ 19,750	35.5	116.0

## STATISTICAL RESULTS FOR 6R600 SERIES ECF NEIGHBORHOOD

Ect Neighborhood - GR600 Series	GR601-MIDWEST-GROUP C (6152C)	GR602-MIDWEST-GROUP B (6152B)	GR603-MIDWEST-GROUP A (6152A)	GR604-CLATOWN-GROUP B (5153B)	GR605-CLAYTOWN-GROUP A (5153A)	GR606-CHASEY CONDON GROUP A (5155A)	GR607-CORE CITY - NORTH CORRTOWN (5156A)	GR608-WOODBRIDGE - JEFFRIES (6161A)	GR609-MIDTOWN-GROUP A (4164A)	GR610-BRUSH PARK-GROUP A (4130A)	GR611-SPRINGWELLS-GROUP A (5157A)	GR612-MICH - MARTIN SW (5154A)	GR613-613-SOUTHWEST DETROIT-GROUP F (5158F)	GR614-CORKSTOWN (5156A)	GR615-615-SOUTHWEST DETROIT-GROUP A (5158A)	GR616-GR616-HUBBARD - MEXICANTOWN (5169A)	GR617-617-WEST SIDE INDUSTRIAL GROUP A (5168A)	GR618-GR618-DEIRAY - CARBON WORKS (5171A)	GR619-GR619-OAKWOOD HEIGHTS-GROUP A (5173A)	GR620-GR620-BONYTON GROUP A,C,D (5174A)	Parcel Count	Number of Sales	Outliers Trimmed	Number of Sales (Outliers Removed)	Minimum Sale Price	Maximum Sale Price	Average Sale Price	Median Sale Price	Minimum Ratio	Maximum Ratio	Minimum Ratio (Outliers Ratio)	Maximum Ratio (Outliers Removed)	Median Ratio	Lower Median Confidence Interval	Upper Median Confidence Interval	Coefficient of Dispersion (COD)	Arithmetic Mean Ratio (All)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Arithmetic Mean Ratio (Outliers Removed)	95% Confidence Interval - Lower	95% Confidence Interval - Upper	Weighted Mean Ratio	Standard Deviation	Coefficient of Variation (COV)	Price-Related Differential
42,507	795	28	767	\$ 1,000	\$ 605,000	\$ 38,140	\$ 40,500	11.5	44.50	11.5	123.8	45.7	43.7	48.2	43.3%	55.6	53.3	51.8	50.1	53.6	42.8	24.8	47.8%	1.21																						
1,858	33	-	33	\$ 5,500	\$ 95,000	\$ 33,090	\$ 25,900	20.4	112.4	20.4	112.4	53.7	34.1	61.5	34.3%	52.9	45.0	50.8	52.9	45.0	60.8	44.6	23.1	43.3%	1.18																					
2,735	70	1	69	\$ 5,000	\$ 83,900	\$ 26,287	\$ 23,250	11.5	148.3	11.5	107.1	39.1	32.5	49.7	32.7%	49.9	43.2	56.6	48.5	43.2	54.7	37.7	26.3	54.3%	1.29																					
3,537	67	2	65	\$ 7,000	\$ 115,000	\$ 27,987	\$ 21,000	21.9	140.3	21.9	106.0	45.6	38.1	51.1	43.9	48.7	43.9	56.2	44.0%	55.0	49.9	60.2	55.0	49.9	60.2	43.4	26.8	48.7%	1.27																	
4,293	104	-	104	\$ 10,000	\$ 160,000	\$ 54,087	\$ 40,000	11.9	127.8	11.9	127.8	49.1	42.9	56.2	44.0%	55.0	49.9	60.2	55.0	49.9	60.2	52.9	45.0	50.8	52.9	45.0	60.8	44.6	23.1	43.3%	1.18															
2,991	77	5	72	\$ 5,000	\$ 163,500	\$ 54,716	\$ 55,000	22.4	169.7	22.4	120.6	44.4	39.8	52.8	41.4%	58.5	50.7	66.3	51.9	46.2	57.6	43.8	24.7	47.8%	1.18																					
3,143	24	-	24	\$ 5,000	\$ 82,000	\$ 34,125	\$ 21,250	18.0	134.5	18.0	134.5	51.7	28.3	74.0	51.0%	57.2	44.2	70.2	57.2	44.2	70.2	42.2	32.4	56.7%	1.35																					
4,645	12	-	12	\$ 10,000	\$ 290,000	\$ 90,625	\$ 77,500	21.6	171.3	21.6	171.3	52.6	50.6%	58.5	56.5	113.0	85.8	56.5	115.0	85.8	56.5	115.0	53.9	31.6	60.2%	1.59																				
806	13	1	12	\$ 35,000	\$ 425,000	\$ 229,982	\$ 265,000	33.9	445.0	33.9	217.9	72.0	38.5	141.1	69.1%	112.7	50.3	174.6	85.1	52.8	117.3	58.6	57.1	67.1%	1.45																					
150	4	1	3	\$ 465,000	\$ 605,000	\$ 527,625	\$ 520,250	12.0	48.4	11.8	48.4	44.4	44.4	48.4	4.5%	37.3	20.6	54.0	45.7	41.8	49.6	45.6	3.5	7.5%	1.00	1.00	1.00	1.00	1.00	1.00																
11	-	-	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	11.0	-	-	-	-	-	-	-	-	51.9	46.2	57.6	43.8	24.7	47.8%	1.18	-	-	-	-	-	-																		
4,659	136	1	135	\$ 15,000	\$ 275,000	\$ 64,592	\$ 55,000	22.6	128.8	22.6	118.4	42.9	41.0	50.2	44.3%	53.2	48.8	57.5	52.6	48.4	56.8	42.9	24.8	47.8%	1.21																					
1,350	30	-	30	\$ 12,500	\$ 170,000	\$ 58,298	\$ 47,000	20.6	143.4	20.6	143.4	47.4	36.2	75.1	59.1%	62.1	49.7	74.4	62.1	49.7	74.4	45.2	34.6	55.7%	1.37																					
1,533	30	-	30	\$ 20,000	\$ 235,000	\$ 76,174	\$ 73,750	24.0	120.8	24.0	120.8	49.0	38.1	59.9	40.0%	55.9	46.7	65.2	54.7	47.3	64.6	41.2	19.5	40.3%	1.29																					
326	3	-	3	\$ 150,000	\$ 337,500	\$ 229,57	\$ 220,000	46.0	51.2	46.0	51.2	46.1	51.2	3.7%	47.8	44.4	51.1	47.8	44.4	51.1	47.3	37.0	62.6%	1.35																						
3,019	62	3	59	\$ 15,000	\$ 400,000	\$ 83,663	\$ 78,500	19.1	137.9	19.1	122.2	42.2	38.1	51.8	44.2%	55.9	48.2	63.5	51.8	45.3	58.3	41.9	25.6	49.4%	1.24																					
515	6	-	6	\$ 74,160	\$ 155,000	\$ 103,943	\$ 99,750	32.4	55.2	32.4	55.2	41.9	41.9	55.2	17.8%	43.4	35.9	51.0	43.4	35.9	51.0	42.8	9.4	21.7%	1.02																					
347	3	-	3	\$ 85,000	\$ 310,000	\$ 161,653	\$ 89,500	29.4	62.4	29.4	62.4	58.6	58.6	62.4	18.8%	50.1	29.7	70.6	50.1	29.7	70.6	40.8	18.0	36.0%	1.23																					
2,101	-	7	7	\$ 9,000	\$ 95,000	\$ 40,571	\$ 25,000	25.5	87.5	25.5	87.5	58.8	58.8	87.5	30.9%	62.7	45.6	79.8	62.7	45.6	79.8	48.3	21.1	36.8%	1.30																					
542	-	-	\$ 1,000	\$ 122,000	\$ 39,359	\$ 35,000	18.6	104.2	43.8	36.6	49.0	40.5%	53.5	47.3	59.7	46.5	42.5	50.6	39.1	21.4	46.0%	1.19	-	-	-	-	-	-																		
3,946	114	8	106	\$ 1,000	\$ 122,000	\$ 39,359	\$ 35,000	18.6	104.2	43.8	36.6	49.0	40.5%	53.5	47.3	59.7	46.5	42.5	50.6	39.1	21.4	46.0%	1.19	-	-	-	-	-	-																	

## STATISTICAL RESULTS FOR 7R700 SERIES ECF NEIGHBORHOOD

ECF Neighborhood - 7R700 Series	Parcel Count			Number of Sales			Number of Sales (Outliers Removed)			Minimum Sale Price			Maximum Sale Price			Average Sale Price			Median Sale Price		
				Outliers Trimmed																	

## STATISTICAL RESULTS FOR CND SERIES ECF NEIGHBORHOOD

ECF Neighborhood - CND Series	Parcel Count									
	Number of Sales									
	Outliers Trimmed									
	Number of Sales (Outliers Removed)									
CNDMO	\$ 88,000	\$ 1,750,000	\$ 362,150	\$ 297,525	25.3	79.8	25.3	36.0	36.7	35.2
CNDOA	\$ 88,000	\$ 382,000	\$ 256,200	\$ 277,500	25.3	64.1	25.3	38.1	34.9	25.3
CNDOB	\$ 167,800	\$ 215,000	\$ 191,400	\$ 191,400	77.3	79.8	77.3	79.8	78.6	78.6
CNDOC	\$ 1,750,000	\$ 1,750,000	\$ 1,750,000	\$ 1,750,000	26.2	26.2	26.2	26.2	78.6	76.1
CNDOE	\$ 250,000	\$ 726,540	\$ 498,851	\$ 525,000	25.8	66.3	25.8	56.0	38.2	29.8
CNDOF	\$ 178,000	\$ 178,000	\$ 178,000	\$ 178,000	43.4	43.4	43.4	43.4	43.4	NA
CNDOG	\$ 151,000	\$ 316,000	\$ 229,875	\$ 240,150	33.8	53.8	33.8	45.4	35.8	35.4
CNDOH	\$ 407,000	\$ 407,000	\$ 407,000	\$ 407,000	35.1	35.1	35.1	35.1	35.1	NA
CNDOI	\$ 205,800	\$ 340,000	\$ 272,500	\$ 272,500	41.2	57.5	41.2	57.5	49.3	49.3
CNDRF	\$ -	\$ -	\$ -	\$ -	16.5%	16.5%	16.5%	16.5%	47.6	11.5
CNDSH	\$ -	\$ -	\$ -	\$ -	10.0%	10.0%	10.0%	10.0%	35.1	23.3%
	\$ 82.	\$ -	\$ -	\$ -	1.04	1.04	1.04	1.04	49.3	33.4



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