Residential Revaluation

Summary Report

2015 Mass Appraisal
of Saltwater Neighborhoods
for 2016 Taxes

Prepared For

Steven J. Drew

Thurston County Assessor

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page.

CERTIFICATE OF APPRAISAL

I certify that, to the best of my knowledge and belief:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are my personal, impartial and unbiased professional analysis, opinions, and conclusions.
- I have no (or the specified) present or prospective interest in the property that is the subject of this report, and I have no (or the specified) personal interest with respect to the parties involved.
- I have performed no (or the specified) services, as an appraiser or in any other capacity, regarding the property that is the subject of this report within the three-year period immediately preceding acceptance of this assignment.
- I have no bias with respect to any property that is the subject of this report or to the parties involved with this assignment.
- My engagement in this assignment was not contingent upon developing or reporting predetermined results.
- My compensation for completing this assignment is not contingent upon the reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- My analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with *the Uniform Standards of Professional Appraisal Practice.*
- I have not personally inspected all of the properties that are the subject of this report. Other appraisers involved in the review of property are listed on the following page.
- No one provided significant mass appraisal assistance to the person(s) signing this certification in the final opinion and conclusions of this report. However, mass appraisal requires a division and specialization of some tasks. I may or may not have been involved in some specific tasks. Although, I did review the conclusions included in this report.

Appraiser # 035, Appraisal Analyst ___(signature on file)_____Date _____

APPRAISAL TEAM

Often teams of appraisers complete one or more parts of a mass appraisal. Major contributors to this appraisal project include the following:

Physical Inspection Team:	007 - Appraiser Analyst 013 - Appraiser Analyst 028 - Senior Appraiser 029 - Appraiser Analyst 030 - Senior Appraiser 035 - Appraiser Analyst 037 - Senior Appraiser 042 - Senior Appraiser 050 - Senior Appraiser 054 - Appraiser Analyst 056 - Appraiser Analyst 057 - Senior Appraiser 063 - Senior Appraiser
Sales Validation:	007 - Appraiser Analyst 013 - Appraiser Analyst 029 - Appraiser Analyst 035 - Appraiser Analyst 054 - Appraiser Analyst 056 - Appraiser Analyst
Analysis and Model Building:	007 - Appraiser Analyst 013 - Appraiser Analyst 035 - Appraiser Analyst 056 - Appraiser Analyst
Final Review:	062 - Chief Deputy

MASS APPRAISAL CONCLUSIONS

Appraisal Date: **January 1, 2015**

Area Name / Number: **Regions 2 and 3 Salt Waterfront and corresponding neighborhoods**

Physical Inspection: **Last inspected in 2010**

Summary of Neighborhood Adjustments, and Sales Ratios:

2015 Saltwater Summary Statistics - 2016 Tax Year									
Nbhd	Region Group	New Land Adj.	New Bldg Adj.	# Sales	Mean Ratio	Median Ratio	Wtd. Mean Ratio	PRD	COD
09YS	17	0.95	1.05	8	.957	.955	.944	1.014	.097
11VS	07	1.03	1.17	10	.975	.935	.971	1.005	.076
11XS	02	0.97	1.14	20	1.029	.974	1.002	1.027	.149
12ZS	05	1.01	1.07	5	.940	.944	.950	.990	.025
13YS	14	1.03	1.23	39	.952	.946	.944	1.008	.101
13ZS	04	1.00	1.01	31	.953	.944	.952	1.001	.113
15XS	09	1.13	1.44	20	.944	.943	.932	1.013	.116
17ZS	22	1.07	1.22	16	.969	.940	.973	.995	.087
18YS	08	0.99	1.09	19	.958	.932	.958	1.000	.165
20ZS	06	0.92	1.18	29	1.060	.967	1.026	1.034	.196
Overall				197	.978	.946	.965	1.013	.126

Sales used in Analysis: Sales used in the analysis are validated following the guidelines laid out in the Sales Verification Procedure. Multi-parcel and multi-building sales are generally excluded as not being representative of this market area. Mobile home and condominium sales are also excluded from the analysis and valuation of standard single family residential construction. Mobile home and condominium sales are analyzed separately for the purpose of appraising these property types. . **Listings of the individual sales used in the analysis for any parcel can be found by utilizing the *Parcel Search (A+)* link on the Assessor's website at** http://www.co.thurston.wa.us/Assessor/**.**

Number of Parcels in the Population: The population of residential vacant land and standard single family residences within Region 02 and 03 Salt waterfront neighborhoods equals approximately 2900 parcels.

Conclusion and Recommendation: Since the values recommended in this report improve uniformity, assessment level, and equity, we recommend posting them for the 2016 Tax Roll.

PREMISE OF THE APPRAISAL

Supporting Documents Used in the Mass Appraisal

"A mass appraisal is the process of valuing a universe of properties as of a given date using standard methodology, employing common data, and allowing for statistical testing."[1]

A mass appraisal for ad valorem taxes is a complicated process involving large amounts of data, gathered and analyzed by teams of appraisers. We do not intend this document to be a self-contained documentation of the mass appraisal but to summarize our methods, data, and to guide the reader to other documents or files, upon which we relied. These documents may include the following:

- Individual property records maintained in a computer database
- Sales ratios and other statistical studies
- Market studies
- Model building documents
- Real estate sales database.
- Previous studies and reports filed in our office.
- Assessor's manuals for data collection analysis.
- Revaluation and sales verification manuals
- Property Tax Advisory Publications by the Washington State Dept. of Revenue.
- Title 84 RCW Property Tax Laws (Washington State Law)
- WAC 458 (Washington Administrative Code)
- Guidelines published by the International Association of Assessing Officers (IAAO)

The Appraisal Standards Board of the Appraisal Foundation biennially publishes the *Uniform Standards of Professional Appraisal Practice* (USPAP). This cycle is subject to the 2014-2015 edition. These standards are written by appraisers to regulate their profession and are the minimum standards for the conduct of property appraisal in the United States. They cover real, personal, and business property. We rely upon these standards in the development and reporting of our assessed values.

[1] USPAP, Appraisal Standards Board of the Appraisal Foundation, p. 3

CLIENT AND INTENDED USERS

This report was prepared for Steven J. Drew, Thurston County Assessor.

The primary intended users are the governing board and levy authority for:

Thurston County
Timberland Regional Library
Medic One
Port of Olympia
PUD 1
Tanglewide Park and Rec
North Thurston SD 3
Olympia SD 111
Rainier SE 307
Rochester SD 401
Tenino SE 402
Tumwater SD 33
Yelm SD
Centralia as 401-L
Griffin SD 324
City of Bucoda
City of Lacey
City of Olympia
City of Rainier
City of Tumwater
City of Tenino
City of Yelm
Fire District 1
Fire District 2
Fire District 3
Fire District 4
Fire District 5
Fire District 6
Fire District 7
Fire District 8
Fire District 9
Fire District 11
Fire District 12
Fire District 13
Fire District 15
Fire District 16
Fire District 17
SE Thurston Regional Fire Authority
West Thurston Regional Fire Authority
Cemetery District 1
Cemetery District 2

Other intended users include the County Board of Equalization and the State Board of Tax Appeals.

ASSUMPTIONS AND LIMITING CONDITIONS

The Appraisal Summary Report, of which this statement is a part, is expressly subject to the following conditions:

This revaluation is a mass appraisal assignment resulting in conclusions of market value. No one should rely on this study for any purpose other than administration and distribution of ad valorem taxation. The opinion of value on any parcel may not be applicable for any use other than ad valorem taxation.

That the maps and drawings in this report are included to assist the reader in visualizing the property; however, no responsibility is assumed as to their exactness.

That the legal description, as given, is assumed correct. No survey or search of title of the property has been made for this report, and no responsibility for legal matters is assumed.

The report assumes good merchantable title and any liens or encumbrances that may exist have been disregarded.

The opinions and values shown in the report apply to the subject parcels only. The assessors made no attempt to relate the conclusions of this report to any other revaluations, past, present, or future.

The assumptions governing the use of multiple linear regression analysis have been met unless otherwise stated.

Unless otherwise stated in this report, the existence of hazardous substances, including without limitation asbestos, polychlorinated biphenyl, petroleum leakage, or agricultural chemicals, which may or may not be present on the property, or other environmental conditions, were not called to the attention of nor did the appraiser become aware of such during the appraiser's inspection. The appraiser has no knowledge of the existence of such materials on or in the property unless otherwise stated. The appraiser, however, is not qualified to test such substances or conditions. If the presence of such substances, such as asbestos, urea formaldehyde foam insulation, or other hazardous substances or environmental conditions, may affect the value of the property, the value estimates is predicated on the assumption that there is no such condition on or in the property or in such proximity thereto that it would cause a loss in value. No responsibility is assumed for any such conditions, not for any expertise or engineering knowledge required to discover them.

All properties are considered to be conveyed in fee simple with the full bundle, with the exception of separate lease-hold accounts. Exceptions will be noted on their individual record cards.

Generally, the appraiser does not have the benefit of an interior inspection. As a result, it is assumed that the interior condition is the same as the exterior. On those occasions in which an interior inspection is granted, the condition is reflective of the overall property. Those parcels which have had an interior inspection are noted on their individual record cards.

SPECIAL ASSUMPTIONS, LIMITING, AND HYPOTHETICAL CONDITIONS

We assume that none of the subject land or improvement(s) is contaminated or that any contamination would affect the value except as shown in individual property records or otherwise stated.

Unless otherwise noted on the individual property record, we assume that the property is not adversely affected by neighboring properties or other external environmental factors.

We assume that the interior of residences and structures are the same as the exterior visual review.

We assume that the current condition and features of the property are the same as of the date of its last inspection.

It is assume that the property is at its highest and best use as improved.

Because of budget restraints, we have not inspected all comparable sales. We have inspected the interiors of only a small percentage of the properties.

We believe that our screening process is adequate to capture arms length property sales. Some arm's length transactions do not actually reflect their market value and were not used for either modeling or ratio studies per trimming guidelines of IAAO

JURISDICTIONAL EXCEPTION

Washington exempts all or a portion of the market value on specific types of property including "open space," agricultural, forest, home improvement, and some low-income housing.

PURPOSE AND INTENDED USE

The intended use of this appraisal is for administration of ad valorem taxation. After certification by the Assessor, these values will be used as the basis for assessment of real estate taxes payable in 2016. We do not intend the values to be used for or relied upon for any other purpose.

This report serves as a record of the revaluation which is subject to review and change by the County Board of Equalization, the Washington State Board of Tax Appeals, and the courts.

TRUE AND FAIR VALUE

The basis of all assessments is the true and fair value of property. True and fair value means market value (Spokane etc. R. Company v. Spokane County, 75 Wash. 72 (1913): Mason County, 62 Wn. 2d (1963); AGO 57-58, No. 1/8/57; AGO 65-66, No. 65, 12/31/65)

The true and fair value of a property in money for property tax valuation purposes is its "market value" or amount of money a buyer willing but not obligated to buy would pay for it to a seller willing but not obligated to sell. In arriving at a determination of such value, the assessing officer can consider only those factors which can within reason be said to affect the price in negotiations between a willing purchaser and a willing seller, and he must consider all of such factors. (AGO 65,66, No. 65, 12/31/65)

DATE OF APPRAISAL

Properties are appraised as of January 1, 2015.

This report was completed June 11, 2015.

PROPERTY RIGHTS APPRAISED

This appraisal is of the fee simple interest in the real property. The fee simple estate is the absolute ownership unencumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat.[2]

PERSONAL PROPERTY NOT INCLUDED IN THE APPRAISAL

No personal property was included in the value. Fixtures are generally accepted as real property. Business value is intangible personal property and it is not appraised.

MARKET AREA AND PROPERTIES APPRAISED

The subject of this mass appraisal is the residential property (excluding mobile homes and condominiums) contained in the market area designated as the Region 02 and 03 saltwater front neighborhoods. Regions are generally influenced by the same broad market trends. This area includes approximately 2600 properties and is shown on the map on page 9 of this report.

Our property records contain photographs, sketches, legal descriptions and other characteristics of land and buildings on each property.

CITY AND NEIGHBORHOOD DESCRIPTION

Region 02 and 03 Saltwater front properties include all residential properties in Thurston County along the south Puget Sound, and some properties just off the water deemed to have a saltwater influence. The primary access roads include Steamboat Island Road, Cooper Point Road, East Bay Road, Boston Harbor Road, Libby Road, and Johnson Point Road.

This region is further broken into 10 residential neighborhoods that are designed to reflect similar land and building characteristics and neighborhood amenities. The neighborhoods and their codes are shown on pages 10-12. They are all considered to be stable in terms of the life cycle of a neighborhood.

ZONING

Thurston County exercises jurisdiction over land use and community planning. The regulations for use and development can be found in its ordinances. We show property zoning as a land characteristic on our digital maps.

[2] *The Dictionary of Real Estate Appraisal. 3rd ed.* Appraisal Institute, p.140

HIGHEST AND BEST USE

True and fair value -- Highest and best use. Unless specifically provided otherwise by statute, all property shall be valued on the basis of its highest and best use for assessment purposes. Highest and best use is the most profitable, likely use to which a property can be put. It is the use which will yield the highest return on the owner's investment. Any reasonable use to which the property may be put may be taken into consideration and if it is peculiarly adapted to some particular use, that fact may be taken into consideration. Uses that are within the realm of possibility, but not reasonably probable of occurrence, shall not be considered in valuing property at its highest and best use. [WAC 458-07-30 (3)]

The highest and best use concept is based upon traditional appraisal theory and reflects the attitudes of typical buyers and sellers. The market sets the highest and best use based on the theory of wealth maximization for the owner with consideration given to community goals.

To estimate highest and best use, four elements are considered:

1. Possible use. What uses of the site in question are physically possible?

2. Permissible legal use. What uses of the site are permitted by zoning and deed restrictions?

3. Feasible use. Which possible and permissible uses will produce a net return to the owner of the site?

4. Highest and best use. Among the feasible uses, the use which will produce the highest net return or the highest present worth?

The highest and best use of the land or site if vacant and available for use may be different from the highest and best use of the improved property. This is true when the improvement is not an appropriate use, but it contributes to the total property value.

For the purpose of this appraisal the highest and best use of all vacant and improved property is considered to be single family residential or related to single family residential use.

SCOPE OF THE APPRAISAL

Under state law, the assessor receives a copy of each Real Estate Excise Tax Affidavit and is therefore privy to the sale price, date, and description of all real estate sales. Our staff compiles and verifies this data into our sales database as explained in our sales verification procedure.

Thurston County is on a six-year revaluation cycle. Every property is revalued annually. At least once each six years, each property is inspected and its data refreshed. The assessor collects property characteristic data as discussed in our Residential Data Standards Manual. Other than new construction, the last physical inspection of residential property in the waterfront areas of Region 2 and Region 3 was during the first half of 2010. A region map is included on next page followed by maps of the various salt waterfront neighborhoods within regions 2 and 3.

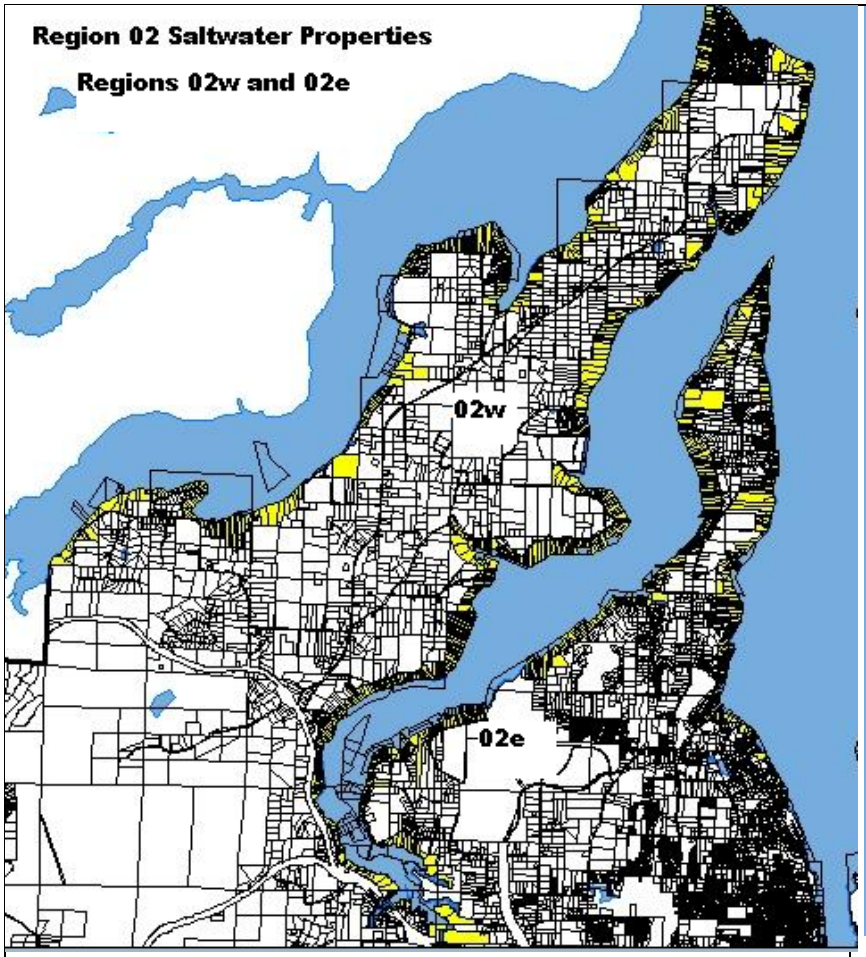
The appraisal considers the cost approaches to value with sales used to calibrate the model to a specific neighborhood. Neighborhood adjustments are widely used to adjust for time and location and are a normal and standard part of the cost approach to value. The Marshall Swift cost manual provides what they call current cost multipliers and local area multipliers to adjust for time and location. Because this is a national valuation service, we fine tune their cost rates even further to consider differences between neighborhoods and local market trends.

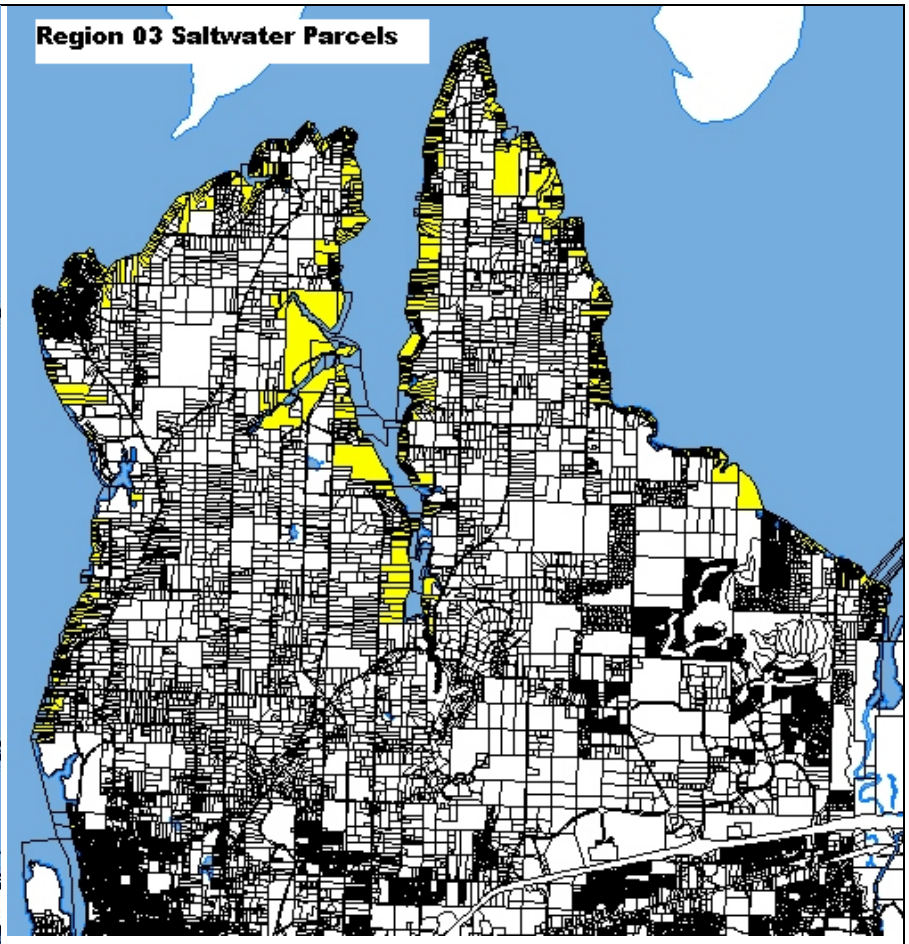
Whether we make these adjustments to the raw land and cost rates or to the preliminary cost values, does not impact the mathematical calculation and does not affect the final result. It is more convenient to apply the time and location adjustments to the preliminary cost values, because it makes the statistical updating of values from year to year much easier.

A market model (strict sales approach) has not been developed for 2015 due to time and budget limitations. The use of an income approach was not considered to be applicable because homes in this area are not typically purchased for their income potential.

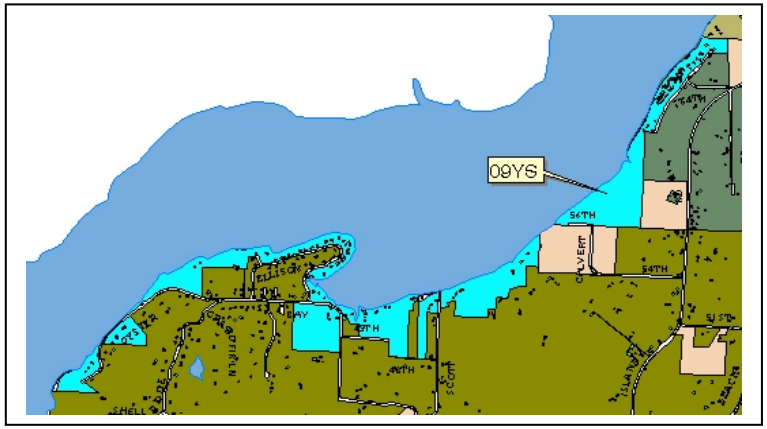
The flow chart on page 15 describes the land model developed as part of the mass appraisal process and how it is used in the sales adjusted cost approach. The model is discussed in more detail starting on page 16.

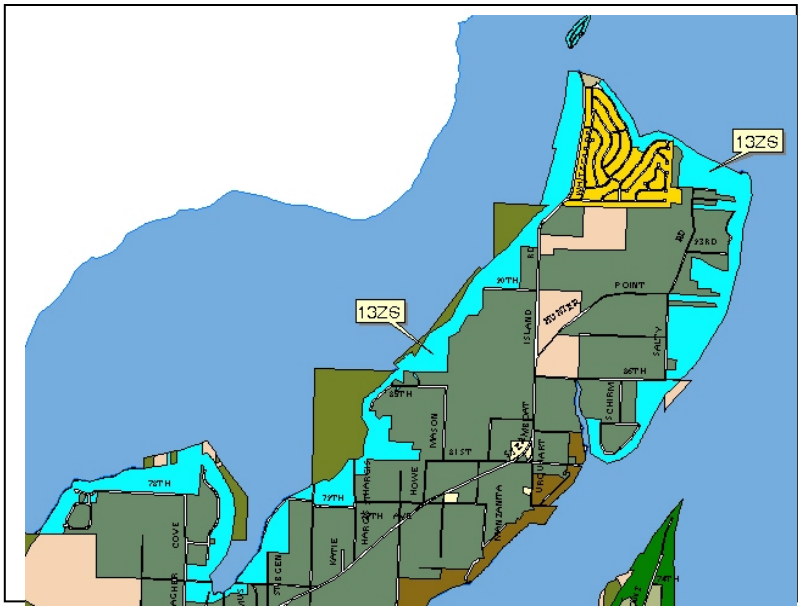
REGIONS 2 & 3 MAP

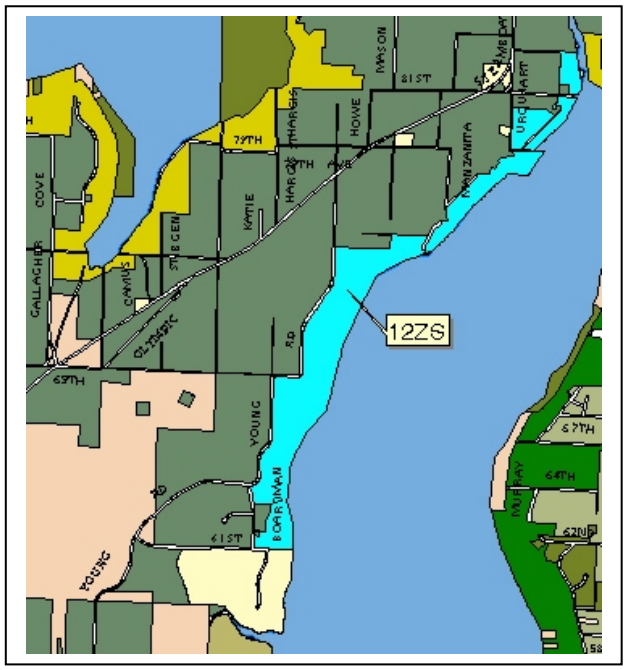




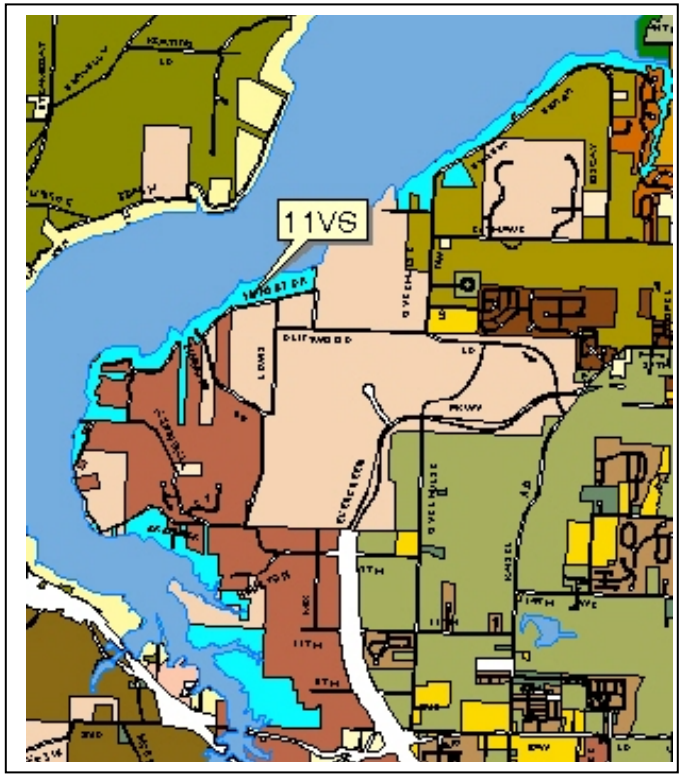
NEIGHBORHOOD MAPS-REGION 02W

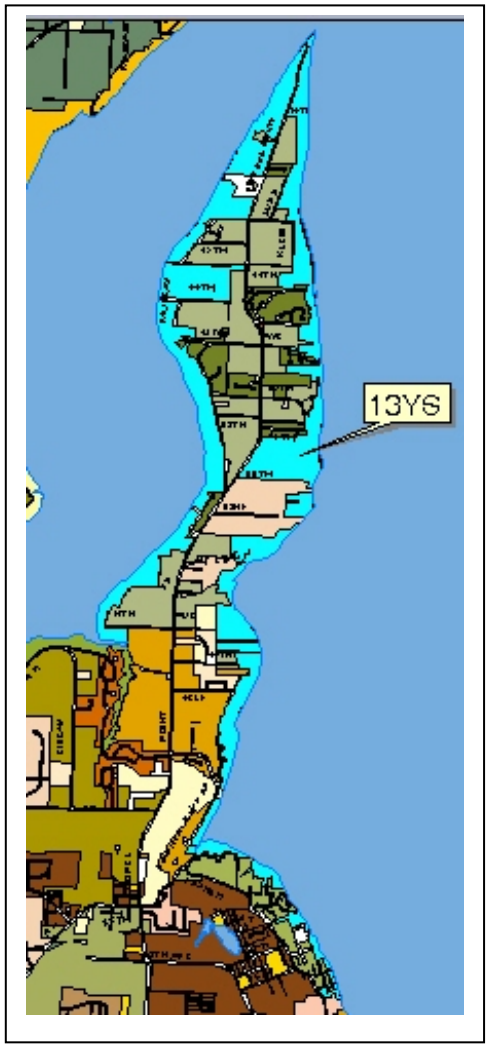




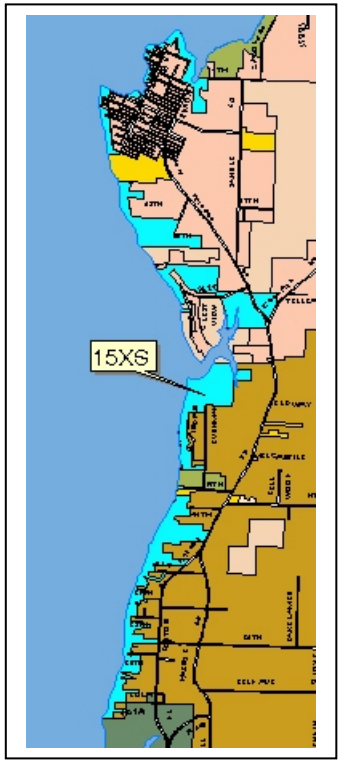


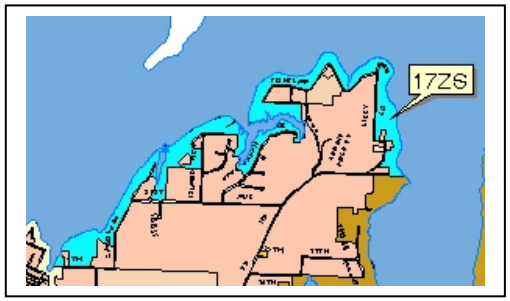
NEIGHBORHOOD MAPS-REGION 02E

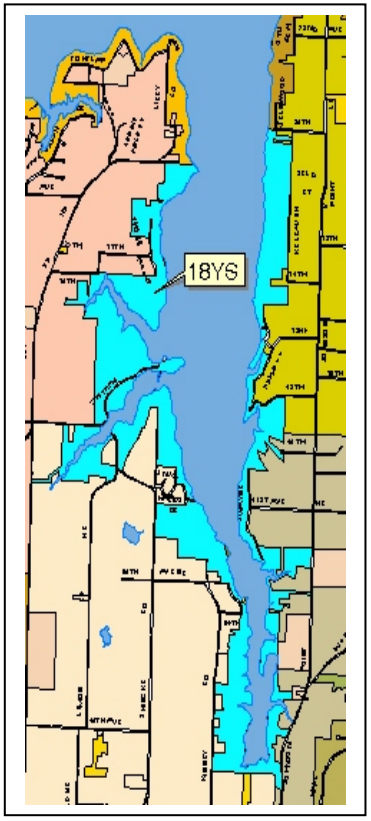


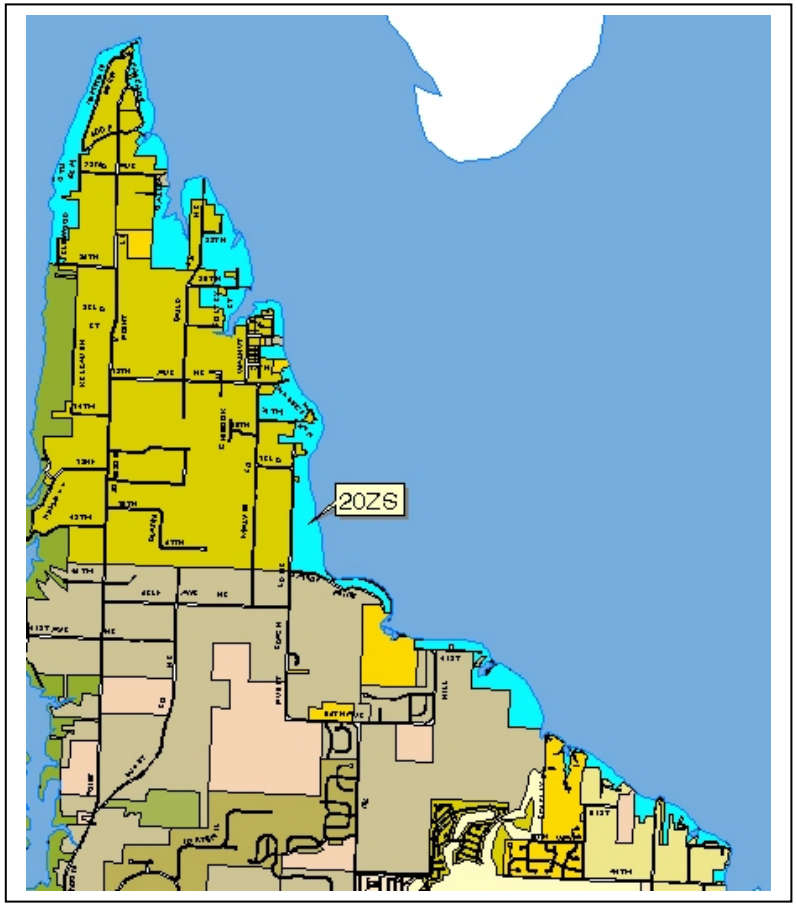


NEIGHBORHOOD MAPS-REGION 03

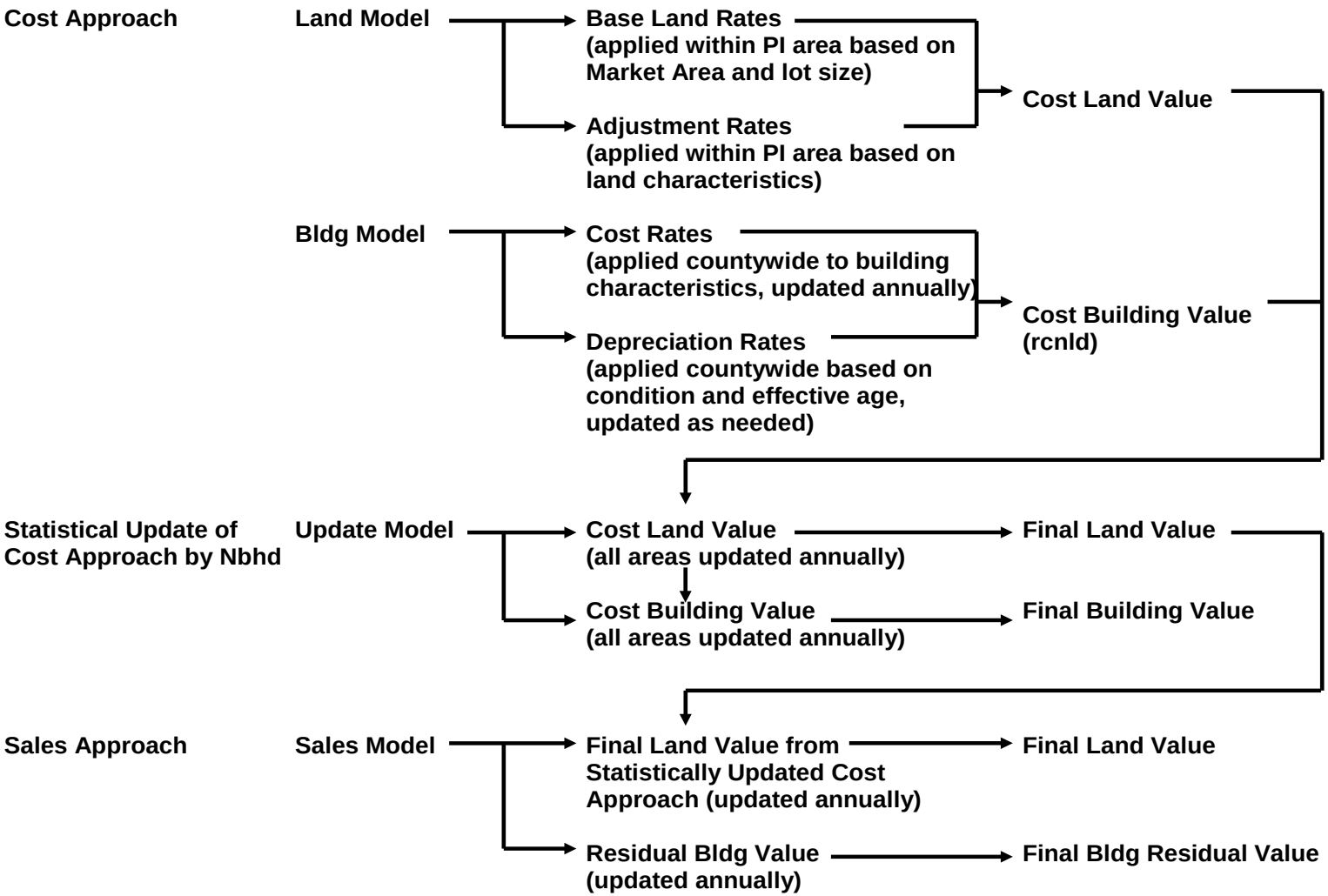








RESIDENTIAL VALUATION PROCESS



COST APPROACH

Land Model Specification

- **A multiplicative model format is used in the development of base land rates and adjustment rates.**
- **Land Model Format:**

$LV = b_0 \times SQFT^{b1} \times LINVIEW^{b2} \times b_3^{LI3} \times b_4^{LI4} \times b_5^{LI5} \times \ldots$

Where: Continuous Variables = SQFT, LINVIEW
Binary Variables LI3, LI4, LI5 . . . = Land Influences (i.e. – region, view, wetlands, etc.)
$b_0, b_1, b_2, b_3, b_4, b_5 \ldots$ = Regression Coefficients

Land Model Calibration

- **Multiplicative model calibrated using log-linear MRA**
- **Logarithms are used to convert a multiplicative equation to a linear form.**

Standard Multiplicative form: $SP/FF = a * FF^b * c^{region} * d^{VIEW} \ldots$
Log Linear form: LN(SP/FF *DEPTH) = LN(a) + (b * LN(FF)) + (LN(c) * REGION) + . . .

- **Log Linear form has the same form as a standard linear equation:**

Linear equation: Y = a + (b * X) + (c * Z)

- **We can then calibrate the Log-Linear form using standard multiple regression analysis.**
- **The calibrated model is then converted back to its Standard Multiplicative form by applying the anti-log function.**

EXP[LN(SP/(FFxDEPTH))] = EXP[LN(a) + (b * LN(FF) + (c*LN(DEPTH)))]

- **Region 02 and 03 saltwater front neighborhoods Land Model –** see saltwater neighborhood work files for model coefficients and other output.

Multiple Regression Analysis Assumptions

Multiple regression analysis is based on several assumptions regarding the data going into the model and the output from the calibration process. These assumptions are validated to determine the accuracy of the model and identify any limitations that may exist. A detailed discussion of the MRA assumptions is included in the Appendix.

Comments on Representation of Variables in the Model

Some less common land influences were not represented or were under represented in the saltwater land model. In that case, appraiser experience, previous models, extrapolation, and appraisal principles were employed to develop multipliers.

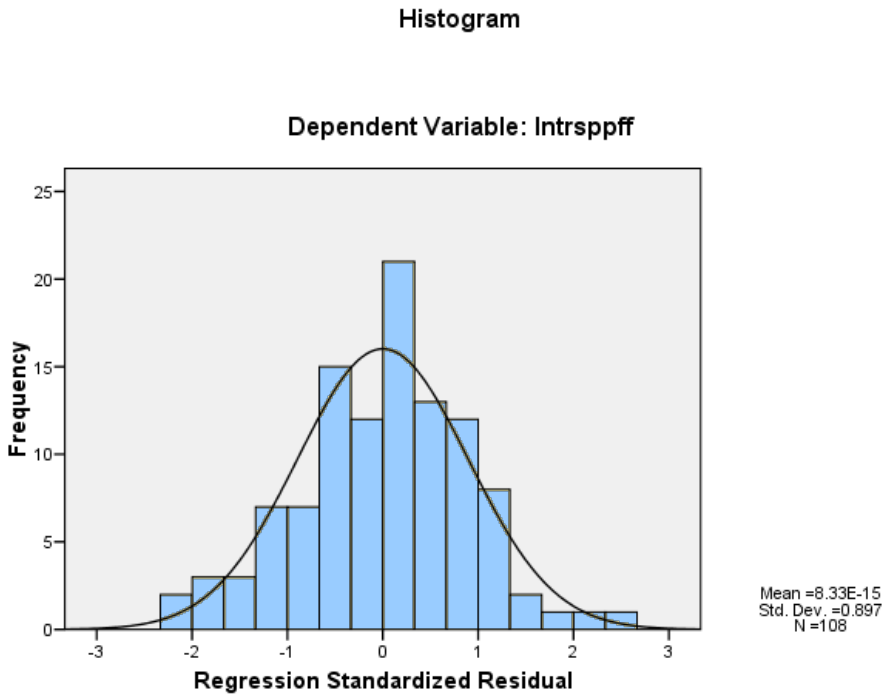
For example, only 36 of the 2600 parcels in the salt waterfront neighborhoods are coded with a FR quality influence. As a result, only one sale with the FR quality neighborhood influence was included in the model, which in turn did not produce a valid adjustment. In this case, the FR quality adjustment was extrapolated from the GD quality coefficient.

Because the negative shape influence was not represented in the model and the positive shape influence was only minimally represented, it was decided to retain the adjustments from the previous model.

Likewise, the model coefficients for wetlands were not used due to the shortage of saltwater sales that included this characteristic. In this case, the wetland adjustments from the upland models were applied to the saltwater land rates.

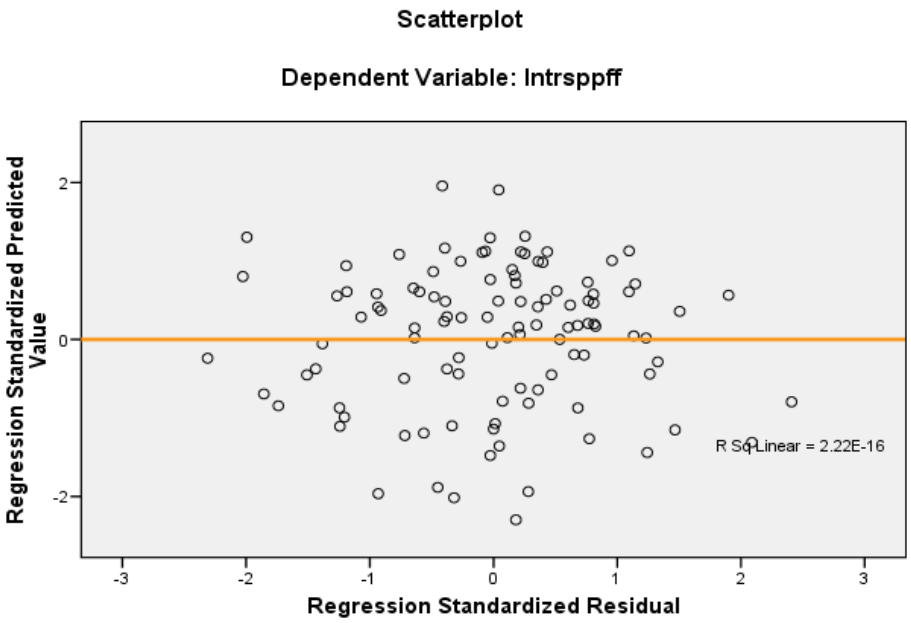
VALIDATION OF REGION 3 LAND MODEL

Normal Distribution of the Residual Errors



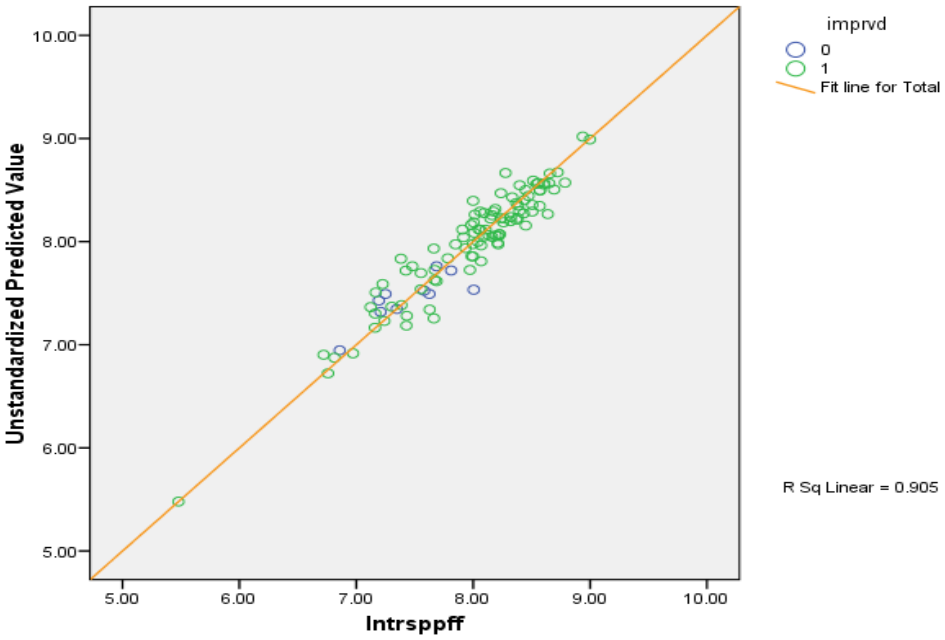
- Total number of sales = 108 (from 1/1/07– 12/31/09 trended to 1/1/10)
- Region 02 and 03 saltwater front neighborhoods sales = 108
- The residual errors are for the most part normally distributed.
- While the frequency distribution illustrates output from the square foot land model, similar results were obtained for the acreage model.

Constant Variance of the Residual Errors



- The residual errors are for the most part are distributed evenly along the range of values.

Comparison of Predicted and Actual Sale Price per Front Foot



- The values predicted by the model accurately reflects actual trended sale prices.

Region 02w Salt Waterfront Neighborhoods Front Foot Rate Table

Region 2w Front Foot Model								
Front Foot Adjustment Factors:								
	Land Flag	**Front Feet**	**FF Value**	**Base Rate**	**FF Rate Group**	**FF Adj Group**	**Size Adj. Ratio**	**FF Adj Factor**
	1740	50	$ 3,397	$ 1,650	3525	2525	0.333	2.07
	1740	75	$ 2,598	$ 1,650	3525	2525	0.500	1.58
	1740	100	$ 2,148	$ 1,650	3525	2525	0.667	1.31
base size>	1740	150	$ 1,643	$ 1,650	3525	2525	1.000	1.00
	1740	200	$ 1,359	$ 1,650	3525	2525	1.333	0.83
	1740	250	$ 1,172	$ 1,650	3525	2525	1.667	0.71
	1740	300	$ 1,039	$ 1,650	3525	2525	2.000	0.63
	1740	350	$ 938	$ 1,650	3525	2525	2.333	0.57
	1740	400	$ 859	$ 1,650	3525	2525	2.667	0.52
Depth Adjustment Factors:								
	Land Flag	**Lot Depth**	**FF Value**	**Base Rate**		**Depth Adj Group**	**Size Adj. Ratio**	**Depth Adj Factor**
	1740	100	$ 1,424	$ 1,650		2530	0.286	0.87
	1740	200	$ 1,542	$ 1,650		2530	0.571	0.94
base size>	1740	350	$ 1,643	$ 1,650		2530	1.000	1.00
	1740	500	$ 1,711	$ 1,650		2530	1.429	1.04
	1740	650	$ 1,763	$ 1,650		2530	1.857	1.07
	1740	800	$ 1,806	$ 1,650		2530	2.286	1.10
	1740	950	$ 1,841	$ 1,650		2530	2.714	1.12
	1740	1100	$ 1,872	$ 1,650		2530	3.143	1.14
Land Influences and Multipliers:								
Lmt View	**Good View**	**VGd. View**	**Exc. View**	**Lagoon**	**Low Bank**	**Med. Bank**	**High Bank**	
0.85	1.00	1.15	1.25	0.70	1.00	0.90	0.80	
Steep Topo	**Fair Nbhd**	**Avg. Nbhd**	**Good Nbhd**	**Pos Shape**	**Neg. Shape**	**Tidelands**		
0.85	0.85	1.00	1.20	1.15	0.80	1.02		
W2	**W4**	**W6**	**W8**	**W0**	**RS**	**GR**		
0.90	0.80	0.65	0.55	0.30	0.50 - 0.85	0.95		

Region 02e Salt Waterfront Neighborhoods Front Foot Rate Table

Region 2e Front Foot Model								
Front Foot Adjustment Factors:								
	Land Flag	**Front Feet**	**FF Value**	**Base Rate**	**FF Rate Group**	**FF Adj Group**	**Size Adj. Ratio**	**FF Adj Factor**
	1740	50	$ 3,956	$ 1,900	3575	2575	0.333	2.07
	1740	75	$ 3,026	$ 1,900	3575	2575	0.500	1.58
	1740	100	$ 2,502	$ 1,900	3575	2575	0.667	1.31
base size>	1740	150	$ 1,914	$ 1,900	3575	2575	1.000	1.00
	1740	200	$ 1,582	$ 1,900	3575	2575	1.333	0.83
	1740	250	$ 1,365	$ 1,900	3575	2575	1.667	0.71
	1740	300	$ 1,210	$ 1,900	3575	2575	2.000	0.63
	1740	350	$ 1,093	$ 1,900	3575	2575	2.333	0.57
	1740	400	$ 1,001	$ 1,900	3575	2575	2.667	0.52
Depth Adjustment Factors:								
	Land Flag	**Lot Depth**	**FF Value**	**Base Rate**		**Depth Adj Group**	**Size Adj. Ratio**	**Depth Adj Factor**
	1740	100	$ 1,659	$ 1,900		2580	0.286	0.87
	1740	200	$ 1,795	$ 1,900		2580	0.571	0.94
base size>	1740	350	$ 1,914	$ 1,900		2580	1.000	1.00
	1740	500	$ 1,993	$ 1,900		2580	1.429	1.04
	1740	650	$ 2,053	$ 1,900		2580	1.857	1.07
	1740	800	$ 2,103	$ 1,900		2580	2.286	1.10
	1740	950	$ 2,144	$ 1,900		2580	2.714	1.12
	1740	1100	$ 2,180	$ 1,900		2580	3.143	1.14
Land Influences and Multipliers:								
Lmt View	**Good View**	**VGd. View**	**Exc. View**	**Lagoon**	**Low Bank**	**Med. Bank**	**High Bank**	
0.85	1.00	1.15	1.25	0.70	1.00	0.90	0.80	
Steep Topo	**Fair Nbhd**	**Avg. Nbhd**	**Good Nbhd**	**Pos Shape**	**Neg. Shape**	**Tidelands**		
0.85	0.85	1.00	1.20	1.15	0.80	1.02		
W2	**W4**	**W6**	**W8**	**W0**	**RS**	**GR**		
0.90	0.80	0.65	0.55	0.30	0.50 - 0.85	0.95		

Region 03 Salt Waterfront Neighborhoods Front Foot Rate Table

Region 3 Front Foot Model								
Front Foot Adjustment Factors:								
	Land Flag	**Front Feet**	**FF Value**	**Base Rate**	**FF Rate Group**	**FF Adj Group**	**Size Adj. Ratio**	**FF Adj Factor**
	1740	50	$ 3,665	$ 1,775	3650	2650	0.333	2.07
	1740	75	$ 2,804	$ 1,775	3650	2650	0.500	1.58
	1740	100	$ 2,318	$ 1,775	3650	2650	0.667	1.31
base size>	1740	150	$ 1,773	$ 1,775	3650	2650	1.000	1.00
	1740	200	$ 1,466	$ 1,775	3650	2650	1.333	0.83
	1740	250	$ 1,265	$ 1,775	3650	2650	1.667	0.71
	1740	300	$ 1,121	$ 1,775	3650	2650	2.000	0.63
	1740	350	$ 1,013	$ 1,775	3650	2650	2.333	0.57
	1740	400	$ 927	$ 1,775	3650	2650	2.667	0.52
Depth Adjustment Factors:								
	Land Flag	**Lot Depth**	**FF Value**	**Base Rate**		**Depth Adj Group**	**Size Adj. Ratio**	**Depth Adj Factor**
	1740	100	$ 1,537	$ 1,775		2655	0.286	0.87
	1740	200	$ 1,663	$ 1,775		2655	0.571	0.94
base size>	1740	350	$ 1,773	$ 1,775		2655	1.000	1.00
	1740	500	$ 1,847	$ 1,775		2655	1.429	1.04
	1740	650	$ 1,903	$ 1,775		2655	1.857	1.07
	1740	800	$ 1,948	$ 1,775		2655	2.286	1.10
	1740	950	$ 1,987	$ 1,775		2655	2.714	1.12
	1740	1100	$ 2,020	$ 1,775		2655	3.143	1.14
Land Influences and Multipliers:								
Lmt View	**Good View**	**VGd. View**	**Exc. View**	**Lagoon**	**Low Bank**	**Med. Bank**	**High Bank**	
0.85	1.00	1.15	1.25	0.70	1.00	0.90	0.80	
Steep Topo	**Fair Nbhd**	**Avg. Nbhd**	**Good Nbhd**	**Pos Shape**	**Neg. Shape**	**Tidelands**		
0.85	0.85	1.00	1.20	1.10	0.90	1.02		
W2	**W4**	**W6**	**W8**	**W0**	**RS**	**GR**		
0.90	0.80	0.65	0.55	0.30	0.50 - 0.85	0.95		

Note: The land model shown above covers all parcels valued by the front foot method on the salt waterfront of Thurston County. Exceptions to the front foot method include some back lots valued by the square foot or acre value method. There are two types of back lots. The first include lots that are valued on one parcel number having the first record valued by the front foot, and a second land record used to value the back portion of the lot separately. This second record is primarily used due to unusual shape or excess land. The second type of back lot is vacant land with a separate parcel number usually owned by the same person as the waterfront parcel. Additionally, some improved parcels that are not on the water are included in the saltwater neighborhood for trending purpose due to the saltwater influence. These parcels and back lots are valued by the SF or Acre models referred to in the respective Region 2 or Region 3 Mass Appraisal Reports.

BUILDING COST SPECIFICATION

- **Model Format for RCNLD:**

  $BV = [(c_1 X Q_1) + (c_2 X Q_2) + (c_3 X Q_3) + \ldots] X$ Pct. Good
  Where: Building Components = $Q_1, Q_2, Q_3 \ldots$
  Costs per unit = $c_1, c_2, c_3 \ldots$

2014 Cost Table Calibration

Introduction

Thurston County uses construction cost data from Marshall & Swift as the basis for our cost approach. While these rates include local area and current cost multipliers to produce a cost estimate that is more tailored to our market area, they do not produce the level of accuracy that is needed in the appraisal process. One way to calibrate the cost tables to the local market is to use actual construction costs obtained from local builders to compare to the replacement cost new calculated from the Marshall & Swift rates. Another alternative is to use sales of new construction to measure the actual cost new to compare to the RCN calculated from M&S. For residential property new construction was used to calculate a calibration factor. For commercial structures and detached structures there were no actual sales of new construction. For these structure types builder cost estimates were obtained and used to determine cost table calibration factor.

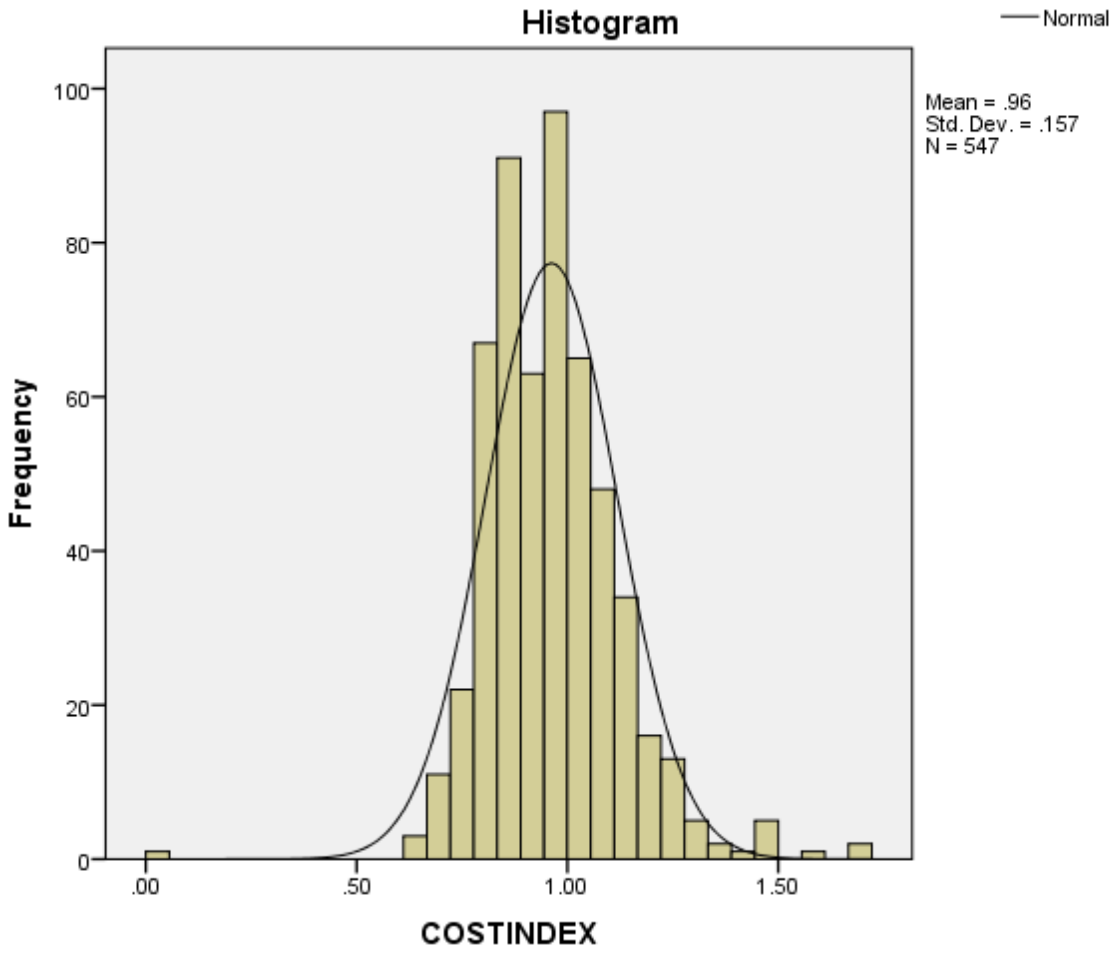
Residential

- ### Procedure

  All new construction sales were queried for 2015. A total of 547 sales of new homes were used in the analysis. A residual building cost was calculated by subtracting an estimate of the land value from the sale price. The assessed value of the land at the time of the sale was used for this purpose. The resulting building cost estimate was then compared to the system generated RCN (replacement cost new) to produce a cost index.

- ### Sales Analysis

  The histogram and descriptives table on the next page-demonstrate the need to reduce the cost table rates to produce a better match with the actual construction costs within our local market.



Descriptives

			Statistic	Std. Error
COSTINDEX	Mean		.9620	.00670
	95% Confidence Interval for Mean	Lower Bound	.9488	
		Upper Bound	.9752	
	5% Trimmed Mean		.9551	
	Median		.9564	
	Variance		.025	
	Std. Deviation		.15673	
	Minimum		.02	
	Maximum		1.72	
	Range		1.70	
	Interquartile Range		.19	
	Skewness		.568	.104
	Kurtosis		4.254	.209

The median and mean cost indexes are 0.9620 and 0.9564 respectively, indicating the need to reduce our cost tables by approximately 4%.

- **Conclusion**

The cost index is rounded to 0.95 and applied countywide to the residential cost tables. The market calibrated cost tables then provide a starting point for the determination of value at the neighborhood level. Sales are further analyzed to determine final land and building adjustments that take into consideration locational differences between neighborhoods.

Detached Structures

- **Procedure**

There were no sales of property that included only new detached structures or outbuildings. Therefore, the cost index was developed by surveying local contractors to determine actual construction cost. The total cost or per square foot cost rates were obtained for different building types, sizes, and qualities of construction. These costs were then compared to the CAMA system generated costs based on M&S rates to determine a cost index.

- **Data Analysis**

Parcel ID	Item	Size	Builder Cost	Our Cost	Cost Index	Sources
36700000701	Machine Shop/ Fair +	36 x 30	$16,000	$16,294	0.98	JOHNSON CUSTOM HOMES LLC
72402100600	UTB/ Avg Quality	26 x 36	$23,400	$24,815	0.94	ELKIN CONSTRUCTION
12631420104	Barn no Loft/Avg Q	37x36	$30,000	$35,949	0.83	STABLE SYSTEMS
12631420104	Lean to/Avg Q	12x37	$4,440	$4,347	1.02	STABLE SYSTEMS
43370000700	Pole Bldg/Fair+	42 x 30	$21,000	$22,315	0.94	TOWN AND COUNTRY POST AND FRAME BLDGS
70710007900	Utility Building/Avg Q	14 X 18	$7,800	$7,866	0.99	HOME RESOURCE CO
74270000800	Framed Garage/Avg Q	30 x 36	$30,000	$33,911	0.88	MILLER CONSTRUCTION
21624440101	Machine Shop/F+ Q	24 x 24	$8,000	$8,690	0.92	TWIN CITY METAL BLDGS
63550003300	PBN/AVG Q	24 x 36	$17,036	$17,859	0.95	ALL BUILDINGS CUSTOM DESIGN
13726210600	PBN/AVG Q	22 x 28	$17,178	$14,057	1.22	TOWN AND COUNTRY POST AND FRAME BLDGS
21613230401	Framed Garage/A+	24 x 30	$33,000	$28,541	1.16	CEDAR CREST CONSTRUCTION
13631330000	Pole Barn/F+	48 x 24	$20,000	$26,023	0.77	CB METAL BUILDINGS
11713120300	Pole Bldg/Avg Q	24 x 36	$21,012	$19,716	1.07	PLUMB LEVEL CONSTRUCTION
				Mean	**0.98**	
				Median	**0.95**	

We want the cost tables to reflect the more traditional method where materials are delivered to the site and the construction occurs from the ground up. The median cost index is not affected by these outliers as much as the mean, and in this case is the better measure to use in determining an appropriate factor to apply to the detached structure cost tables.

- **Conclusion**

The median cost index is rounded to 0.95 and applied countywide to the detached cost rates.

Construction Cost Tables

Marshall Swift cost rates, adjusted to the current year and local area, are used to determine the replacement cost of each residential improvement. Adjustments can also be made for various structure types and for other building components based on locally advertised building costs.

The complete set of rate tables is too lengthy to include here. However, an example of the rates for the main floor level of a residence by quality grade is shown below. The complete set of rate tables is stored within the Sigma CAMA System.

	SFLA	LOW	FAIR	AVG	GD	VGD	EXC	EXP
BASE-1STY-SS	600	73.89	78.17	87.37	102.65	115.57	161.09	225.53
BASE-1STY-SS	800	70.10	75.99	86.40	102.65	115.57	161.09	225.53
BASE-1STY-SS	1000	67.06	73.96	84.96	103.43	115.57	161.09	225.53
BASE-1STY-SS	1200	64.55	72.12	83.46	103.22	115.57	161.09	225.53
BASE-1STY-SS	1400	62.42	70.51	82.00	102.58	116.00	161.09	225.53
BASE-1STY-SS	1600	60.59	69.05	80.65	101.73	115.86	161.09	225.53
BASE-1STY-SS	1800	59.00	67.75	79.38	100.80	115.42	161.22	225.69
BASE-1STY-SS	2000	57.57	66.57	78.20	99.85	114.79	160.95	225.32
BASE-1STY-SS	2200	56.29	65.49	77.11	98.89	114.08	160.45	224.62
BASE-1STY-SS	2400	55.14	64.51	76.10	97.94	113.30	159.77	223.68
BASE-1STY-SS	2600	54.08	63.59	75.15	97.02	112.49	159.01	222.61
BASE-1STY-SS	2800	53.12	62.74	74.27	96.14	111.68	158.18	221.45
BASE-1STY-SS	3000	52.24	61.96	73.44	95.29	110.87	157.33	220.26
BASE-1STY-SS	3200	51.40	61.24	72.66	94.47	110.09	156.45	219.02
BASE-1STY-SS	3400	50.62	60.56	71.87	93.70	109.30	155.56	217.79
BASE-1STY-SS	3600	49.88	59.95	71.14	92.95	108.54	154.69	216.56
BASE-1STY-SS	4000	48.51	58.77	69.77	91.52	107.08	152.96	214.15
BASE-1STY-SS	4400	48.51	58.77	68.52	90.31	105.70	151.28	211.79
BASE-1STY-SS	4800	48.51	58.77	67.40	89.21	104.29	149.67	209.54
BASE-1STY-SS	5200	48.51	58.77	66.41	88.12	102.88	148.14	207.39

DEPRECIATION ANALYSIS

Effective Age

The effective age of a building is largely based on its overall condition. It is a measure of how old a building looks and not how old it actually is. As a result, any type of maintenance, repair, remodel, or renovation will tend to reduce the effective age. The more extensive the maintenance or repair work the more the effective age is reduced. This concept suggests that a very old building can be brought back to almost new condition, thereby reducing the effective age to a level that is typical of much newer construction.

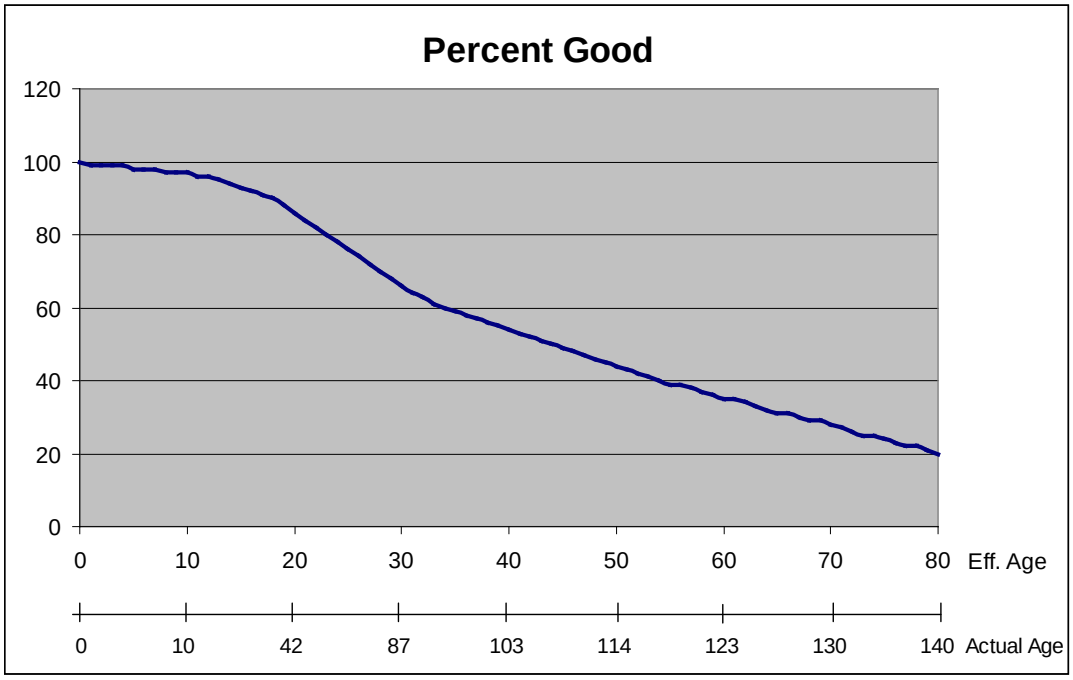
Depreciation Rate Tables

Periodically, the depreciation tables are calibrated using residential sales representing all years of construction. The most recent estimates of the land values are subtracted from the sale prices to determine the residual building values. These values are compared to the replacement cost new to arrive at an estimate of the percent good, which is then correlated with the effective age of the building to produce a set of depreciation tables. An example table for a stick built house is show below. The depreciation rates are expressed as a percent good.

DEPRECIATION TABLE 1 (2011DEP)

Age	Low	Fair	Avg	Good	Vgood	Exc	Exp
0	100	100	100	100	100	100	100
1	99	99	99	99	99	99	99
2	99	99	99	99	99	99	99
3	99	99	99	99	99	99	99
4	99	99	99	99	99	99	99
5	98	98	98	98	98	98	98
6	98	98	98	98	98	98	98
7	98	98	98	98	98	98	98
8	97	97	97	97	97	97	97
9	97	97	97	97	97	97	97
10	97	97	97	97	97	97	97
11	96	96	96	96	96	96	96
12	96	96	96	96	96	96	96
13	95	95	95	95	95	95	95
14	94	94	94	94	94	94	94
15	93	93	93	93	93	93	93
16	92	92	92	92	92	92	92
17	91	91	91	91	91	91	91
18	90	90	90	90	90	90	90
19	88	88	88	88	88	88	88
20	86	86	86	86	86	86	86
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
60	35	35	35	35	35	35	35
61	35	35	35	35	35	35	35
62	34	34	34	34	34	34	34
63	33	33	33	33	33	33	33
64	32	32	32	32	32	32	32
65	31	31	31	31	31	31	31
66	31	31	31	31	31	31	31
67	30	30	30	30	30	30	30
68	29	29	29	29	29	29	29
69	29	29	29	29	29	29	29
70	28	28	28	28	28	28	28
71	27	27	27	27	27	27	27
72	26	26	26	26	26	26	26
73	25	25	25	25	25	25	25
74	25	25	25	25	25	25	25
75	24	24	24	24	24	24	24
76	23	23	23	23	23	23	23
77	22	22	22	22	22	22	22
78	22	22	22	22	22	22	22
79	21	21	21	21	21	21	21
80	20	20	20	20	20	20	20

The graph below shows the relationship between the percent good, actual age, and effective age.



Condition

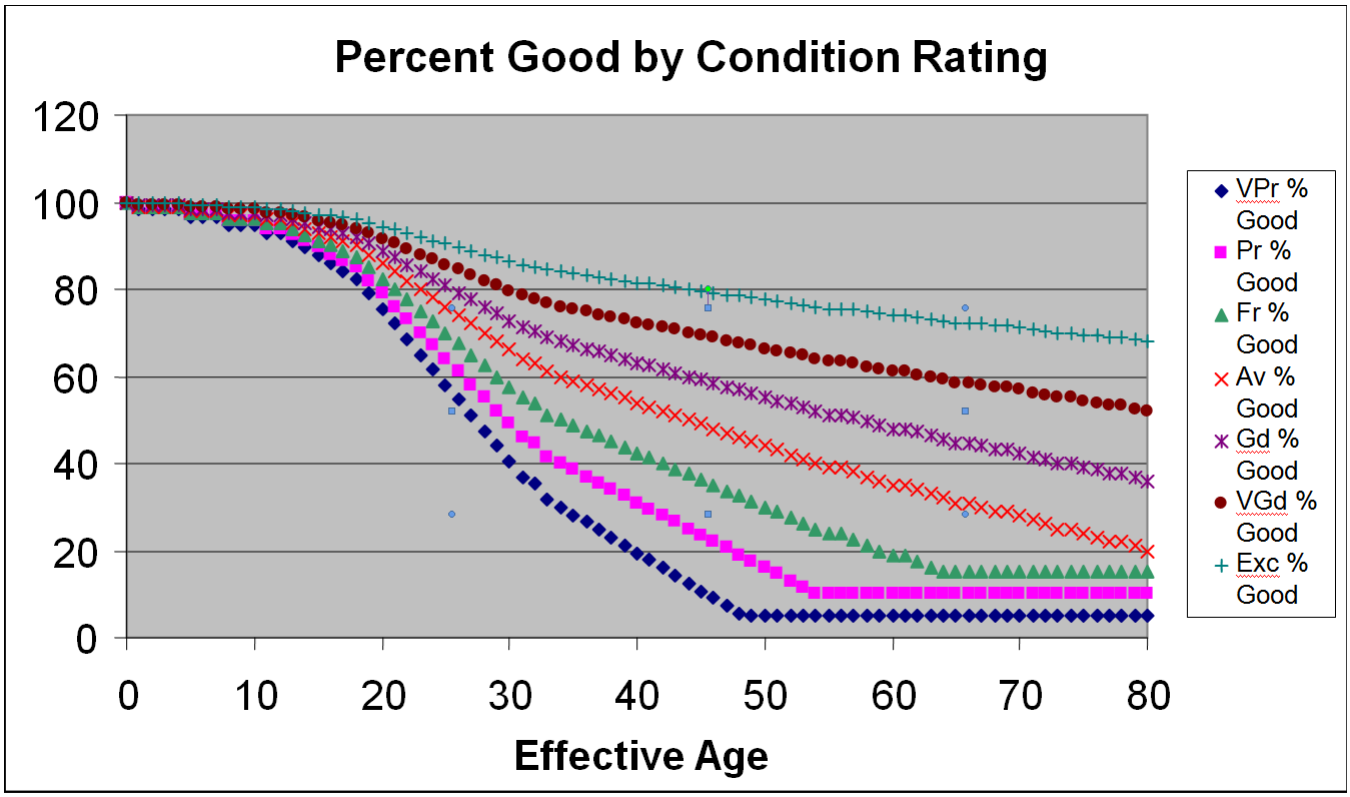
Because many properties are in better or worse condition than what is typical for their age, we need a method to adjust the depreciation rate accordingly. There are two ways to accomplish this. One is to adjust the effective age and the other is to adjust the condition rating to raise or lower the amount of depreciation that is applied.

Adjusting the effective age would involve a fairly complex set of instructions and calculations for different situations that may be encountered. Minor remodels, major renovations, and building additions would require different adjustment techniques. Even with these procedures in place, there would be substantial appraiser judgment involved that would open the door for inconsistencies in the way effective age is determined and depreciation is applied.

A better method is to establish guidelines for determining the condition rating to apply to each property. In general, if an improvement to a parcel of land is typical for its age and has received average maintenance, it would be considered to be in average condition. If the improvement has had less than average maintenance, it will be in less than average condition. If the improvement has received better than average maintenance, it will be in better than average condition.

Generally, the appraiser does not have the benefit of an interior inspection. As a result, it is assumed that the interior condition is the same as the exterior. On those occasions in which an interior inspection is granted, the condition is reflective of the overall property. Those parcels which have had an interior inspection are noted on their individual record cards.

The following graph shows the effect that the condition rating has on the percent good curve. It summarizes the relationship between effective age, building condition, and the rate of depreciation.



NEIGHBORHOOD ADJUSTMENT MODEL SPECIFICATION

The equation for the neighborhood adjustment has an additive model format but without the constant term.

$V = b_1(LV) + b_2(BV)$

Where: b_1 and b_2 are based on a combination of regression analysis and appraiser judgment.

NEIGHBORHOOD ADJUSTMENT CALIBRATION

Initially regression coefficients are developed to apply to both land (b_1) and building (b_2) values within each neighborhood. A preliminary adjustment to the neighborhood land values is determined first by considering only available vacant land sales within the region.

After making the initial adjustment to the land value, the coefficient for the building value (rcnld) can be determined. This again produces a preliminary adjustment or starting point for determining the final neighborhood building trend.

Next, each neighborhood within the region is analyzed to consider its unique characteristics, amenities, and market conditions. This final adjustment to the neighborhood land and building values is largely based on the appraiser's analysis of individual sales ratios guided by the region wide sales analysis. An iterative process of adjusting the initial coefficients is applied to each neighborhood to reach the desired level of assessment, PRD, and COD. The Assessor's target level of assessment for 2015 is 96%. This level was chosen to reflect that the majority of residences are not 'market ready' compared to the properties that sold at 100% of their market value.

As an example, final adjustments for neighborhood "09YS" are shown below.

- **Final Neighborhood adjustments for 09YS:**
    - b_1 = .95 land value adjustment
    - b_2 = 1.05 building value adjustment

Final Ratios for 09YS	
Mean	.957
Median	.955
Weighted Mean	.944
Price Related Differential	1.014
Coefficient of Dispersion	.097

The sales ratio analysis of each neighborhood in Saltwater neighborhoods in Regions 02 and 03 is indicated in the Summary Statistics table on page 3 of this report.

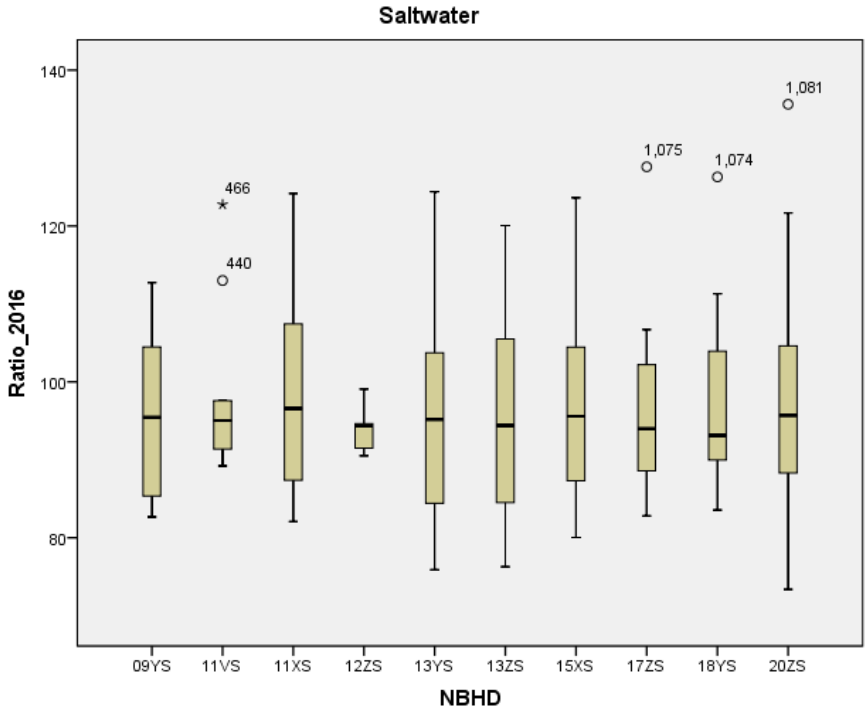
Neighborhood Adjustment Model Validation

Neighborhood trends were calibrated using 197 sales that took place between 01/01/2010 to 03/11/2015. For information on time trending of sales, refer to the *Market/Time Adjustment* document in the Appendix.

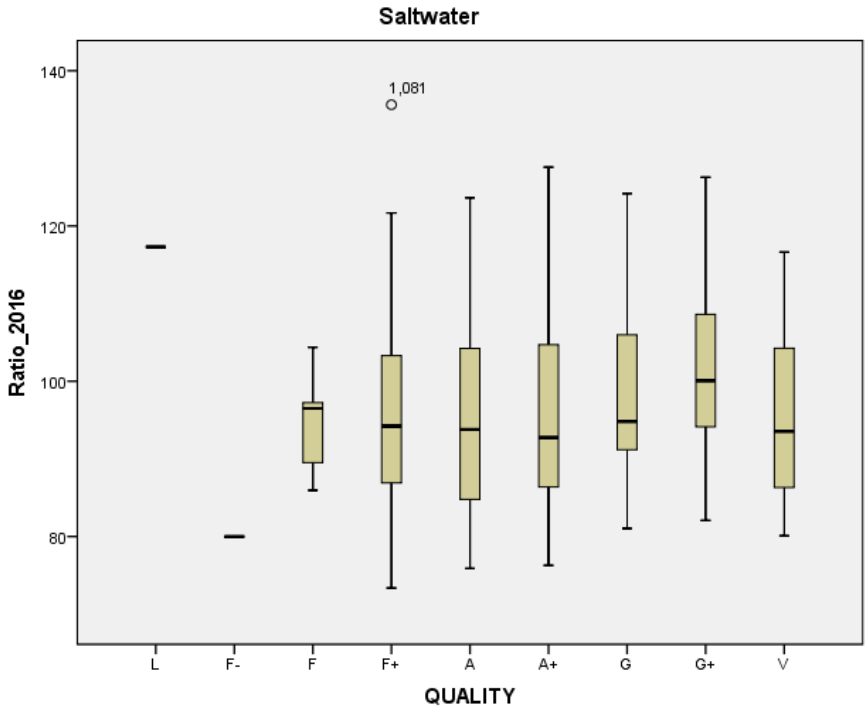
Overall Level of Assessment and Assessment Uniformity

Overall Salt Ratio Statistics New Value/Sale Price	
Mean	.978
Median	.946
Weighted Mean	.965
Price Related Differential	1.013
Coefficient of Dispersion	.126

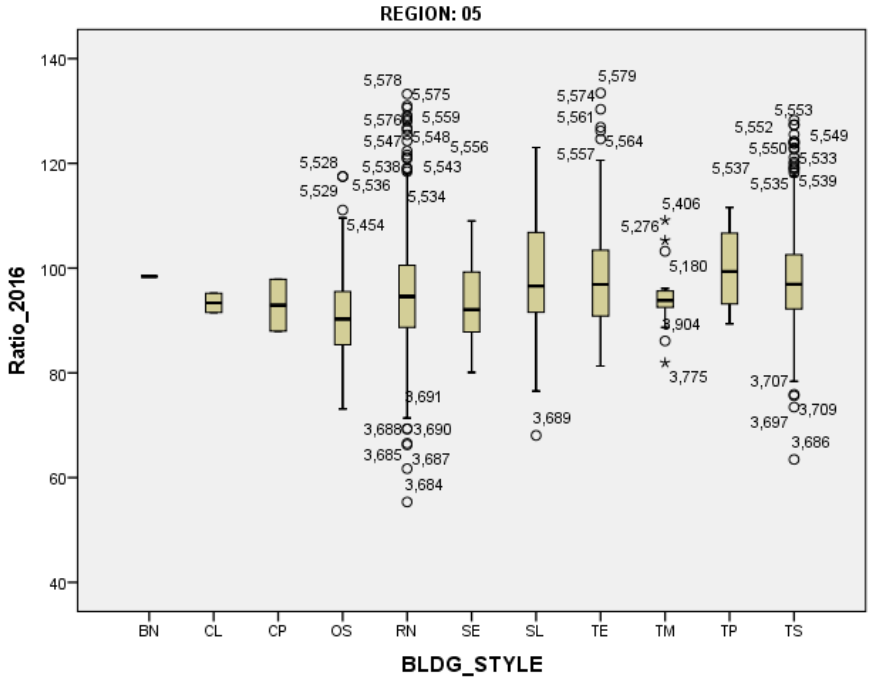
Assessment Uniformity by Neighborhood



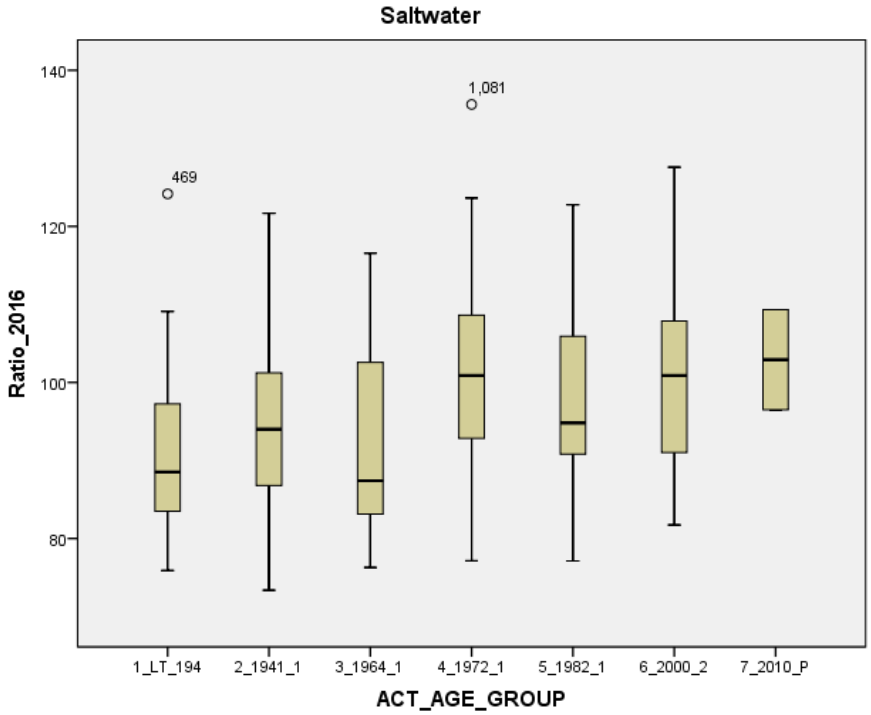
Assessment Uniformity by Quality Grade



Assessment Uniformity by Building Style



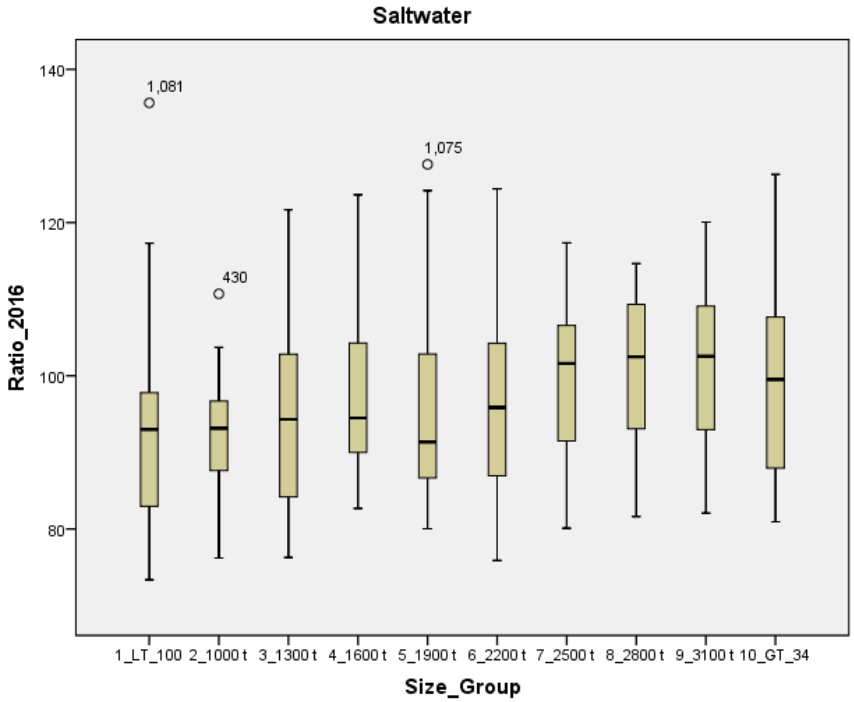
Assessment Uniformity by Actual Age Group



Residential construction occurs in cycles that are reflective of market conditions which are influenced by many factors from economic, geopolitical influences and changes in demographics to name just a few. These cycles as measured by units constructed within any given year, with discernible peaks and troughs; during these periods residences exhibit greater uniformity of styles and materials used within any given cycle, which may not appear in other cycles. For example, a bungalow style built in the 1920s and 30s, with hardwood floors, hardwood trims, plaster walls, and gravity furnace was replaced by the 1970's by rambler designs, drywall, pine trim, and forced air furnace. To examine for any bias these properties are analyzed by cycle groups as follows:

1_LT_1941
2_1941_1963
3_1964_1971
4_1972_1981
5_1982_1999
6_2000_2009
7_2010 to present

Assessment Uniformity by Size Group



In Thurston County, fifty percent of detached single family residences are between 1,480 and 2,293 square feet. Graphically, they can be seen in size groups 3 through 5. The average size of a residential house as measure by the mean is 1,927 square feet and 1,843 square feet as measured by the median. These would be seen in size group 4 and 5. The population was divided into 10 size groups the first for all properties less than 1,000 square feet and separated by groups of 300 square feet. The largest property group size is greater than 3,400 square feet. This was done is order to check for any systematic bias by size groups and reveal any significant outliers at the tails of the distribution.

RECONCILIATION AND CONCLUSION

Considering the quantity and quality of data and the reliability of the various models as shown in the performance tests above, we have concluded that the Sales Adjusted Cost Approach produces an accurate estimate of market value.

Summary of Inventory Statistics:

2015 Residential Improved Property Value Changes						
Nbhd	Region Group	Parcel Count	Avg. $ Change	Med. $ Change	Avg. % Change	Med. % Change
09YS	17	93	44,648	42,100	11.0	11.1
11VS	07	123	33,031	28,850	5.2	5.2
11XS	02	294	20,016	15,700	4.4	4.1
12ZS	05	81	25,141	23,350	5.3	5.3
13YS	14	347	70,485	63,850	11.1	10.9
13ZS	04	322	33,340	28,925	8.2	8.1
15XS	09	213	59,420	47,750	9.7	9.4
17ZS	22	159	39,128	33,100	7.4	7.3
18YS	08	149	18,718	15,650	4.0	3.9
20ZS	06	284	82,767	64,775	15.5	15.6
Overall		2,065	46,733	34,950	8.8	8.3

SALES RATIO STATISTICS FOR SALT WATERFRONT NEIGHBORHOODS

New Value/Sale Price	
Mean	.978
Median	.946
Weighted Mean	.965
Price Related Differential	1.013
Coefficient of Dispersion	.126

MULTIPLE REGRESSION ANALYSIS ASSUMPTIONS

Complete and Accurate Data:

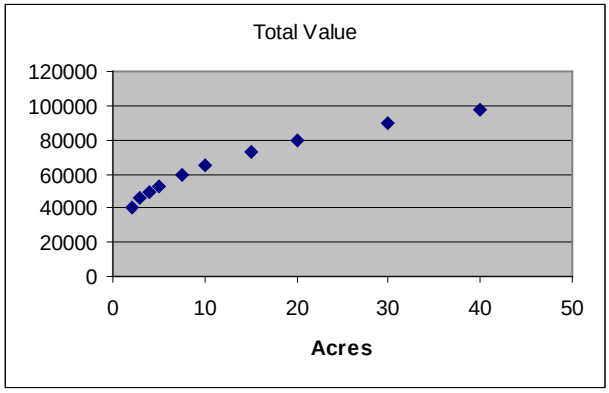
- Data definitions and standards have been developed to ensure our data is as complete and accurate as possible.
- A procedure has been established to ensure sales are properly verified.
- Annual training is conducted to remind appraisers of the standard that have been developed.

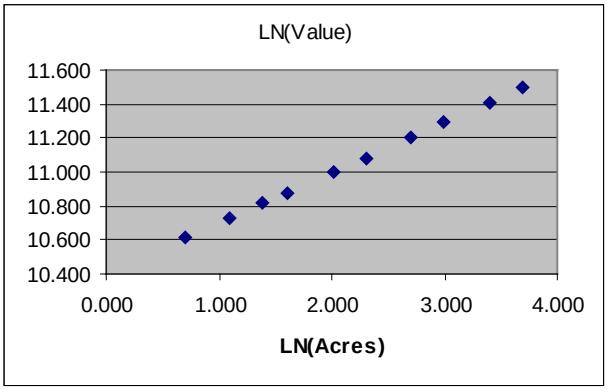
Representativeness:

- It is assumed that the sale sample adequately represents variables in the model.
- Violation of this assumption may affect the accuracy of the model in predicting the value of properties that are under-represented. For example, if there are no sales of "Excellent" view, the model would make no distinction from the typical "Average" view and an "Excellent" view. Using scalar or linearized variables in the model has mitigated this potential problem.

Linearity:

- It is assumed that the marginal contribution of a variable is constant over the range of values for the variable. Each additional unit of size or quantity adds equally to the value.
- The assumption is violated when economies of scale or other non-linear relationships are present.
- Developing a multiplicative land model has helped to create linear relationships between the dependent variable and independent variables.
- For example, using the natural logarithm of the lot size (acres) addresses the decreasing marginal utility of adding additional units of land. See example below.





Additivity:

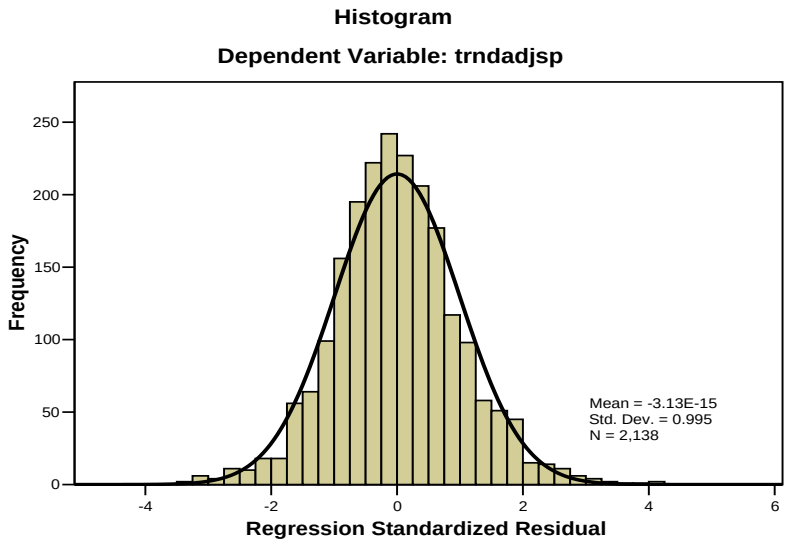
- It is assumed that the marginal contribution of one independent variable is not affected by the changes in other variables.
- The assumption is violated when one impendent variable interacts with another.
- This assumption generally does not hold for land models
    - Land characteristics are often interactive. For example, the adjustment for view may be influenced by the size or topography of the land parcel.
- A multiplicative model helps to address this issue but converting the format to log-linear terms.

No Correlation between Independent Variables:

- It is assumed that there is no correlation between independent variables.
- This assumption is addressed by reviewing the correlation matrix and by either eliminating one of the correlated variables or combining the highly correlated variables.

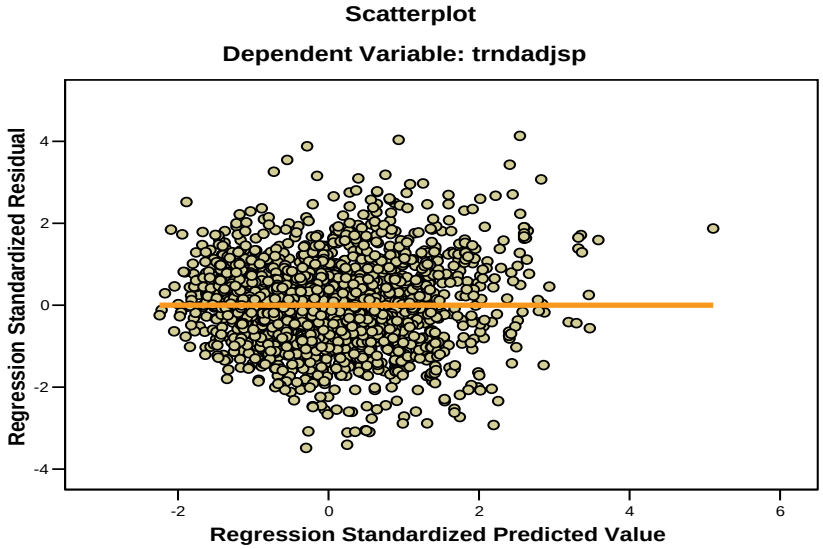
Normal Distribution of Residual Errors:

- Violation of this assumption affects the interpretation of the SEE, COV, and t-statistics.
- With large samples and proper screening of the sales, this assumption is typically not a problem.
- The assumption is verified by examining a histogram of residual errors. See example below.



Constant Variance of the Error Term (homoscedasticity):

- The residual errors should be consistent as prices increase.
- Violation of this assumption implies the residual errors are not evenly distributed (heteroscedasticity).
- As a result the model will chase high priced sales that may not be representative of the market.
- Sales have been properly screened to ensure accuracy of the data, and outliers have been removed to reduce the likelihood of this problem.
- Expressing the sale price (dependent variable) in per square foot or per acre terms has also helped to minimize this potential problem.
- Verified by examining a scatter diagram comparing residual errors to corresponding predicted values. See scatter diagram below as an example. The horizontal line-of-best-fit indicates that the residual errors are evenly distributed among the predicted values.



MARKET / TIME ADJUSTMENT

For any statistical estimate to be valid, it must be representative of the population. In theory, under ideal circumstances, the sample should be an adequate size and randomized. However, in the real world, convenience samples are utilized. A convenience sample is one where the units that are selected for inclusion in the sample are, in this instance, the best available sales. Although these samples lack randomness, there is no other methodology available but to use actual sales. If the sample is large enough to represent the population value, then estimates can be developed which should reflect true market action.

So how does one increase the sample size? One method would be to expand the area, however, since real estate is highly dependent upon location that methodology would result in failure. The only other option is to extend the time frame (sale date range) in which to select observations. This methodology is quite accurate when properly controlled. The following explains the rational for this decision and the results.

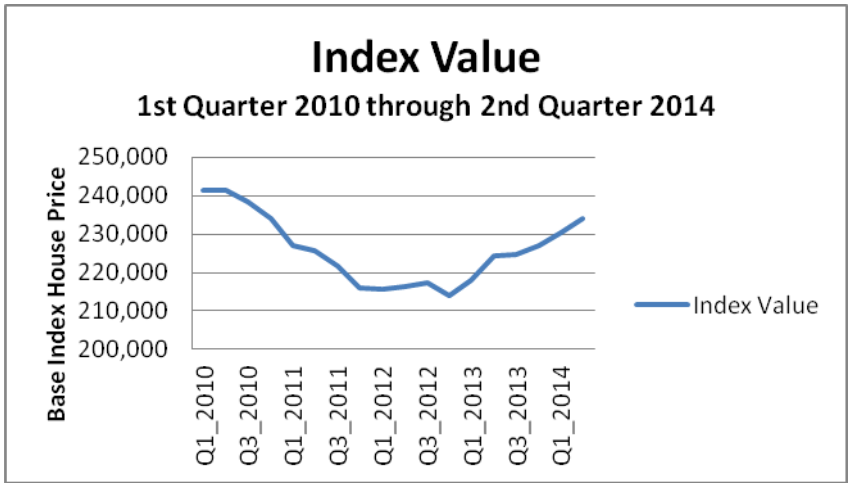
Values in all economic markets change over the course of time. The changes in values can occur as rapidly as second by second as in securities trading, or have slower movement which occurs over months, quarters, or even years as is more typical in real estate. The reader is cautioned to remember that it is not time itself which accounts for the change, but changes in supply and demand factors. These changes can be due to abstract things such as public sentiment and taste, to physical features such as weather conditions and natural aging of a depreciating asset, and to changes in economic conditions to name just a few.

Real estate prices are subject to many factors and when analyzed in sequence can exhibit predictable patterns. These patterns are generally seasonal and cyclical. For residential properties these values tend to peak in late spring/early summer and bottom out around mid-November to early-February. However, these patterns do not perfectly repeat so there can be differences in the magnitudes in common seasons. Besides the seasonal influences, cyclical influences also occur. These can be due to a sudden exogenous shock, such as the World Trade Center Attack and the beginning of the War on Terror, or more likely due to economic upheavals such as the Great Recession.

For residential real estate, when other variables are controlled for such as size, quality, condition, age, and site value. Time patterns can be seen and influence determined. This is standardized research methodology that is used in academic, medical, social, and economic studies.

These time variables were determined by using 12,716 observations which occurred from January 1, 2010 to March 11, 2015. To minimize the impact of a random outlier as well as to create an efficient model, time adjustments were categorized on a quarterly basis.

Thurston County's residential values exhibit a strong pattern. The indications are that the market is still in the recovery stage because they have not yet reached the early 2010 levels. This also indicated that the recession was deep and long, reaching near bottom in the 4th quarter of 2011 and remaining there until about the 1st quarter of 2013. Since the first quarter of 2013 the market appears to be on a stable recovery. This can be seen graphically on the next page.



Quarter	Index Value	
Q1_2010	241,303	0.969284022
Q2_2010	241,275	0.969396268
Q3_2010	238,305	0.981477713
Q4_2010	233,891	0.999999871
Q1_2011	226,976	1.030463537
Q2_2011	225,691	1.036330633
Q3_2011	221,762	1.054692987
Q4_2011	215,995	1.082853629
Q1_2012	215,783	1.083916211
Q2_2012	216,348	1.081087677
Q3_2012	217,372	1.075993448
Q4_2012	213,859	1.093670569
Q1_2013	218,147	1.072172332
Q2_2013	224,502	1.041822229
Q3_2013	224,547	1.041610546
Q4_2013	226,896	1.030826796
Q1_2014	230,332	1.015453663
Q2_2014	233,891	0.999999871

At this point the reader is wondering, how we know if those numbers are accurate? The proof can be determined by four features. Does the model have predictive ability, do the variables used "explain" the variance in values, is the model structurally correct, and when analyzed in isolation is there an indication of systematic bias?

The predictive ability of a model is determined by utilizing an Analysis of Variance (ANOVA) technique with an F-test. The regression utilized 61 variables with 12,716 observations. The F-test value was 2048.059 which is highly significant ($p<.001$). This would indicate that the model has highly predictive ability as a whole.

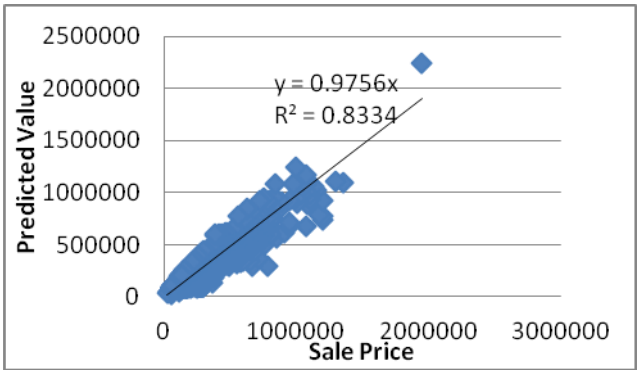
The next step is to determine if the chosen variables (including market/time) explain the dependant variable, in this case its value. This is accomplished by determining the Coefficient of Determination (R^2) and the Adjusted Coefficient of Determination (adj. R^2). The Raw R square results in a value of .953. One way to imagine this is that 95% of the variance is accounted for by the variables.

A common concern is the "usefulness" of the number of variables used. In other words, does the increase in the number of variables result in a general improvement of the model? The method to estimate this is by the adjusted R square. In this case the model still renders good results with a value of .908, or effectively, that these chosen variables explain 90% of the variance.

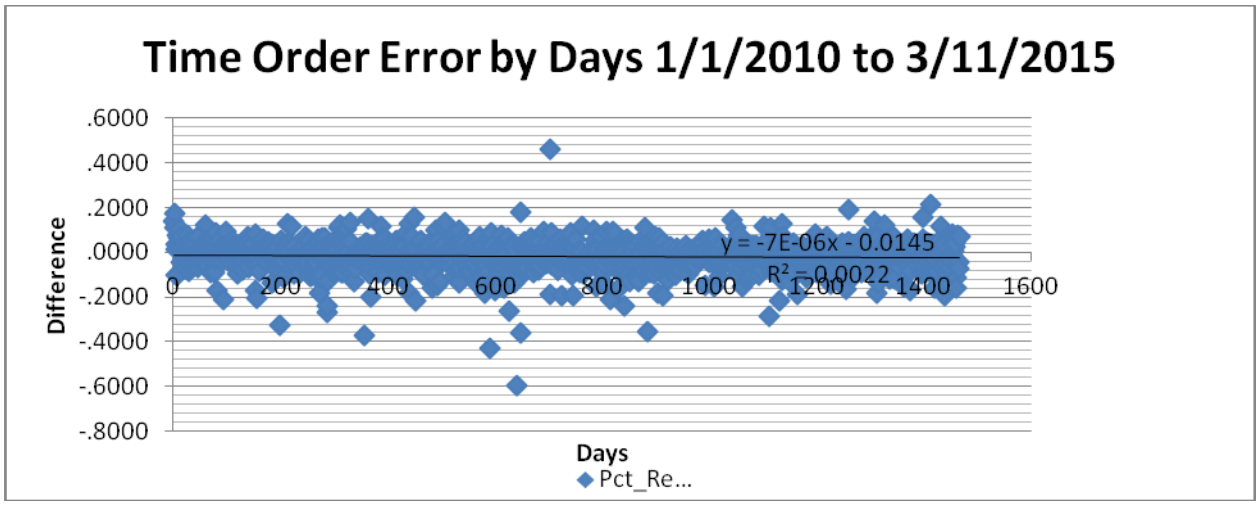
Of utmost importance, is the model correctly structured or is there a systemic bias. The most critical and rudimentary check is whether the model is misspecified. A misspecification results when the coefficients' value is beyond what would be a reasonable estimate or the directionality of the variable is opposite of what is expected by theory and established practice: for example, if the square footage adjustment is a minus $90.00 per square foot,or the value was $34,000 per square foot. Of the 61 variables utilized in the model, none are misspecified.

When two independent variables which affect the dependant variables similarly and to a high degree, it produces another possibility of systematic bias called multicollinearty. For example, total rooms and square feet both refer to size, both are highly correlated to each other and both affect home prices in nearly the same way. If both are introduced into the same model, their parameter values would be incorrect and quite likely would bias all other estimates as well. The most common check to avoid such a result would be to run a correlation matrix between all independent variables and assure that no correlation exceeded +/- 0.60. This was achieved in the model, so there is no indication of multicollinearty.

While we do not need the assumption of homoskedasticity for a model to create unbiased estimators, it is critical to the predictability of the model and the resulting standard error of the estimate. The ideal is to have the errors of the estimate to be consistent along the value range. When this occurs the model exhibits homoskedasticity, when it does not it is said to be heteroskedasticity. When heteroskedasticity is present,as the values move away from the mean, the error rate increases. While there are several tests for this, the easiest review is to plot the estimates for the actual value. We have achieved a homoskedastic distribution if the error is consistent along the value range. This can be seen in the graph below.



Another critical feature of systemic bias is whether there is autocorrelation present in the model. Autocorrelation is a check for time related bias. A common check is the Durbin-Watson Statistic. This value ranges from 0 to 4, with 2 meaning there is no autocorrelation or, if you will, time bias. A value of 0 indicates positive autocorrelation. This is the most common time error when present. It means the directionality of the residual is followed by the same directionally of the previous observation. If either seasonal or cyclical influences were not accounted for in the model the pattern would look serpentine. A value of 4 would indicate negative autocorrelation. This would result in each observation's residual moving in the exact opposite of the previous observed direction. The residuals would exhibit a staccato pattern of rapid up and down movements. The model produced a value of 1.959, meaning there is no time bias that has not been accounted for by the variables.



The final test would be to simply examine the predicted values by year to determine if there is an indicated bias by year. The chart below indicated that each year the value is correctly forecasted, and that 50% of the values fall between +/- 7% consistently.

Sale Year	Obs	Lower Quartile	Median	Upper Quartile
2010	2,383	93.7	100.5	107.8
2011	2,016	93.8	99.9	107.4
2012	2,349	94.7	100.8	108.9
2013	2,858	95.0	100.9	108.2
2014	2,729	94.2	100.9	108.0
2015	382	92.6	99.5	109.0

The results indicate that the model is systematically unbiased and the time adjustments accurately reflect the market conditions.