

Leveraging
Imagery &
Technology to
Improve
Accuracy and
Efficiency

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*WCAD***

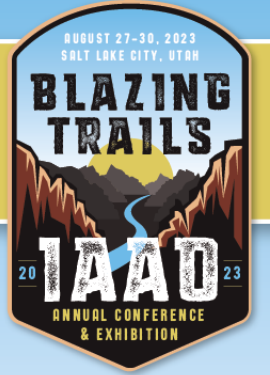


**Texas Association
of Appraisal Districts**

**2024 Conference
February 18-21**



Overview

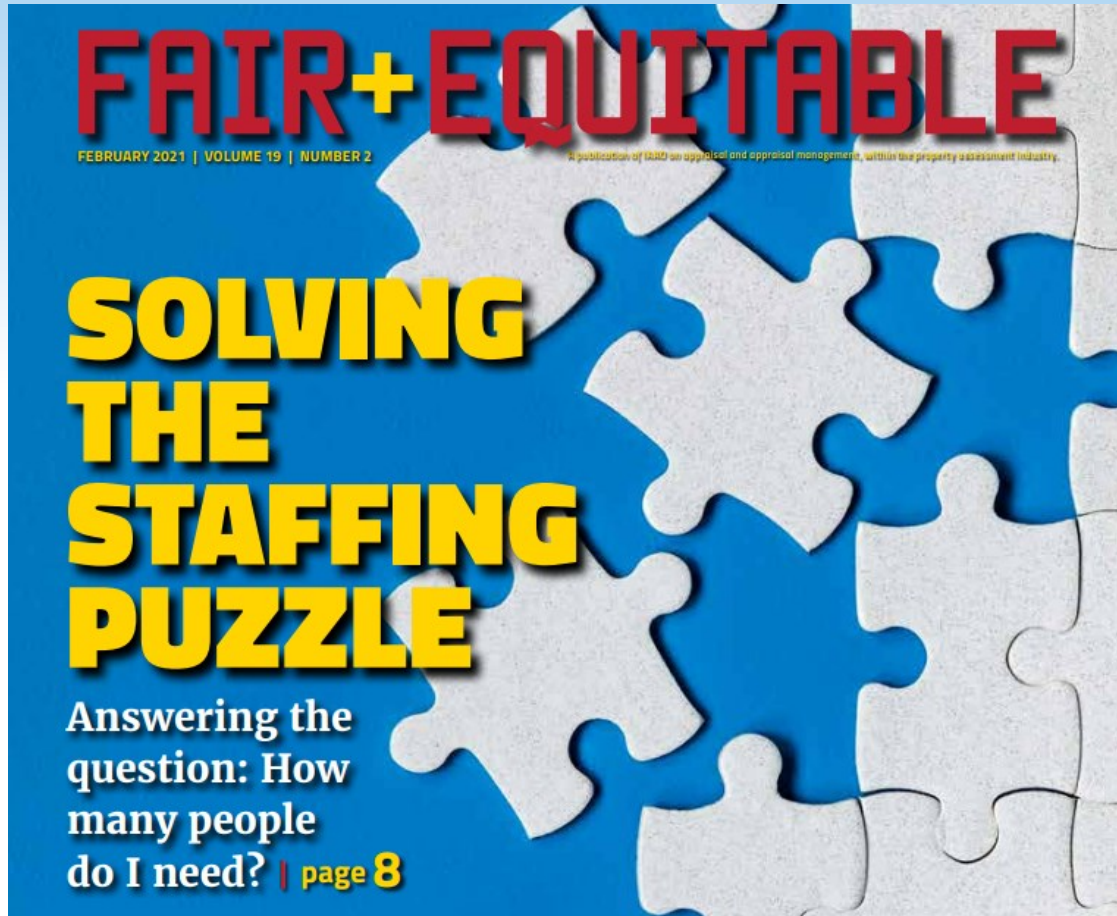
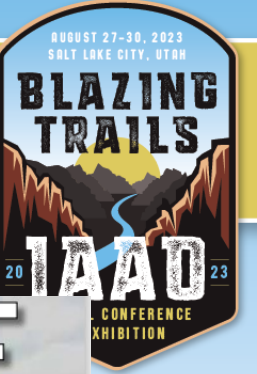


Session Description

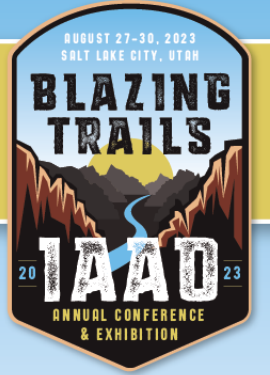
This presentation will focus on WCAD's long-standing commitment to accuracy, efficiency, and innovation by using Change Detection, Sketch Verification, street level and aerial oblique imagery technology in our daily workflow. We will share details on the technology and benefits achieved from its use, along with proven return on investment that they have provided to our staff and customers. We will also share various AI software that has been used in tandem with the street and aerial imagery in projects that were implemented to increase appraisal accuracy and equity.



Staffing Issues Are Not Uncommon!



Tax Code Requirements



23.01 Appraisals Generally...

(h) Sources of methods and techniques

Appraisal Institute -- Appraisal of Real Estate and Dictionary of Real Estate Appraisal

The Appraisal Foundation -- USPAP

Publication that includes information related to mass appraisal

25.18 Periodic Reappraisals

(b)....provide for the following reappraisal activities.....

(1) identifying properties to be appraised through physical inspection or by other reliable means of identification, including deeds or other legal documentation, aerial photographs, land-based photographs, etc....

The MAP



Comptroller Methods and Assistance Program

1. Does the appraisal district's reappraisal plan include all the statutory requirements of Tax Code Section 25.18?

To receive a YES for this sub-question, all requirements in the checklist below must be included in the reappraisal plan.

Yes/No	Statutory Requirement
	Identify the properties to be appraised
	Provide for identifying and updating relevant characteristics of each property in the appraisal records
	Define the market areas for the county
	Provide for identifying and updating relevant characteristics that affect property value in each market area, including: the location and market area of property
	Provide for identifying and updating relevant characteristics that affect property value in each market area, including: physical attributes of property (size, age, and condition)
	Provide for identifying and updating relevant characteristics that affect property value in each market area, including: legal and economic attributes
	Provide for identifying and updating relevant characteristics that affect property value in each market area, including: easements, covenants, leases, reservations, contracts, declarations, special assessments, ordinances, or legal restriction
	An appraisal model that reflects the relationship among the property characteristics of the properties being appraised
	Provide for applying the conclusions reflected in the model to the characteristics of the properties being appraised
	Provide for reviewing the appraisal results to determine value

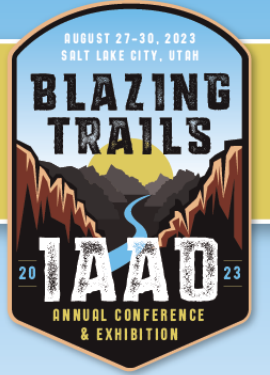
2024-25 MAP Guidelines

APPRAISAL STANDARDS, PROCEDURES AND METHODOLOGY

61. Have the physical inspection dates in the appraisal records been updated within the previous six years as discussed in IAAO's *Standard on Mass Appraisal of Real Property*? **TIER (S) 1-3**

If the answer to this question is NO, the answer to Mandatory question 5 is a FAIL.

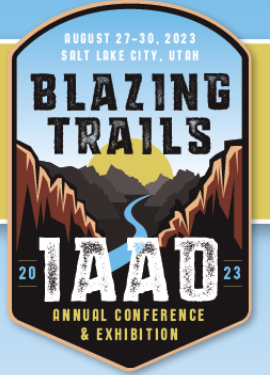
IAAO Standard on Mass Appraisal



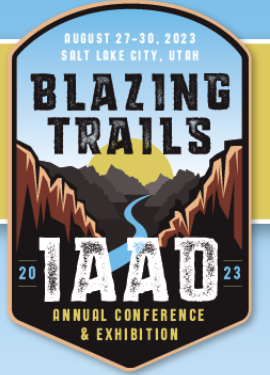
<https://www.iaao.org/media/standards/StandardOnMassAppraisal.pdf>



3.3.5 Alternative to Periodic On-site Inspections



Provided that initial physical inspections are timely completed and that an effective system of building permits or other methods of routinely identifying physical changes is in place, jurisdictions may employ a set of digital imaging technology tools to supplement field reinspections with a computer-assisted office review. These imaging tools should include the following:

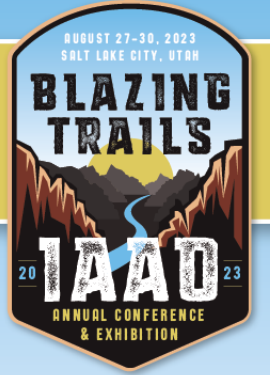


3.3.5 Alternative to Periodic On-site Inspections

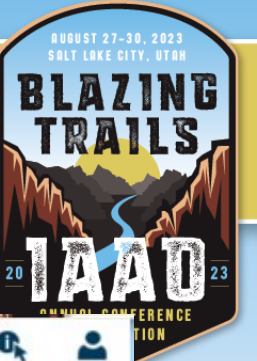
Imaging Tools: Street-View, Orthophotos and Obliques

- **Current high-resolution street-view images** (at a sub-inch pixel resolution that enables quality grade and physical condition to be verified)
- **Orthophoto images** (minimum 6-inch pixel resolution in urban/suburban and 12-inch resolution in rural areas, updated every 2 years in rapid-growth areas or 6–10 years in slow-growth areas)
- **Low-level oblique images** capable of being used for measurement verification (four cardinal directions, minimum 6-inch pixel resolution in urban/suburban and 12-inch pixel resolution in rural areas, updated every 2 years in rapid-growth areas or 6–10 years in slow-growth areas).

Are you capturing traditional (static) street-level images?



Are you using aerial oblique Imagery?

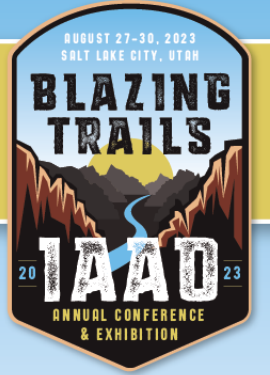


A screenshot of the CONNECTEXPLORER software interface. The main window displays an aerial oblique photograph of a residential neighborhood with houses, lawns, and a golf course. A blue location pin is placed on a road. On the left, there is a smaller inset window showing a street view of a white house with a dark roof, labeled "Real Springs Dr.". The interface includes a search bar at the top with the text "Click a location to view.", a toolbar with various icons, and a status bar at the bottom showing "map: Auto (Oblique)", "Mar 2016 - May 2016", and "image 4 of 6". A scale bar in the bottom right corner indicates 20 feet and 10 meters.

Orthogonal , Oblique, Street-view



Williamson Central Appraisal District



Facts and Figures:

North of Travis County (Austin)

600K+ Population

264,000 Real Parcels 16,520 BPP

2023 year - \$164B appraisal roll

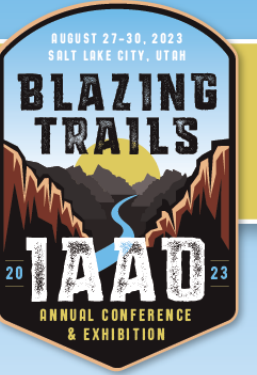
78 employees

Reappraise yearly

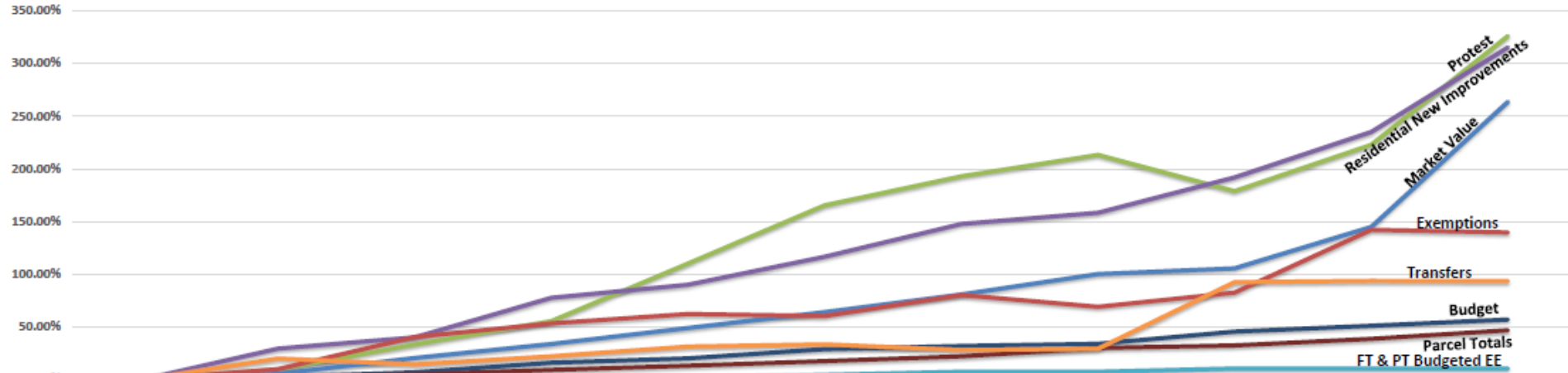
2023 year – 80,000 value appeals



Williamson County Growth – Award winning!



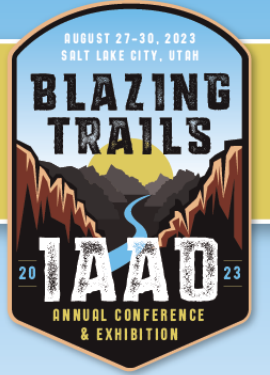
10 Year Summary



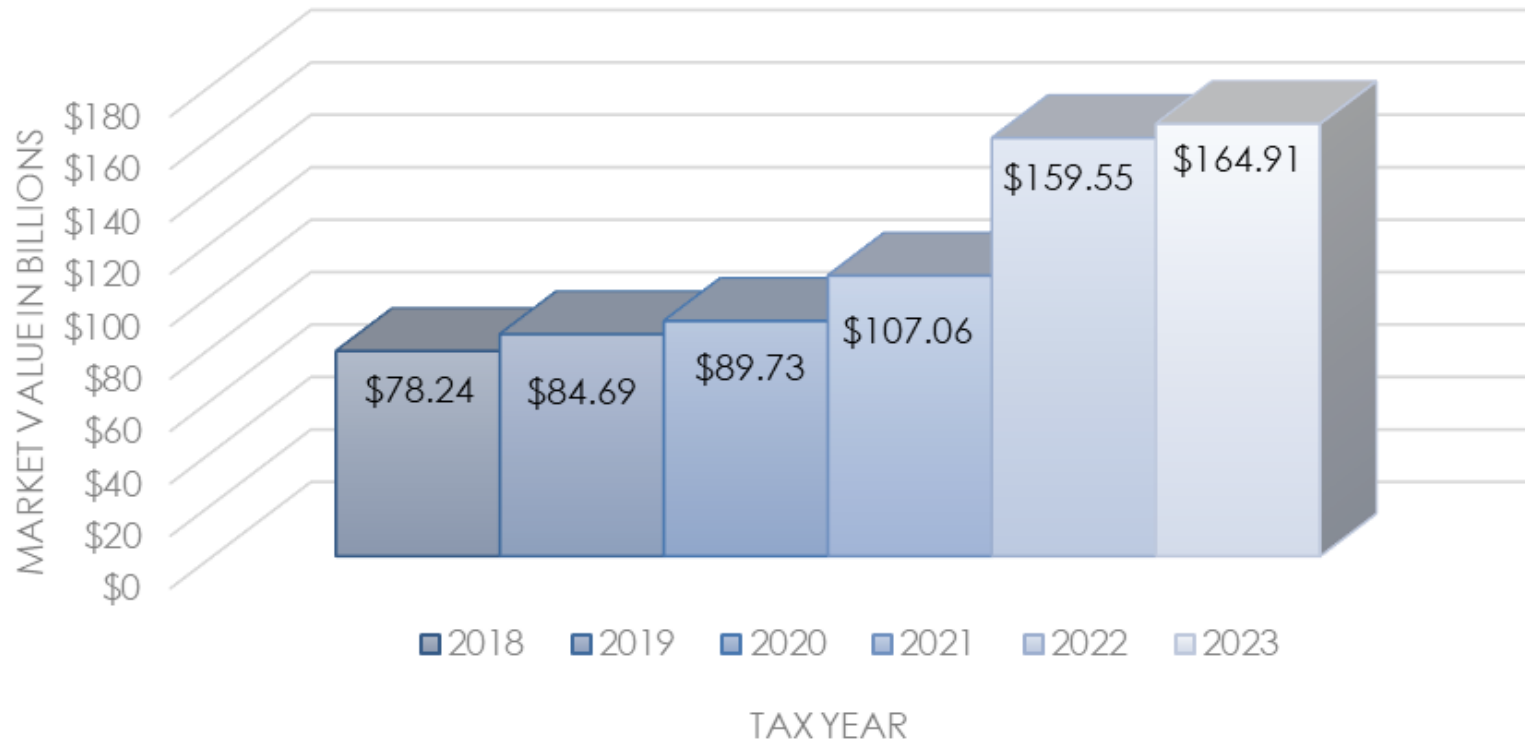
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Budget	0.00%	2.61%	6.93%	16.12%	20.21%	29.00%	32.00%	34.09%	45.64%	51.24%	57.10%
FT & PT Budgeted Employees	0.00%	0.00%	0.00%	1.52%	1.52%	4.55%	7.58%	7.58%	10.61%	10.61%	10.61%
Protests	0.00%	9.88%	33.37%	55.52%	110.21%	165.34%	193.05%	213.20%	178.77%	222.79%	326.05%
Residential New Improvements	0.00%	29.59%	40.21%	77.76%	90.13%	116.71%	147.69%	158.35%	192.01%	235.12%	315.27%
Parcel Totals	0.00%	2.14%	4.94%	9.36%	13.38%	17.59%	22.29%	30.11%	32.50%	38.83%	46.92%
Market Value	0.00%	5.56%	20.63%	33.95%	49.08%	64.16%	80.79%	100.21%	105.60%	145.00%	263.61%
Exemptions	0.00%	9.95%	40.47%	53.41%	62.39%	60.41%	80.36%	69.19%	82.68%	142.23%	139.74%
Transfers	0.00%	20.15%	14.48%	22.16%	31.55%	33.50%	28.07%	29.30%	92.55%	93.79%	93.43%

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Budget	\$6,529,600	\$6,700,300	\$6,982,300	\$7,582,200	\$7,849,200	\$8,423,000	\$8,619,200	\$8,755,800	\$9,509,500	\$9,875,300	\$ 10,257,900
FT & PT Budgeted Employees	66	66	66	67	67	69	71	71	73	73	73
Protests	19,516	21,444	26,029	30,351	41,025	51,783	57,191	61,125	54,405	62,995	83,147
Residential New Improvements	2,927	3,793	4,104	5,203	5,565	6,343	7,250	7,562	8,547	9,778	12,155
Parcel Totals	182,376	186,285	191,389	199,444	206,773	214,458	223,022	237,294	241,650	253,195	267,942
Market Value	\$43,971,339,521	\$46,416,843,707	\$53,044,204,626	\$58,899,392,246	\$65,552,059,052	\$72,183,721,640	\$79,496,697,112	\$88,034,507,973	\$90,406,674,959	\$107,731,408,700	\$ 159,884,359,663
Exemptions	14,686	16,147	20,629	22,530	23,849	23,558	26,488	24,847	26,829	35,574	35,208
Transfers	18,044	21,679	20,656	22,043	23,736	24,089	23,109	23,330	34,743	34,968	34,902

Williamson County Growth – Award winning!

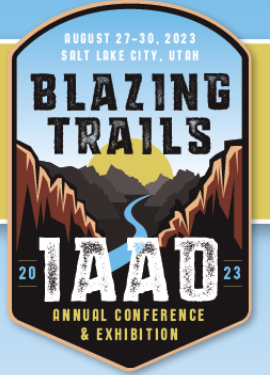


Williamson County Total Market Value (in billions)



2022 – Existing residential property increased approx. 49%

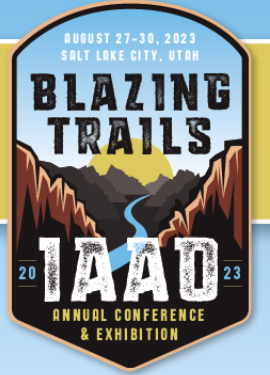
Philosophical Question.....



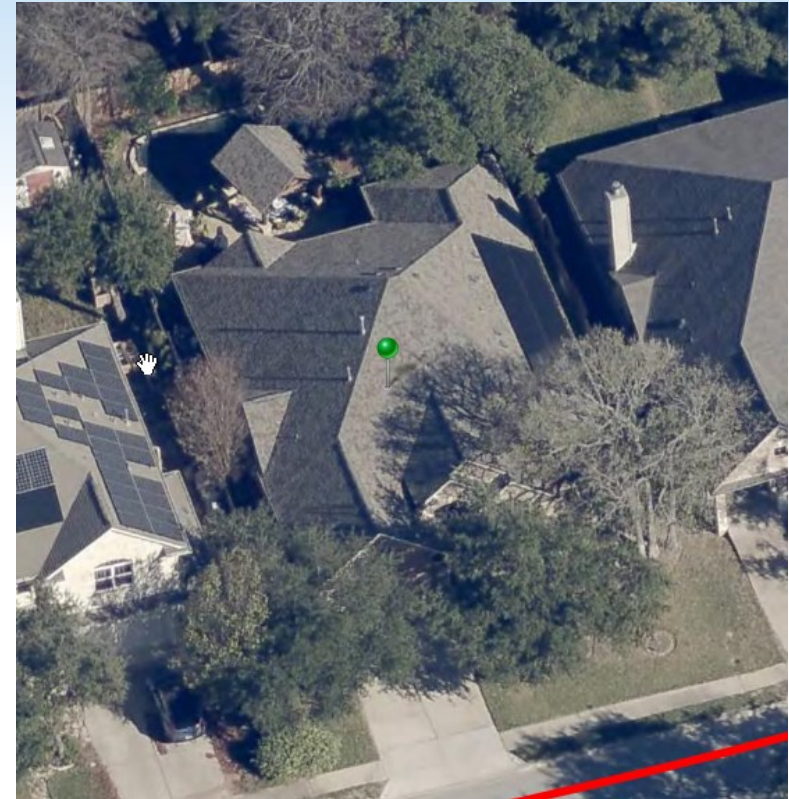
Which Came First?



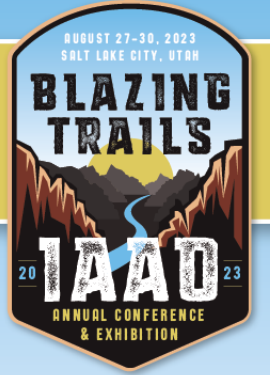
WCAD Philosophical Question.....



Which Came First?




WCAD – Street Level 2006 , 2012, 2018, 2023









Initial primary use was property record cards and sales comparison grids

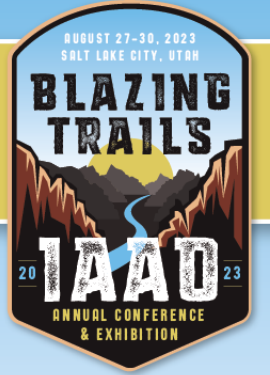
Later implementation with online protests and NOH letters

Property ID and Legal Description		Owner Information				
R453470 R-16-4466-000F-0013 S8524 - MAYFIELD RANCH SEC 6, BLOCK F, Lot 13	Tax Year: 2023	CONNELLY, CHRISTOPHER B & KIMBERLY R (O526326)				
3905 VALLARTA LN, ROUND ROCK, TX 78681		3905 VALLARTA LN ROUND ROCK, TX 78681-2355				
Property Situs Address 3905 VALLARTA LN, ROUND ROCK, TX 78681		 <p>12/10/2018</p>				
Linked Property R019066 - R-16-0212-0000-0007B						
Neighborhood L498506D	Exemptions/Spec. Vals HS					
Taxing Unit Information CRR;GWI;J01;RFM;SRR;W09						
Topography	Utilities ALL	Access	Other			
Attributes	Const Style	Foundation SLB	Ext. Finish	Int. Finish SR	Roof Style MX	Flooring CP
	Heat/AC	Plumbing	Fireplace	Rooms	Bedrooms	
	CHCA	2.0				
	Date	Price	Seller	Book / Instrument	Page	

Comparable Sales Report

For Property: R-11-8025-400A-0021		Comp Sheet Format: On-Line protest Comps			Market Area: RURAL NW	
	Subject	Comp1	Comp2	Comp3	Comp4	Comp5
Quick Ref ID	R479414	R479454	R479458	R488683	R479411	R488639
Situs Address	240 CORN HILL DR	628 SHALE DR	223 CORN HILL DR	209 MOONSTONE DR	228 CORN HILL DR	317 TURQUOISE WAY
Neighborhood Code	J204407G	J204407G	J204407G	J204407G	J204407G	J204407G
Acres	0.000	0.000	0.000	0.000	0.000	0.000
Eff Year Built/Class	2007 / R2	2007 / R2	2007 / R2	2007 / R2	2007 / R2	2007 / R2
Actual Year Built	2007	2007	2007	2007	2007	2007
Living Area SF	1,540	1,540	1,550	1,580	1,540	1,604
Living Area Value	\$123,446	\$123,446	\$123,148	\$125,531	\$123,446	\$125,850
Non-Living Area Value	\$22,075	\$21,243	\$20,895	\$20,975	\$33,107	\$18,674
Land Value	45,765	45,765	45,765	45,765	45,765	45,765
Sale Date		[REDACTED]				
Sale Price		[REDACTED]				
Time Adj		799	3200	2150		2063
Living Area Value Adj		\$0	\$298	\$-2,085	\$0	\$-2,404
Location Adj		\$0	\$0	\$0	\$0	\$0
Depreciation Adj						
Non-Living Area Vaue Adj		\$832	\$1,180	\$1,100	\$-11,032	\$3,401
Land Value Adj		0	0	0	0	0
Adjusted Sale Price		[REDACTED]				
Photo						

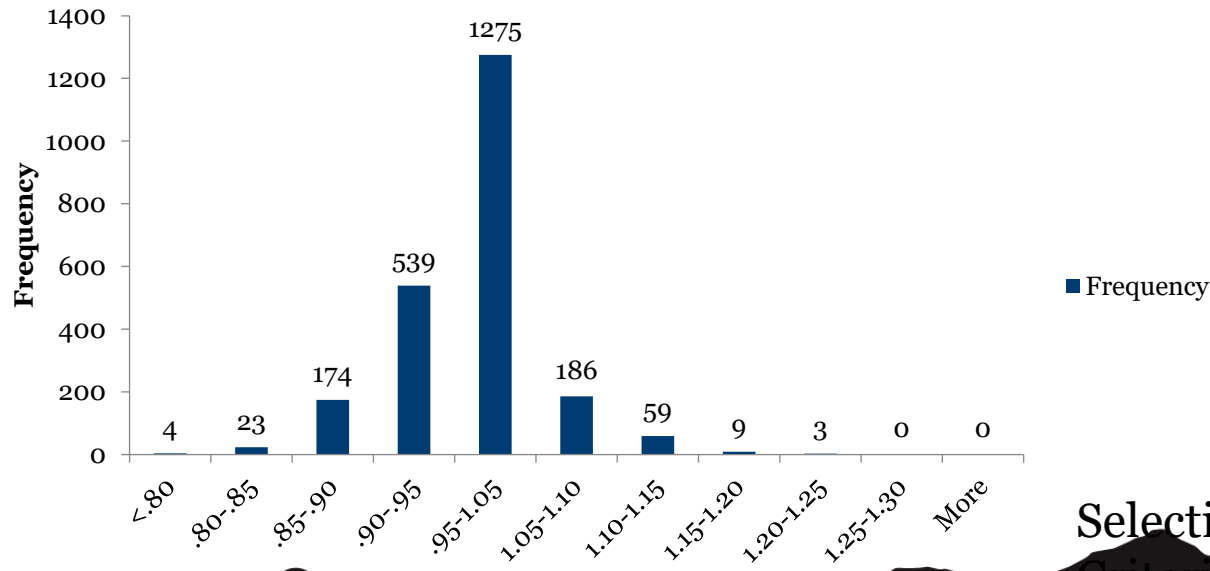
Street Level – New Ideas and uses for new methods – Residential Valuation



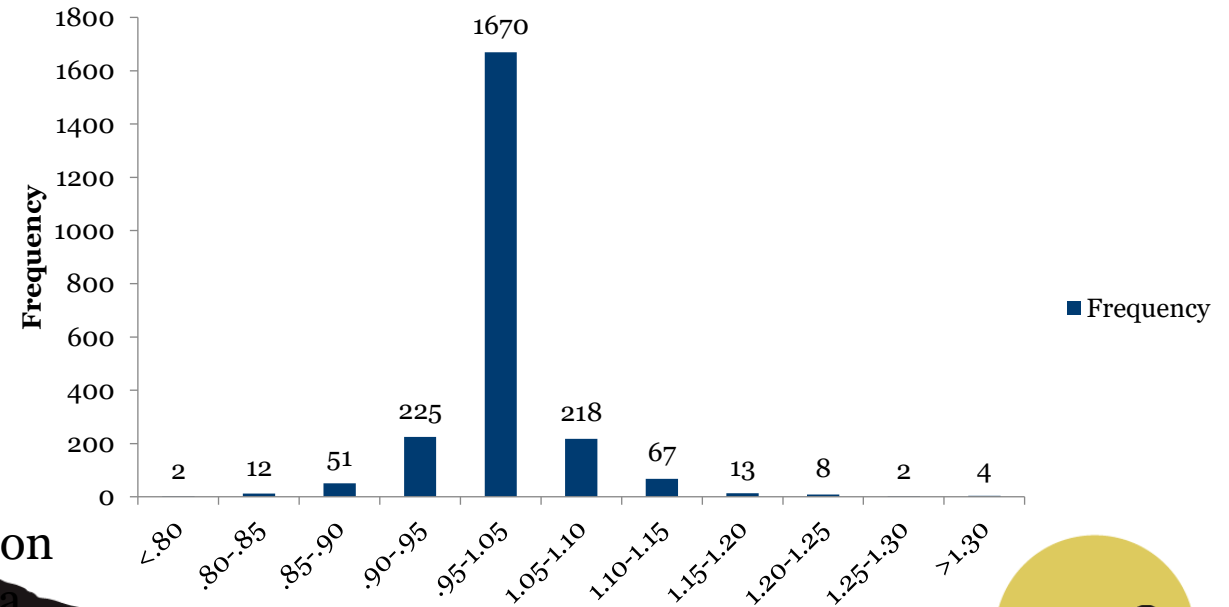
Depreciation & Effective Age Application

Market Area	MRA Formula	Market Modified Cost	MRA Sales Comparison Grid
WGT	7.47	6.77	4.69
RREH	6.04	5.41	4.19
LW	7.63	5.95	4.98
WRR	8.35	5.67	5.22

MMCost / TASP



MRA Sales Grid / TASP



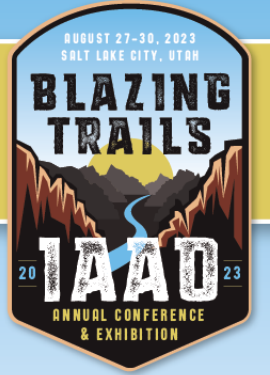
Selection Criteria

Street Level – New Ideas and uses for new methods



Depreciation and Effective Age Application

Effective Age Project 2020	
# of NBHDs	219
Year Built Range	1950-1995
# of Improved Accts	39,926
# of Appraisers	3
Avg time (min) per Acct	3
Total Hours to Complete	1996
Total Weeks to Complete	17



Depreciation and Effective Age Application

Effective Age aka "The Super Huge Massively Colossal Project" has been completed

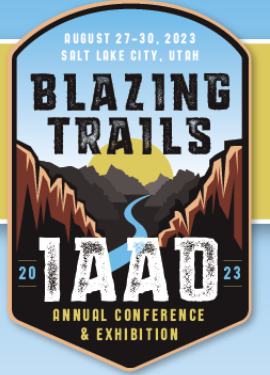
14



- Completed & entered into Orion (30% faster)
 - Total Number of Accounts reviewed **38,709**
 - Total Changes: **9,618**

	Number of Changes	% of total project
Good	7245	18.59%
Very Good	2116	5.43%
Excellent	257	0.66%

Street Level – New Ideas and uses for new methods



Residential Classing Application

What is FOXY AI?

Foxy AI is a program that uses artificial intelligence, neural networks, and computer vision to convert real estate photos into data. For WCAD, Foxy AI was used to determine the quality of finishes and estimate the overall build quality. The result of this analysis is a “Quality Score”. This score is similar to WCAD’s residential improvement class.

Why Use It?

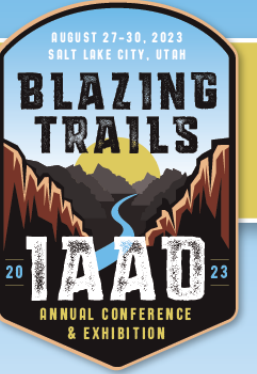
Use of AI helps WCAD to review large groups of properties quickly. Also, a tool that methodically creates quality scores for properties allows WCAD to test scores for quality made by appraiser judgement, resulting in a more accurate, fair, and equitable roll.

Project Workflow

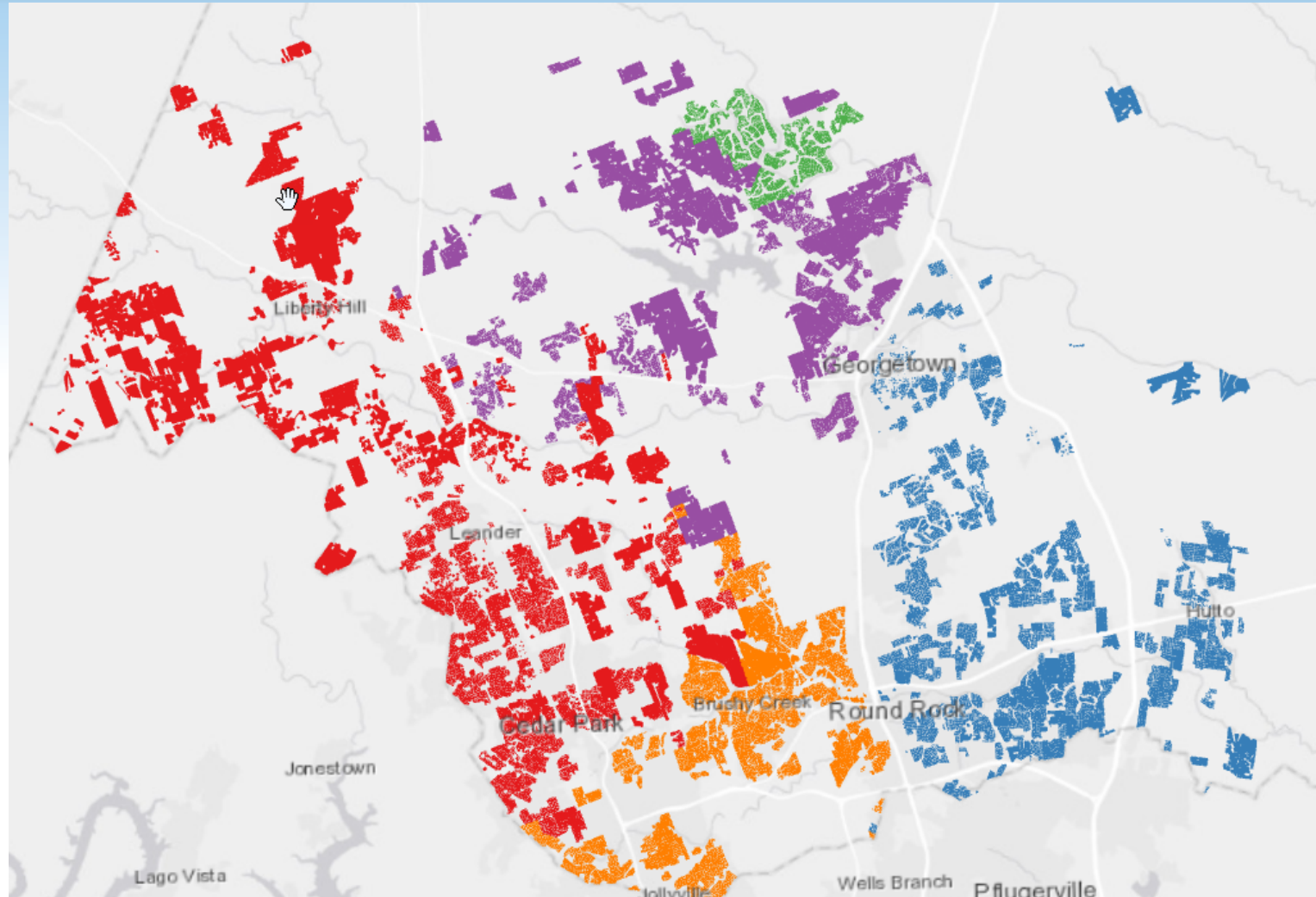
- WCAD sent the residential classing guide, accounts, and photos to Foxy for review and to calibrate their classing score program.
- After calibration, WCAD sent photos of residential accounts to be scored.
- Foxy AI runs photos of residential properties through their AI to determine a classing score.
- Scoring results were returned to district and compared to WCAD scores.

FOXY

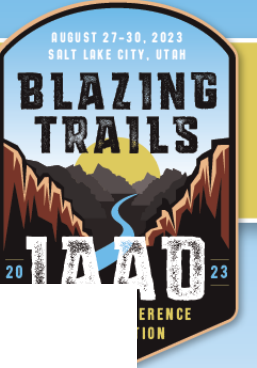
Street Level – New Ideas and uses for new methods



Residential Classing Application



Street Level – New Ideas and uses for new methods



Residential Classing Application

Examples from WCAD Classing
Guide of an R5 sent to FOXY AI

R5



Image sent to FOXY AI

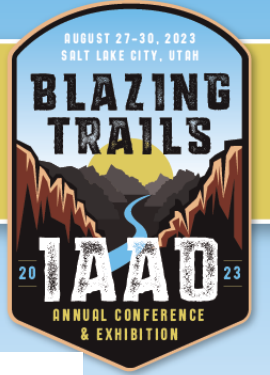
WCAD Class R5

Foxy Class R4

Corrected to R4



Street Level – New Ideas and uses for new methods



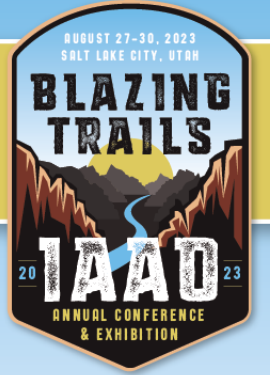
Residential Classing Application

Return On Investment

Appraisers	Hours Spent	Cost in Wage	Accounts Reviewed	Average Time For FC To Review Class (Min)	Total Time To Review (Hrs)	Cost In Wage Not Incurred
2	126	\$3,147.48	8020	14	1,871.33	\$46,745.90
			Accounts Confirmed 118656	14	27686.40	\$691,606.27
Total Wage		\$3,147.48				\$738,352.17

Total Fees To Foxy AI - \$19,914

Aerial Imagery

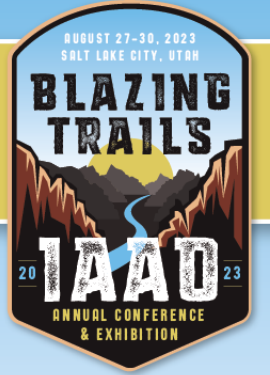


Most Common Use -

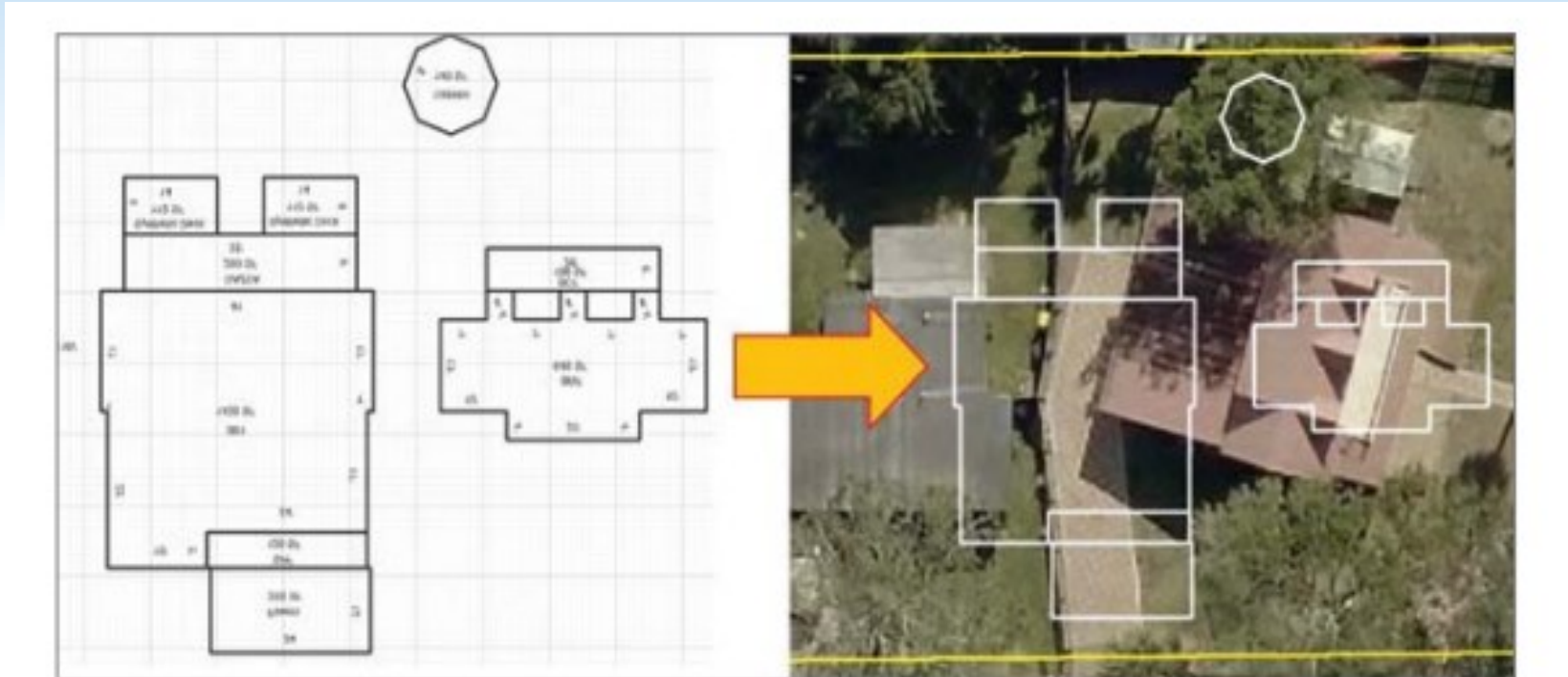
Change Detection and Sketch Verification:

These tool sets may incorporate change detection techniques that compare building dimension data (footprints) in the CAMA system to georeferenced imagery or remote sensing data from sources (such as LiDAR [light detection and ranging]) and identify potential CAMA sketch discrepancies for further investigation.

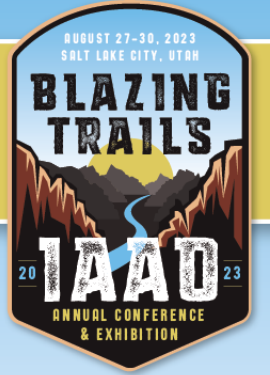
Aerial Imagery – Not just for bird's eye views!



Sketch Validation



Aerial Imagery – Not just for bird’s eye views!



Sketch Validation Test Area Results:

2016 Tyler Verify Sketch Validation Test Project

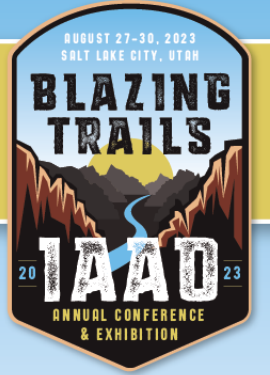
West Georgetown ISD
20,219 Parcels Reviewed

Appraiser Hours Spent		621
(x) Approximate Salary Per Hour	\$	24.00
(=) Subtotal Appraiser Cost	\$	14,904
Sketch Validation Parcels Reviewed	\$	20,219
(x) Sketch Validation Cost Per Unit	\$	0.30
(=) Sketch Validation Service Cost	\$	6,066
Subtotal Appraiser Cost	\$	14,904
(+) Sketch Validation Service Cost	\$	6,066
Total Project Cost	\$	20,970

Total Value Added	\$	9,537,915
(x) Average Tax Rate		\$2.50 Per \$1,00
Total Taxes Gained Year 1	\$	238,448

Total Cost to District	\$	20,970
Total Taxes Gained Year 1	\$	238,448
ROI		1037%

Aerial Imagery – Not just for bird’s eye views!



Sketch Validation Countywide Results:

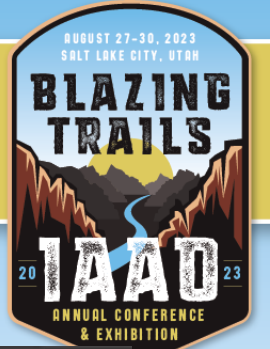
2016 Sketch Validation ROI Countywide

Appraiser Hours Spent	1973
(x) Approximate Salary Per Hour	\$ 24.00
Subtotal Appraiser Cost	\$ 47,352
Sketch Validation Service Cost	\$ 49,966
Total Project Cost	\$ 97,318

Total Value Added	\$28,203,402
(x) Average Tax Rate	\$2.50 Per \$1,00
Total Taxes Gained Year 1	\$ 705,085

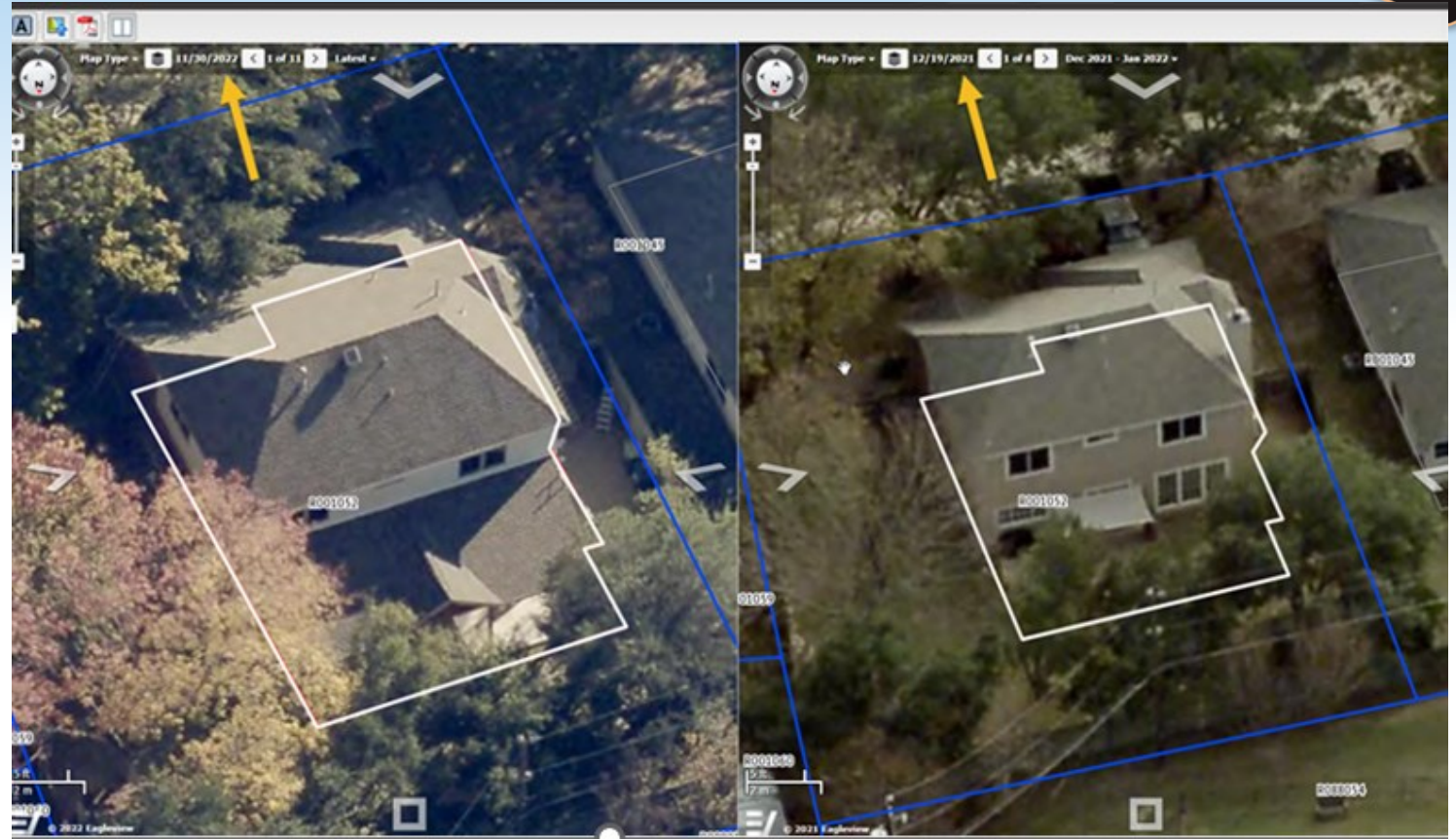
Total Cost to District	\$ 97,318
Total Taxes Gained Year 1	\$ 705,085
ROI	625%

Aerial Imagery – Not just for bird's eye views!

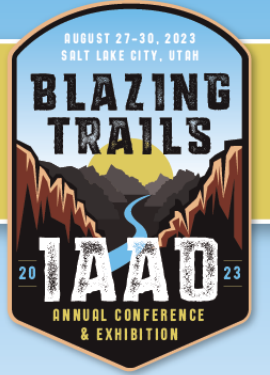


Change Detection

- Began 2015
- Initial yearly flight coverage decisions
- Total county high res. now



Aerial Imagery – Not just for bird’s eye views!



Change Detection

- 2016- \$510,783 647%
- 2018- \$635,282 684%
- 2019- \$1,055,765 867%
- 2021- \$937,733 746%
- 2022- \$1,358,392 989%
- 2023- \$1,532,798 938%

2015 Change Finder Results

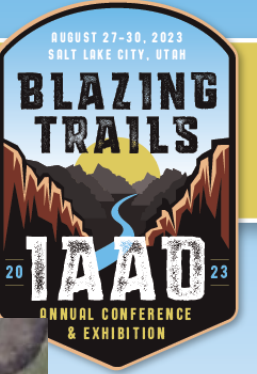
Countywide

Appraiser Hours Spent		1532
(x) Approximate Salary Per Hour	\$	24.00
(=) Subtotal Appraiser Cost	\$	36,768
Change Finder Service Cost	\$	42,911
Subtotal Appraiser Cost	\$	36,768
(+) Change Finder Service Cost	\$	42,911
Total Project Cost	\$	79,679

Total Value Added	\$	14,337,704
(x) Average Tax Rate		\$2.50 Per \$100.00
Total Taxes Gained Year 1	\$	358,443

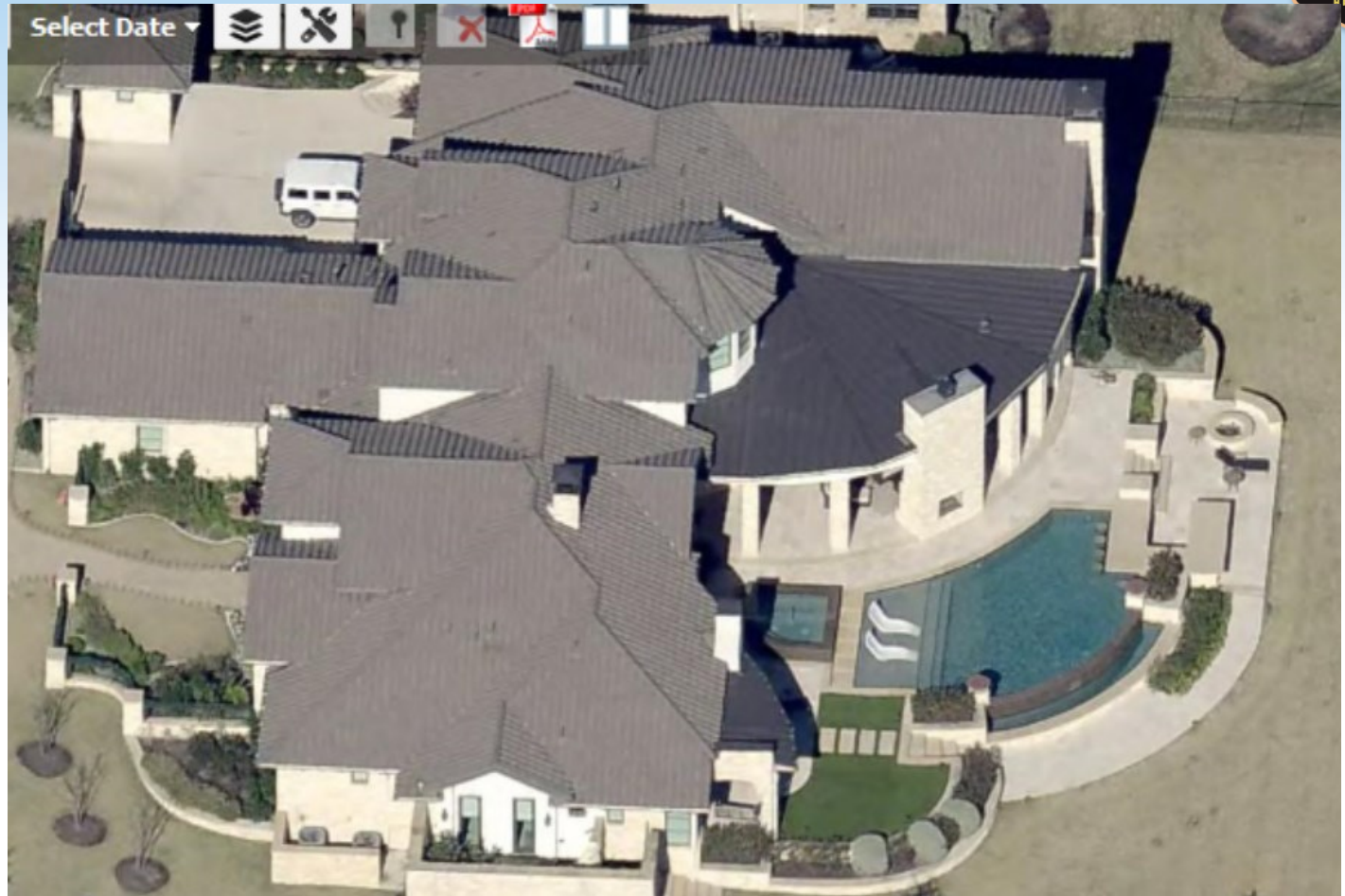
Total Cost to District	\$	79,679
Total Taxes Gained Year 1	\$	358,443
ROI		450%

Aerial Imagery – Not just for bird's eye views!

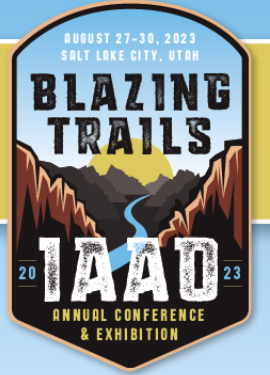


Pool Detection

- Began 2015
- Every 3 years



Aerial Imagery – Not just for bird’s eye views!



Pool Detection

- 2015 - \$358,055 2,292%
- 2018 -
- 2021 - \$1,154,471 1,793%
- 2024 – This Fall

2015 Pool Finder Test Project	
Countywide	
784 Parcels Reviewed	
Appraiser Hours Spent	54
(x) Approximate Salary Per Hour	\$ 24.00
(=) Subtotal Appraiser Cost	\$ 1,296
Pool Finder Service Cost	\$ 14,323
Subtotal Appraiser Cost	\$ 1,296
(+) Pool Finder Service Cost	\$ 14,323
Total Project Cost	\$ 15,619
Total Value Added	\$ 14,322,182
(x) Average Tax Rate	\$2.50 Per \$100.00
Total Taxes Gained Year 1	\$ 358,055
Total Cost to District	\$ 15,619
Total Taxes Gained Year 1	\$ 358,055
ROI	2292%



Aerial Imagery – Not just for bird's eye views!



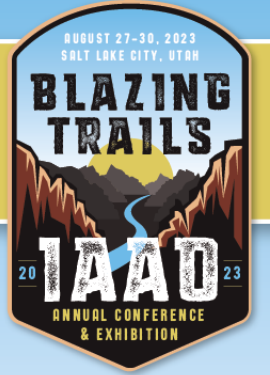
Creative pool project

- MRA Valuation taking place
- Pool and the sf are significant variables in regression model
- No longer a single value for Y or N
- Ability to value and adjust for size

3 Possible Options

1. Send appraisers out to the field to measure approx. 12,000 pools
2. Have staff trace pools over aerial imagery
3. Outsource

Aerial Imagery – Not just for bird’s eye views!



Scope

Create polygons for each known pool in Williamson County

- Working from a parcel file WCAD provided to “Pushpin” with the CAD’s pool info
- Only draw in-ground pools

Collect any new pools that reviewers happen to see

Project Details

Explored using AI/machine learning, but was cost prohibitive for a one-off project

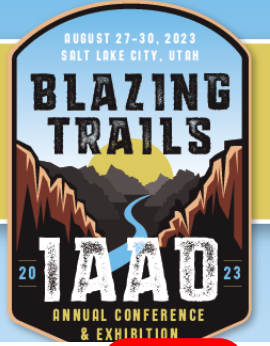
Entirely manual review at a cost of \$.15/parcel

About 12,000 parcels were reviewed

Project cost: ~\$1,800

Project duration: 3 weeks

Aerial Imagery – Not just for bird’s eye views!

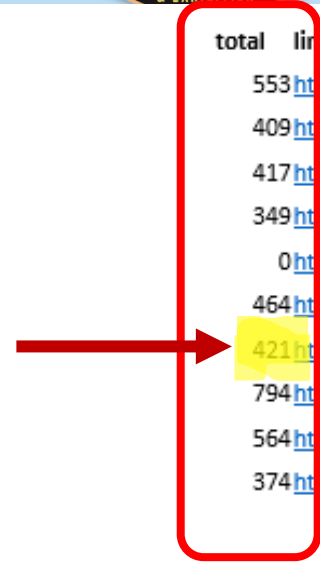


Deliverables

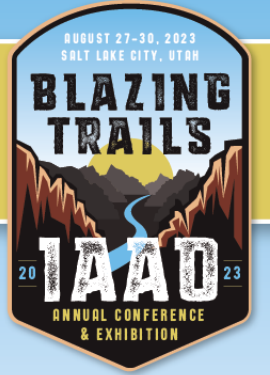
- Polygons delivered in kml format
- Attributes also delivered as csv
- The project also included online map/viewer for staff to review the results

parcel	address	latitude	longitude	sector	buildings	areas	total	link
R469910		30.73879885	-97.71009707	2301	2512;41		553	http://push
R096829		30.54852176	-97.83486747	1180	1409		409	http://push
R064142		30.49719963	-97.6655665	2874	1417		417	http://push
R407002		30.56843892	-97.67511149	2782	1349		349	http://push
R032679		30.53622903	-97.75667964	1978	0		0	http://push
R415331		30.51706596	-97.59370224	3476	2423;41		464	http://push
R379207		30.51051226	-97.60002701	3476	1421		421	http://push
R411407		30.49917139	-97.78432077	1674	2764;30		794	http://push
R361213		30.45749827	-97.76031576	1970	1564		564	http://push
		30.55460263	-97.56640844	3781	1374		374	http://push

Type	Description	St Cd, HS, Type	Class	Improvements			
				Area	Area Factor	Adjusted Area	Perimeter
MA	Main Area	A1 Y R	R4	1,587		1,587	172
MA2	Second Floor	A1 Y R	R4	1,487		1,487	203
G	Garage	A1 Y R	R4	550	50	275	94
OP	Open Porch	A1 Y R	R4	41	25	10	28
CP	Carport	A1 Y R	R4	275	25	69	72
P	Patio	A1 Y SP		118		118	43
CSP	Concrete Pool	A1 Y R	R4	421		421	96
FP	Fireplace	A1 Y R	R4	1		1	



Aerial Imagery – Not just for bird’s eye views!



Results:

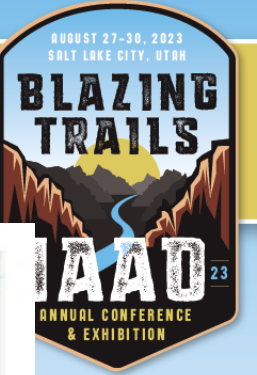
- Deliverable overlying aerial imagery:
- Clear view of pool
- Obscured view of pool
- Reviewer inferred shape of pool outline in obscured areas
- Surprisingly accurate when compared to actual outline
- No returned data

Other Benefits:

- Corrected erroneous/obsolete information
- Filled in pools located
- Corrected pool types – CSP vs. above ground
- More detailed valuation and adjustments for property owners







Aerial Imagery – Another creative use - “Rollback Finder”



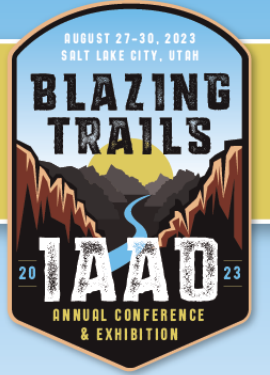
Changes in land use
“Hyperverge”
&
“Quantarium”



-  Maybe
-  No
-  Yes
-  Other



Aerial Imagery – Another creative use

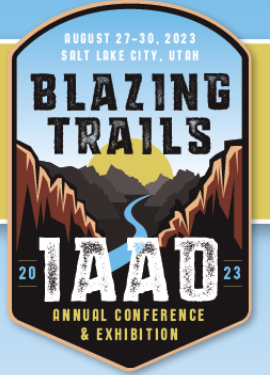


Changes in land use

Hyperverge Rollback Finder Results (2017-2021)

Appraiser Hours Spent	350
(x) Approximate Salary Per Hour	\$ 35.00
(=) Subtotal Appraiser Cost	\$ 12,250
Hyperverge Cost	\$ 12,600
Total Project Cost	\$ 24,850
Total Rollback Tax Dollars (1-5 years of rollback)	\$ 9,172,878
Total Cost to District	\$ 24,850
Total Taxes Gained Year 1	\$ 9,172,878
ROI	36913%

Imagery – Possible Future Use Consideration



Street-level or aerial images

- **Percent Complete Detail**
- **Properties in levels of construction**
- **Builders Inventory**



The Past vs. The Present



What will the Future hold ?

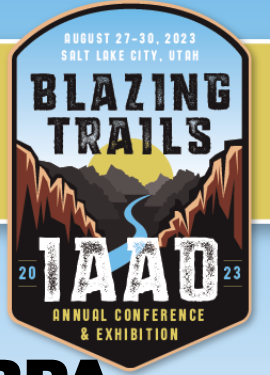




THANK YOU



Questions?



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