JAMES A. GRAASKAMP COLLECTION OF TEACHING MATERIALS

V. INDUSTRY SEMINARS AND SPEECHES - SHORT TERM

F. Miscellaneous Professional Associations

22. "A Simple Technique to Improve Market Comparison of Land Sales", sponsored by the American Right-of-Way Association, June 22, 1976

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A Simple Technique to Improve
Market Comparison of Land Sales

Tuesday, June 22, 1976
Marc Plaza Hotel
American Right-of-Way Association

I. The appraisal of vacant land acreage or vacant commercial sites has been greatly complicated in recent years by increasing sophistication of public regulators of land use, greater awareness of buyers of potential development pitfalls, and modification of the basic "highest and best use" definition by the appraisal society.

A. Environmental concerns, community economic impact, the uncertainty of energy costs and supplies, and greater sensitivity to soils, water tables, and other site physical characteristics do not lend themselves to direct price per unit adjustments for the market comparison method.

B. The new Appraisal Terminology Handbook, co-sponsored by the American Institute of Real Estate Appraisers and the American Society of Real Estate Appraisers, and edited by Dr. Byrl Boyce at the University of Connecticut has subtly and significantly modified the definition of highest and best use. (See Exhibit A)

C. Note the reference to the most probable use and most probable investor as this leads to definition of fair market value as most probable price, a term which implies a central tendency around which a transaction might take place and some estimate of error which one could reasonably expect.

D. Fair market value is often defined as:

"The most probable price is that selling price which is most likely to emerge from a transaction involving the subject property if it were to be exposed for sale in the current market for a reasonable time at terms of sale which are currently prodominant for properties of the subject type." R. U. Ratcliff

II. To relate prices paid for sites which differ from one another and from the subject to be appraised in terms of their physical suitability for development, their capacity in terms of scale and density, and their compatibility with the community requires some device for systematic recognition of differences.

A. A point system for comparison is suggested with total points for each parcel plotted against price per unit as one way to make the comparison. It is also possible to weight the points from the viewpoint of the most probable buyer, as a fast food chain may look for something different than a small retailer or a small offie building investor, even though they may all locate within the same zoning code category.

B. Fitting a straight line to a scatter diagram of points scored graphed against sales price can be done by instpection or by hand calculator, quickly and cheaply, and may provide some by-product in terms of estimating the extent of the error as well.

1. First example is a fictitious set of data to demonstrate techniques
2. Second example is an actual appraisal of fast food sites

C. The use of linear regression to relate sales price to points representing property attributes has been discussed at length by Prof. Richard U. Ratcliff in chapter 6 & 7 of his most recent book VALUATION FOR REAL ESTATE DECISIONS (available from Democrat Press, P.O. Box 984, Santa Cruz, Cal. 95060)

D. Refer to Exhibit B in which four vacant land sales are compared to a subject property.

1. Prices have been adjusted for time and terms of sale and then divided by number of net usable acres. Usable is in reference to most probable use and often means that flood plains, established road right-of-ways, or other unbuildable areas have been removed so that price refers to that part of the surface which appears to have development use.

2. Various categories of factors are identified and each attribute is scaled from 1-5 to reflect undesirable to desirable. To the point the more favorable the attribute to the use intended.

3. Various categories are weighted in terms of the importance the most probable buyer group places on those factors.

4. A line representing the ratio of total points scored for each sale parcel to the price per unit is then fitted to the least squares method for linear regression.

5. The subject property is scored and the price per unit computed on the same basis.

6. Having the mean price or central tendency for the subject property it is then possible to determine the standard error of the estimate so that the appraiser can modify his conclusion higher or lower in terms of standard errors.

E. Reference to Exhibit C-1, 2, 3 tables show application of the technique to fast food sites in Madison, Wisconsin selected after the most probable use for the subject site was determined to be restaurant use.

EXHIBIT A

HIGHEST AND BEST USE, PRINCIPLE OF - Real Estate Appraisal Principles and Terminology, by SRA, Second Edition 1971

A valuation concept that can be applied to either the land or improvements. It normally is used to mean that use of a parcel of land (without regard to any improvements upon it) that will maximize the owner's wealth by being the most profitable use of the land. The concept of highest and best use can also be applied to a property which has some improvements upon it that have a remaining economic life. In this context, highest and best use can refer to that use of the existing improvements which is most profitable to the owner. It is possible to have two different highest and best uses for the same property: one for the land ignoring the improvements; and another that recognizes the presence of the improvements.

HIGHEST AND BEST USE - Real Estate Appraisal Terminology, by Boyce, for MAI-SRA, 1975.

That reasonable and probable use that will support the highest present value, as defined, as of the effective date of the appraisal.

Alternatively, that use, from among reasonably probable and legal alternative uses, found to be physically possible, appropriately supported, financially feasible, and which results in highest land value.

The definition immediately above applies specifically to the highest and best use of land. It is to be recognized that in cases where a site has existing improvements on it, the highest and best use may very well be determined to be different from the existing use. The existing use will continue, however, unless and until land value in its highest and best use exceeds the total value of the property in its existing use. See Interim Use.

Implied within these definitions is recognition of the contribution of that specific use to community environment or to community development goals in addition to wealth maximization of individual property owners.

Also implied is that the determination of highest and best use results from the appraiser's judgment and analytical skill, i.e., that the use determined from analysis represents an opinion, not a fact to be found. In appraisal practice, the concept of highest and best use represents the premise upon which value is based. In the context of most probable selling price (market value) another appropriate term to reflect highest and best use would be most probable use. See Most Probable Use, Most Profitable Use.

EXHIBIT B

VACANT LAND MARKET COMPARISON USING WEIGHTED SCALE FOR LINEAR REGRESSION

Selected Comparative Attributes	Scale	Raw Points Subject	A	B	C	D	Weight Multiplier	Points Weighted for Buyer Viewpoint Subject	A	B	C	D
Gross sales price/usable* acre			$1500	2500	1700	1900						
Suitability (40%)												
Soils	5	5	2	5	3	3	10	50	20	50	30	30
Shape	5	4	3	5	3	4	10	40	30	50	30	40
Vegetation	10	6	5	2	3	5	10	60	50	20	30	50
Water	10	0	8	5	3	2	10/40	0	80	50	30	20
Capacity (15%)												
Public Infrastructure	5	3	1	5	5	0	9	27	9	45	45	0
Zoned Capacity	5	2	1	5	2	3	3	6	3	15	6	9
Transit Linkages	5	5	2	3	0	3	3/15	15	6	9	0	9
Comparability of Neighborhood Characteristics (15%)												
Social	5	5	5	3	3	4	5	25	25	15	15	20
Physical	10	3	3	5	6	4	10/15	30	30	50	60	40
Community Compatibility (30%)												
Fiscal Impact of Development	10	10	6	8	6	7	15	150	90	120	90	105
Environmental Impact of Development	10	6	3	10	4	8	15/30	90	45	150	60	120
TOTALS							100%	493	388	574	396	443

* Usable for best use already determined in order to select comparables

EXHIBIT B (continued)

Least Squares Linear Regression
Method of Appraising Vacant Land

$$Y = a - bX$$

where Y = estimated land

X = weighted points for subject site

a = intercept b = slope of line

Step I: Construct 5 columns to record actual values of Y (price) and X (points), their squares and their crossproducts.

Comp	Y	X	Y^2	X^2	XY
A	15~~00~~	388	225	150544	582000
B	25~~00~~	574	625	329476	1435000
C	17~~00~~	396	289	156816	673200
D	19~~00~~	443	361	196249	841700
	$\Sigma = 76$	$\Sigma = 1801$	$\Sigma = 1500$	$\Sigma = 833085$	$\Sigma = 3531900$

Step II: Compute the mean of Y and the mean of X

$$\bar{Y} = \frac{\Sigma Y}{n} = \frac{76}{4} = 19$$

$$\bar{X} = \text{Sum of } \frac{X}{n} = \frac{1801}{4} = 450$$

Step III: Compute Σy^2, Σx^2, and Σxy (Note that we use lower-case letters for these terms which are completely different from the terms denoted by upper-case letters that we computed previously). Use the following these equations:

$$\Sigma y^2 = \Sigma Y^2 - n(\bar{Y})^2$$
$$= 1500 - 4(19)^2 = 56$$
$$\Sigma x^2 = \Sigma X^2 - n(\bar{X})^2$$
$$= 833085 - 4(450)^2 = 23085$$
$$\Sigma xy = \Sigma XY - n\bar{X}\bar{Y}$$
$$= 3531900 - 4(450)19 = 3297700$$
$$= 1119$$

Step IV: Compute the regression coefficient b:

$$b = \frac{\Sigma xy}{\Sigma x^2} = \frac{1119}{23085}$$

$$= .048473 \quad \text{OR} \quad .0485$$

Step V: Compute the regression coefficient a:

$$a = \bar{y} - b\bar{x}$$

$$= 19 - (.0485)(450)$$

$$19 - 21.83$$

$$= -2.83$$

$$Y = a + bX$$

Hence the regression equation is

$$Y = -2.83 + .0485493$$

Subject price equals - 2.83 + 23.91 (100)
21.08 (100) = 2108 or 2100

Step VI: Compute the Standard error of the estimate.

$$S_{yx} = \sqrt{\frac{\Sigma y^2 - b\,\Sigma xy}{n-2}}$$

$$= \sqrt{\frac{56 - .0485(1119)}{4-2}}$$

$$= \sqrt{\frac{2.29}{2}} = \sqrt{1.146}$$

$$\simeq (1.07)(100) = 107$$

Step VII: Compute the Correlation Coefficient

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}}$$

$$= \frac{1119}{\sqrt{23085(56)}}$$

$$= \frac{1119}{\sqrt{1292760}} \simeq \frac{1119}{1137} = .98$$

EXHIBIT C-1

Basic Information on Restaurant-Commercial Land Sale Comparables

	Barnaby's East	Barnaby's West	Bud's West	Pigs Ear East	Marc's Big Boy South	Marc's Big Boy East
Sales Price	$92,000*	$89,000	$75,700	$91,000	$87,500	$85,000
Sales Date	10-6-70	6-30-70	6-29-71	5-20-72	9-3-69	3-15-68
Type of Deed	Lease with Option	WD	WD	WD	WD	WD
Volume & Page	209-455	184-75	264-173	344-385	130-463	15-108
Grantee	Barnaby's Inc.	Barnaby's Inc.	Clyde Chamberlain	Poole, Inc.	B & G Realty	B & G Realty
Area	38,211	32,900	45,236	141,570	38,327	30,237
Zoning	C-2	C-3-L	C-3-L	M-1	C-2	C-2
Principal Business Frontage	E. Washington Ave.	Mineral Point & Grand Canyon Roads	Odana Rd.	Cottage Grove Road & Atlas Avenue	S. Park Street	E. Washington Ave.
Position on Block	Inside lot	Corner lot	Inside lot	Corner lot	Corner lot	Inside lot

All have city services, Pigs Ear did not have curb and gutter
No adjustment of time required as restaurant economics would not permit inflation of land prices.

EXHIBIT C-2

Attribute Point and Weight Comparison
Of Restaurant-Commercial Land Sales and Subject Property

	(See Exhibit #8)	Barnaby's East		Barnaby's West		Bud's West		Pigs Ear East		Marc's Big Boy South		Marc's Big Boy East		Subject	
30	*Site	Points	Wgt'd Pts												
	Shape	5		1		5		3		5		3		5	
	% Usable	3		3		5		5		5		5		1	
	Site Preparation	3		1		5		5		5		5		5	
	Visibility	3		5		5		3		5		3		3	
	Access														
	Left & Right Turn	5		5		5		3		3		3		1	
	Frontage Road	3		5		5		1		5		5		5	
	Total	18		20		25		20		28		24		20	
	Weight		540		600		750		600		840		720		600
50															
	Linkages														
	Traffic Volume	5		5		3		3		5		5		3	
	Supportive Retail/Serv.	5		5		3		1		1		3		1	
	Proximity to Multi-Family Residential	1		5		5		1		3		3		3	
	Proximity to Employm.	3		3		3		1		1		5		3	
	**Interstate-Beltline	2		1		1		3		2		2		1	
	Total	15		18		15		9		12		18		11	
	Weight														
20	Image														
	Development Activity	5		5		3		1		1		3		1	
	Prestige of Street Address	5		5		3		1		3		5		1	
100	Total	10		10		6		2		4		8		2	
			200		200		120		40		80		160		40
	*Scale 1,3,5 Except **		1490		1700		1620		1090		1520		1780		1190

Exhibit C-3

Determination of Linear Regression
Weighted Mean Value of Land/sf
Commercial-Restaurant

Comparable	1 Land $/sf Yi	2 Total Wgtd. Pts. Xi	3 (Land $/sf)^2 Yi^2	4 (Wgtd.Pts)^2 Xi^2	5 (3 x 4) XiYi
1	$2.40	1490	5.76	2220100	3575
2	2.73	1700	7.45	2890000	4641
3	1.67	1620	2.79	2624000	2705
4	.64	1090	.41	1881000	698
5	2.28	1520	5.20	2310400	3466
6	2.81	1780	7.90	3168400	5002
TOTAL	$12.53	9200	29.51	15093000	20087
Mean	(Y)=$2.09	(X)=1533			

Calculations of Mean, Standard Deviation

$$\text{Sum } y^2 = Y^2 - n(Y)^2$$

$$= (29.51)^2 - 6(2.09)^2$$

$$= 845$$

$$\text{Sum } x^2 = X^2 - n(X)^2$$

$$= 1509300 - 6(1533)^2$$

$$= 993366$$

$$\text{Sum } xy = XY - n(x)(Y)$$

$$= 20087 - 6(1533)(2.09)$$

$$= 863$$

$$Y' = a + bX_{subject}$$

$$b = \frac{\text{Sum } xy}{\text{Sum } x^2} = \frac{863}{993366} = .00087$$

$$a = (Y) - b(X) = \$2.09 - .00087(1533)$$

SALES PRICE/SUBJECT SITE

$$Y' = a + bX_{subject}$$

$$= -\$.76 = .00087(1190) = \underline{\$1.80}$$

STANDARD DEVIATION

$$S_{xy} = \frac{\text{Sum } y^2 - b(\text{Sum } xy)}{n-2}$$

$$= \$ \underline{.15}$$