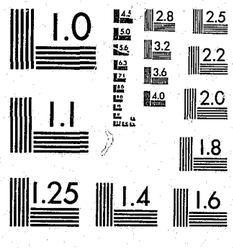




Mf-1

# THE IMPACT OF PRISON PROXIMITY ON PROPERTY VALUES IN GREEN BAY AND WAUPUN, WISCONSIN

A STUDY COMMISSIONED BY THE

STATE OF WISCONSIN
DIVISION OF CORRECTIONS
AND
BUREAU OF FACILITIES MANAGEMENT
NOVEMBER 1978



COMPLETED BY

CRAIG E. STANLEY
ASSISTANT PROFESSOR OF BUSINESS
GRADUATE SCHOOL OF BUSINESS
1155 OBSERVATORY DRIVE
UNIVERSITY OF WISCONSIN

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## EXECUTIVE SUMMARY


THIS STUDY HAS BEEN COMMISSIONED BY THE STATE OF WISCONSIN DIVISION OF CORRECTIONS IN COOPERATION WITH THE BUREAU OF FACILITIES MANAGEMENT. THE DIRECTIVE FOR THE STUDY REQUESTS AN ANALYSIS OF THE IMPACT OF PRISON PROXIMITY ON RESIDENTIAL PROPERTY VALUES IN TWO WISCONSIN COMMUNITIES, ALLOUEZ, HOME OF THE GREEN BAY REFORMATORY AND WAUPUN, HOME OF THE WAUPUN STATE PRISON.

PART I OF THE STUDY PRESENTS THE GENERAL DESCRIPTION OF ALLOUEZ AND ITS RELATIONSHIP TO THE REFORMATORY.

PART II DESCRIBES THE URBAN LAND ECONOMIC LITERATURE AS IT RELATES TO THE PREDICTION OF RESIDENTIAL PROPERTY VALUES BASED ON STRUCTURAL CHARACTERISTICS AND NEIGHBORHOOD EXTERNALITIES AFFECTING MARKET VALUES.

PART III DESCRIBES THE RESEARCH METHOD UTILIZED FOR THE STUDY AND PRESENTS SIMPLE DESCRIPTIVE STATISTICS FOR THE ALLOUEZ COMMUNITY. THIS IS FOLLOWED BY A DISCUSSION OF THE RESULTS OF THE STATISTICAL MODEL. THE CONCLUSIONS OF THE ALLOUEZ STUDY ARE AS FOLLOWS:

* THE RESULTS OF THE STATISTICAL ANALYSIS CONFIRM THE OBSERVATIONS OF ANY ALLOUEZ VISITOR THAT PROXIMITY TO THE REFORMATORY HAS NO MEASUREABLE DELETERIOUS EFFECT ON EITHER THE ASSESSED VALUE OR MARKET PRICES OF HOMES IN THE SAMPLED DATA SET OF 587 CASES.
* THE OPPOSITE EFFECT IS SHOWN STATISTICALLY TO BE TRUE IN SOME EQUATIONS: ALL OTHER THINGS HELD CONSTANT, THERE IS A SMALL TENDENCY FOR HOMES TO INCREASE IN ASSESSED VALUE

THE NEARER A HOME IS LOCATED TO THE REFORMATORY.

* THE REGRESSION EQUATIONS EXPLAIN APPROXIMATELY 70% OF THE VARIATION IN MARKET PRICE AND ASSESSED VALUE. THEY ARE QUITE STABLE WITH LITTLE CHANGE RESULTING FROM THE ADDITION OF OTHER STRUCTURAL VARIABLES. MARKET PRICE AND ASSESSED VALUE EQUATIONS ARE QUITE SIMILAR IN STRUCTURE.
* IN GENERAL, OTHER VARIABLES ARE MUCH MORE IMPORTANT IN DETERMINING ASSESSED VALUE OR MARKET PRICE THAN ARE VARIABLES ASSOCIATED WITH DISTANCE TO, OR WITHIN SIGHT OF, THE PRISON.

## THE WAUPUN STUDY

PART IV. PROVIDES A GENERAL DESCRIPTION OF WAUPUN AND THE STATE PRISON LOCATED THERE.

PART V. DESCRIBES THE DATABASE AND THE TESTING PROCEDURE UTILIZED IN WAUPUN FOLLOWED BY A COMPARISON OF WAUPUN AND ALLOUEZ SIMPLE STATISTICS. THE CONCLUSIONS OF THE WAUPUN STUDY ARE AS FOLLOWS:

* THE RESULTS OF THE STATISTICAL ANALYSIS CONFIRM THE VISUAL PERCEPTION OF THE WAUPUN VISITOR THAT PROXIMITY TO THE PRISON HAS NO MEASURABLE DELETERIOUS EFFECT ON THE ASSESSED VALUE OF RESIDENTIAL PROPERTY IN THE SAMPLED DATA SET OF 315 CASES.
* THE OPPOSITE EFFECT CAN BE SHOWN TO OPERATE STATISTICALLY AT THE 95% LEVEL OF CONFIDENCE IN SOME EQUATIONS: ALL OTHER THINGS HELD CONSTANT, THERE IS A WEAK TENDENCY FOR HOMES TO INCREASE IN ASSESSED VALUE THE MORE PROXIMATE A HOME HAPPENS TO BE TO THE PRISON.
* THE ASSESSED VALUE EQUATIONS EXPLAIN APPROXIMATELY 75% OF THE VARIATION IN ASSESSED VALUE AND ARE QUITE STABLE WITH LITTLE CHANGE RESULTING FROM THE ADDITION OF OTHER STRUCTURAL VARIABLES.

CONTENTS

THE GREEN BAY STUDY

* BECAUSE OF A LACK OF RECENT MARKET SALES, THE MARKET PRICE EQUATIONS CONTAIN ONLY 65 OBSERVATIONS AND ARE CONSEQUENTLY LESS RELIABLE. NEVERTHELESS, PROXIMITY TO THE PRISON HAS BEEN SHOWN TO HAVE NO MEASURABLE EFFECT ON RESIDENTIAL MARKET VALUE.
* IN GENERAL OTHER VARIABLES AND FACTORS NOT INCLUDED IN THIS STUDY ARE MUCH MORE IMPORTANT IN DETERMINING ASSESSED VALUE OR MARKET PRICE THAN ARE VARIABLES ASSOCIATED WITH DISTANCE TO, OR WITHIN SIGHT OF, THE PRISON.

# PART I

## A DESCRIPTION OF THE ALLOUEZ AREA

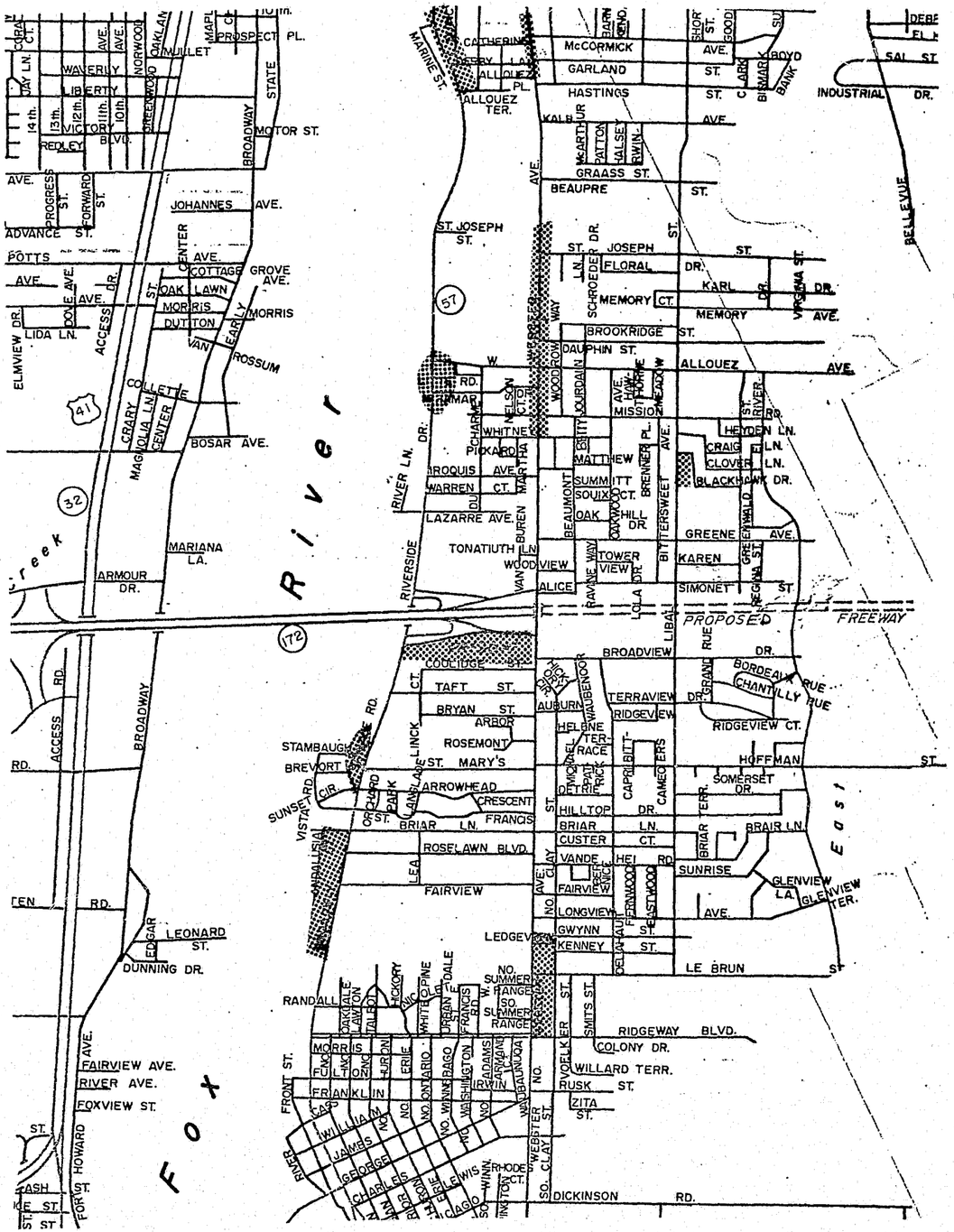
### A. Introduction

The Green Bay Reformatory is located on the east bank of the Fox River in the Town of Allouez, an unincorporated suburb of the City of Green Bay. State Highway 172 runs along the north wall of the facility after crossing the river from the Town of Ashwaubenon to the west. The city limits of Green Bay are 1.9 miles north of the prison site while the city limits of DePere are .7 miles to the south.

Allouez is an urban township bounded on the west and east by the Fox and East Rivers and the cities of Green Bay and DePere on the north and south. Current population (1978) is about 15,000, a gain of 2000 over the 1970 census population of 12,960. The town is a bedroom community of Green Bay with virtually no industry, except for the Reformatory, and few commercial establishments. The commercial areas that do exist are mainly on South Webster Avenue and Riverside Drive, the two north-south arterials running between Green Bay and DePere. (See Map No. 1.) The character of Allouez is upper-middle class residential with neighborhoods of varying ages from those newly built to some over a century old.

### B. Allouez Neighborhood Descriptions

The general impression of Allouez as an upper-middle class community is supported by the 1970 Census figures on income shown in Figure 1.




**MAP NO. 1 - commercial areas**



**Figure 1 - Income Comparison**

| Tract No. | Median Family Income | Mean Income |
|---|---|---|
| 208 | $10,126 | $10,304 |
| 209 | 12,558 | 14,373 |
| 210 | 15,711 | 20,012 |
| 212 | 12,172 | 14,247 |
| Green Bay (all tracts) | 9,975 | 10,690 |
| Rest of Brown County | 10,737 | 12,102 |

The Allouez census tracts, with the exception of Tract 208, had the highest median and mean family income figures in Brown County, including the city of Green Bay. The tract with the highest income, Tract 210, is the one surrounding the Reformatory. Conversations with local realtors and residents have convinced us that Allouez is the most prestigious residential area in Brown County. Allouez has been an upper income area for many years and, surprisingly the wealthier neighborhoods were built after the Reformatory was constructed. The oldest of these affluent neighborhoods is just west of South Webster Avenue and north of State Highway 172 between Lazane and West Allouez Avenues. Photos numbered #1 and #2 are typical of the homes in the area. These homes are pinpointed on map no. 2. In addition, there are a number of very large homes in this area that could be called mansions. This neighborhood is just 1/4 mile north of the prison wall.

There are two other upper income neighborhoods. One is the Sunlight Park Subdivision located 1/2 mile south of the prison site between Riverside

and South Webster Avenue. Photo #3 is representative of the homes in this area. The other area is very new, located east of Libal Street and south of Broadview Drive in the Parc DeLonglade subdivision. Photos #4 and #5 are two of the largest new homes recently built there.

The least well-to-do neighborhoods are located just south of the Reformatory on Coolidge, Taft and Bryan Streets, and north of the Chicago & North-western Railroad tracks, in the Hastings, Garland and McCormick Streets area.

#1

2501 DuCharme

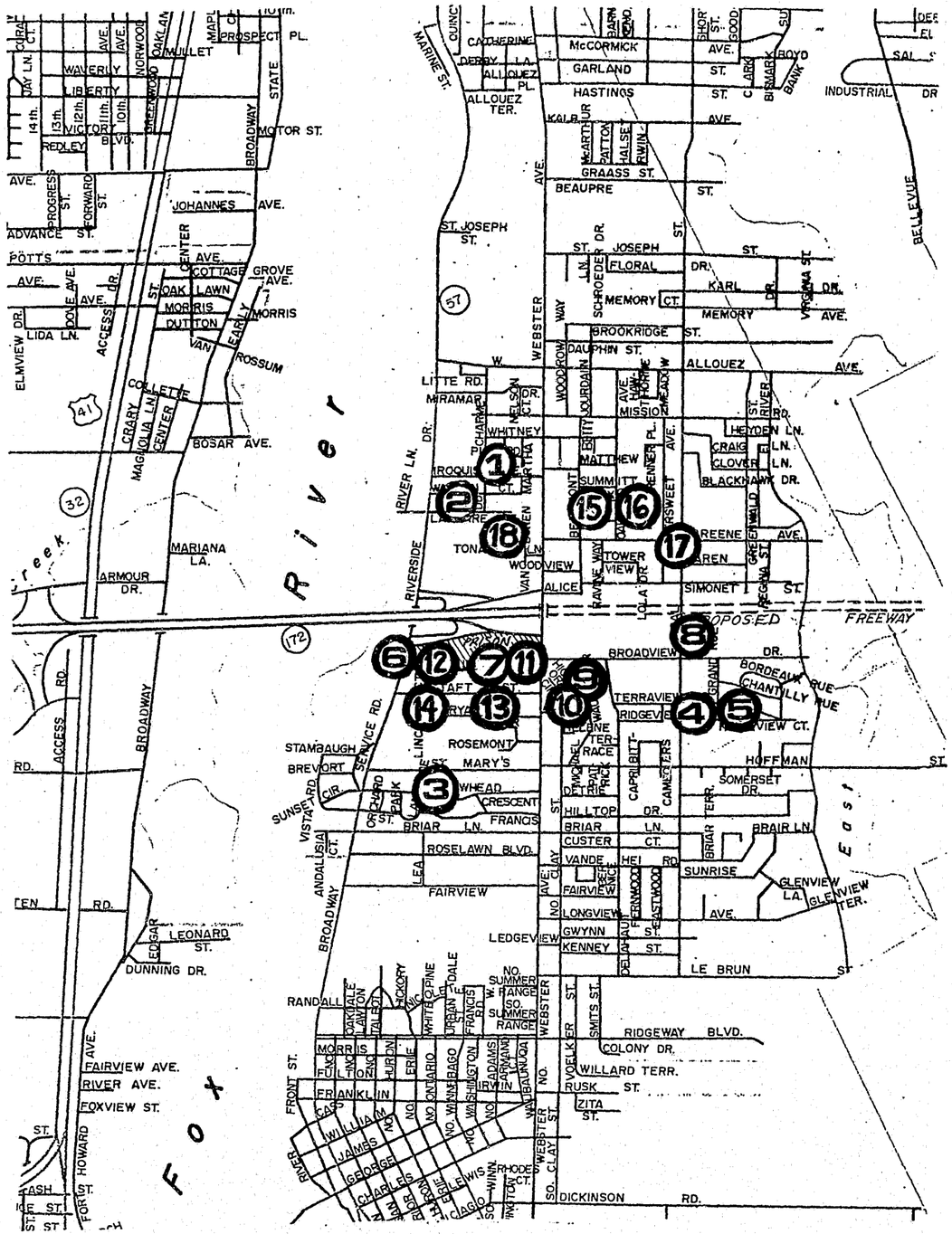
#2

365 Warren Court

415 Francis #3

#4 Terraview & Libal

#5 606 Terraview






The homes in both sections are mostly small wood frame structures on narrow lots, 20 years of age or older. The area north of the railroad tracks is really an extension of the Green Bay neighborhoods immediately to the north while the Coolidge Street area appears as if it had been originally built to house Reformatory employees.

Homes in the rest of the township look typically middle class, ranging in age from 50 years to new and comprise the largest percentage of the housing stock.

C. Residential Market Activity

The housing market in Allouez has been very active in recent years in both new construction and turnover of existing stock. Since the Building Inspector's office does not aggregate its monthly report statistics into yearly summaries, aggregate statistics on annual turnover are just estimates. Figures for the other communities in the Green Bay area are presented in the following table:

Single Family New Construction Permits Granted

| | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|
| Green Bay | 274 | 423 | 293 | 360 |
| DePere | 56 | 87 | 54 | 129 |
| Ashwaubenon | | | 83 | 101 |
| (across Fox River from Allouez) | | | | |
| Howard (west of G.B.) | | | | |
| Allouez | | | | |

Recently platted areas in Allouez include the Kane and Plous Subdivision on the site of the old golf course north of St. Mary's Street and east of R rside Drive. Another subdivision, the Town & Country plat, has had recent

lot sales of around $25,000, with one going for more than $30,000. The Town & Country plat is located across Riverside Drive from the Kane & Plous Subdivision. Other very new areas are located south of East Hoffman Road and west of Libal Street. The State of Wisconsin put 38 acres of the old prison farm up for auction and got a high bid of $17,500 an acre (or $710,000--I have heard two figures tossed around). Bill Fairbairn, Allouez' part-time assessor, felt the bid was more than the land was worth. The buyers are apparently counting on a rezoning of that part of the tract fronting South Webster from residential to commercial. However, Fairbairn also seemed to feel that would not happen with the present Town Council; there currently exist several vacant parcels zoned commercial. His estimate of the parcels' value was $12-15,000 an acre.

Property tax rates and assessments in Green Bay area are shown below.

| | Tax Rate per $1000 Assessed Value | Assessment I (of mkt. value) | Effective Rate |
|---|---|---|---|
| Green Bay | $40.067 | 30.11% | $20.118 |
| Allouez | 35.5 | 45. | 15.98* |
| DePere | 38.76 | 56. | 21.705 |
| Ashwaubenon | 57.97 | 30. | 17.39 |
| Howard | 33.32 | 39. | 18.99 |

*Allouez uses three different mill rates.

A comparison of Allouez's effective tax rate with the other communities points up a small tax advantage enjoyed by its residents.



Conversations with realtors and assessors in the area had led us to conclude that the high level of activity in the Allouez market is due to the rapid rate of growth in the Fox River Valley, the continued perception of Allouez as one of the more desirable residential locations, and a significant amount of turnover due to the practice of many area companies of shuffling their management people in and out of town.

D. The Green Bay Reformatory

Site Description

The Reformatory occupies a rectangular area of about 50 acres, the long sides of this rectangle running between Riverside Drive and South Webster. Most of the prison grounds, except for the extreme western end, are enclosed by a high stucco-looking wall topped with guard towers spaced about every 1,000 feet. This wall forms the north, south, and east boundaries of the prison site. The west end, facing the Fox River, has 5-10 acres of lawn and full grown pine trees that screen the old stone building that forms the west wall of the compound. (See photo #6.)

The site is bounded by public streets on all sides but the south where the backyards of the homes on the north side of Coolidge Street run up against the prison's south wall. The view of the wall from the south is partially screened by trees in the neighborhood (see photo #7). There is nothing to screen the wall on the east and north sides.

Topography

The land to the north of the prison rises sharply just beyond the intersection of State Highway 172 and Webster Avenue. This is the beginning of a

View of prison from west--across Riverside Drive

Photo #6

View of prison wall from south side of Coolidge Street--note guard tower atop wall.

Photo #7
256 Coolidge



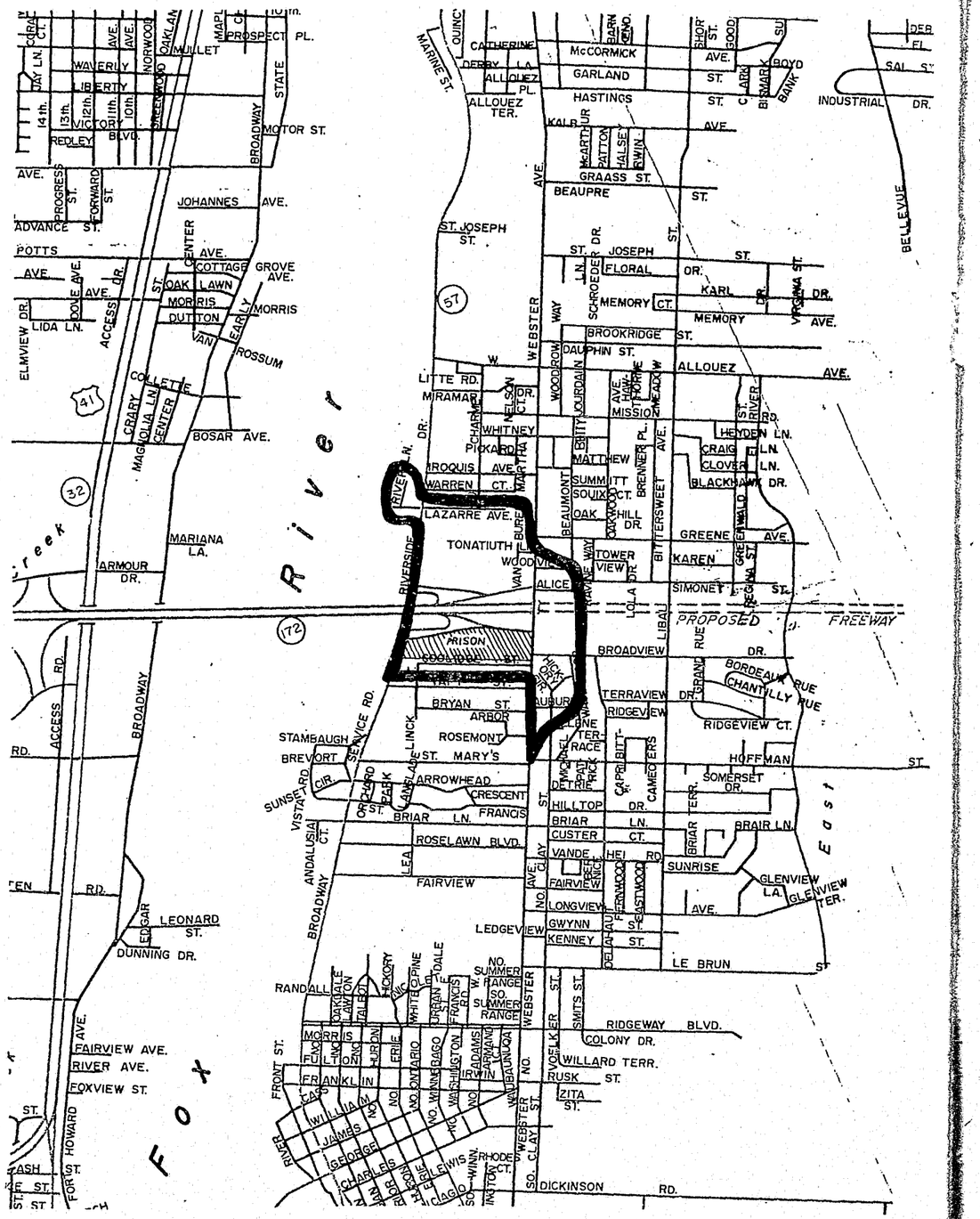
ridge that parallels the Fox River north into Green Bay and south toward DePere, though this ridge is not so pronounced south of the prison. West of this north-south ridge, the land gently slopes toward the Fox River. East of the ridge, the land slopes to the East River. The effect of the topography and the prison's location is to restrict the sight-line of homes east and north of the ridge from the prison. The walls can be seen from relatively few homes in the vicinity. (See map #3.)

Adjacent Land Uses

The Reformatory site is buffered from residential areas to the north by State Highway 172 and Heritage Hills State Park, an area of about 20 acres of open space the state has used for the construction of replicas of frontier buildings that once existed in Wisconsin. The residential area beyond Heritage Hills is about 1500 feet from the north wall of the prison. (See map #4.)

Land to the east of the Reformatory, across Webster Avenue, is owned by the state. Originally a farm worked by inmates, it is now the site for the proposed continuation of State Highway 172. (See photo #8.) The remainder of the land is to be sold. Currently, this 279 acre tract is vacant. It is approximately 1200 feet wide (north to south) and about 1 mile long from Webster Avenue to the East River.

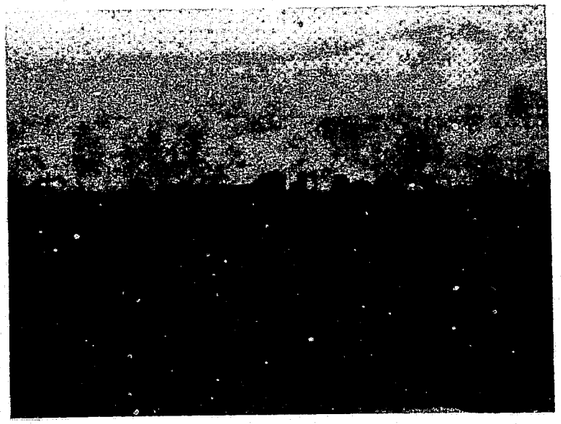
Southeast from the Reformatory is an established residential area where the homes appear to be 15-20 years old and about 1000-1400 square feet in size (photos #9 and #10). Further away to the southeast is a new neighborhood of larger and more expensive homes, some selling for upwards of $100,000 (photos #4 and #5). This area, east of Libal Street and south of Broadview, is the most exclusive of new residential areas in Green Bay. The southeast corner of Broadview and South Webster is occupied by the Old Orchard apartment building, an upper income residential structure with a high proportion of




**MAP NO. 3 - sightlines of prison**

**MAP NO. 4**

retired and widowed tenants. The existence of the Old Orchard Apartments across the street and in full view of the prison wall is evidence of the opinion, voiced by many Allouez residents, that the Reformatory's location has made very little impact either consciously or unconsciously on home buyer behavior. The only contact the townspeople have with the prison is a view of the outside wall, a topographical feature they apparently find unobtrusive.



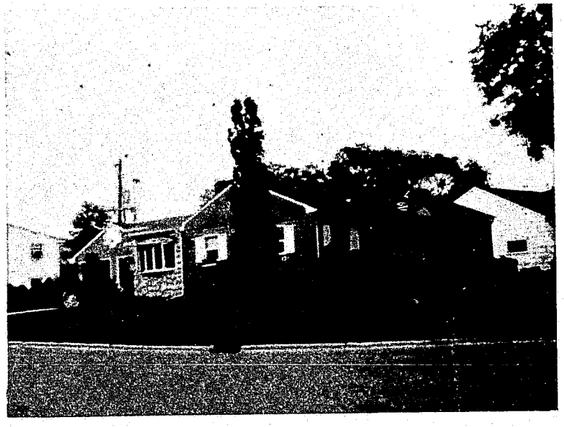
#8

View of prison farm (site of Highway 172) from Libal Street looking west. Column above long, low building is prison smokestack.



This home sits on the ridge southeast of the prison. The prison wall and guard towers are clearly visible from the front lawn of the home in photo #10.

3101 Clay
Photo #9



137 Auburn
Photo #10

South of the Reformatory between Riverside Drive and South Webster Avenue is Coolidge Street, the nearest residential area to the prison wall. The homes there are generally quite small, about 900 square feet, relatively inexpensive, and 20 years old and older (photos #11 and #12). There are larger and newer homes along both sides of Coolidge as well as a few new duplexes on the south side of the street. The back yards of the north side of Coolidge run up against the prison's south wall. The next two streets south, Taft and Bryan, are lined with homes somewhat larger and more expensive than those on Coolidge, about 1100 square feet in size (photos #13 and #14). These three streets comprise the neighborhood closest to the prison and would bear the greatest impact on property values of any in the township.

South of Bryan is an open area that had been a golf course. This piece of land is about 600 feet wide and 2000 feet long from Riverside Drive to where Rosemont Drive dead-ends.

Moving south of the old golf course is a neighborhood of upper middle class homes 15 years old and older. Some of the houses in this area are quite large and expensive. South of this neighborhood are the grounds of St. Norbert Abbey, an open area about 155 acres in size. The north edge of the Abbey grounds also forms the city limits of DePere. The nearest residential area to the Reformatory is 5600 feet away in DePere.

There are two clusters of homes between Riverside Drive and the Fox River. One is north of the prison just beyond Heritage Hills State Park. The second and larger group is south of the prison about 1500 feet. Both clusters are made up of homes about 1400 square feet and larger. Again, both are part of upper-middle income neighborhoods.

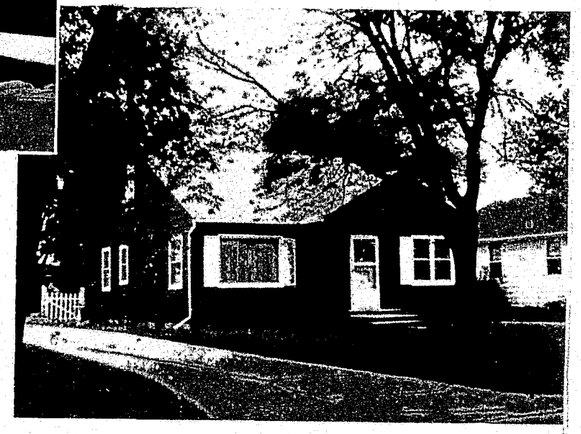
The west bank of the Fox River, directly across from the prison is an industrial area of factories, warehouses and lumber yards along U.S. Highway

#11
158 Coolidge

prison wall in background

#12
356 Coolidge

#13 215 Bryan



#14
355 Bryan

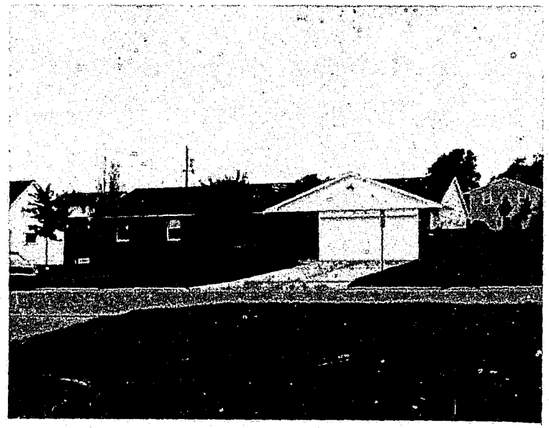
41 business route which parallels the river. The residential subdivision nearest the prison on the west bank is more than 1/2 mile north of State Highway 172, well removed from any "prison effect."

East of South Webster Avenue and north of the proposed extension of Highway 172 is a middle income neighborhood with homes that look very much like those in photos #15, #16, and #17).

To summarize, the residential neighborhoods to the north of the Reformatory are buffered by State Highway 172 and Heritage Hills (photo #18). That leaves the residential neighborhoods to the south and southeast that may exhibit any effects of prison proximity.

#15
2559 Beaumont

#16
2565 Orchard



#17
2678 Libal

Looking south toward prison from Heritage Hills State Park.

#18

E. Descriptive Summary

From observation, the relationship of housing values in Allouez to the prison suggests an absence of a "prison effect." Alternatively, other concerns of the home buyer may overshadow such an effect. State ownership of land north and east of the prison has created a buffer zone between the residential neighborhoods to the north and the Reformatory site. Furthermore, the topography of the area gives only a handful of homes a view of the prison. Any significant impact on property values would most likely show up in the homes south and southeast of the prison.

It remains for the following statistical analysis to verify or reject the implied hypotheses based on these observations.

## PART II

## A BRIEF LITERATURE REVIEW

A. The Basis for the Study Method

In recent years, consumer choice theory has changed dramatically partly as a result of the work of Kelvin Lancaster. His contribution to demand theory asserts that persons view the goods they purchase as bundles of attributes. Consequently, it is the attributes that are valued, and the decision to buy one or another bundle will depend on the relative efficiency of each as a source of supply for the satisfaction-providing attribute.

The Lancastrian demand model is unusually apt as a description of household behavior in housing markets. What actually is purchased by the home buyer are copper pipes, brass doorknobs, hardwood parquet flooring, basements and brick siding as well as permission to send children to a neighborhood public elementary school and exposure to certain levels of noise and crime. What motivates these purchases are the demands for interior space, privacy from neighbors, a pleasant neighborhood, etc.

B. Empirical Studies:

There are several studies of demand in housing markets that have attempted to empirically test Lancaster's theoretical demand model. In a study of the determinants of real estate values in the New Haven metropolitan area, Grether and Mieszkowski develop a model to predict house values by employing information on the physical characteristics of the house and on some features of the neighborhood in which the house is located.

The basic hypothesis tested by the authors was that the value of a house is an additive function of its structural characteristics, the characteristics of the lot, and the characteristics of the neighborhood

in which the house is located, i.e.,

$$V_i = S_i\alpha + L_i\beta + N_i\gamma + \bar{\varepsilon}_i$$

where $S_i$, $L_i$ and $N_i$ are vectors of characteristics of the structure, lot and neighborhood and $\alpha$, $\beta$, $\gamma$ are vectors of unknown coefficients.

The basic data for this study was obtained from the multiple listing files of the Greater New Haven Board of Realtors and assessor's records. The files provided information on the physical characteristics of the houses sold as well as giving the location of the house, the owners asking price, the date the house was listed, the selling price and the date of the transaction. There was also information on a large number of structural characteristics, among which are: the number of rooms, the total square feet of living space, the type of plumbing, the number of independently adjusted heat zones in the house, the building materials used, the kind of roof, the amount of garage facilities (if any), the age of the house, and the kind of floors. In addition, information is provided on insulation, storm windows, the number of small rooms in addition to the primary rooms, the size of the basement, the number of finished rooms in the basement, whether or not there is a laundry hook-up and electrical wiring. All houses are rated by the realtors as to overall general condition; the categories being: excellent, very good, good, fair and poor. The files also give information on special or non-standard features of the house, e.g., what appliances are included, if there is a fireplace or family room, air condition, if there is wall-to-wall carpeting, stall showers, etc.

Data for the neighborhood variables came from public sources or were constructed from maps. Reading percentiles for the elementary schools,

Table 1

Regression Results*

| Variable | Coefficient | t | Variable | Coefficient | t |
|---|---|---|---|---|---|
| Size (sq. foot of living space) | 5.2 | 6.8 | Age squared-size | 0.00033 | 5.6 |
| $ value of appliances | 1.2 | 2.8 | D·size | 1.8 | 6.7 |
| D·(size·stories) | 2.0 | 2.3 | D=1 if excellent | | |
| D=1 if brick or stone | | | D·size | 1.5 | 5.2 |
| D·(size/stories) | 1.7 | 3.1 | D=1 if very good | | |
| D=1 if slate roof | | | D·size | 0.79 | 3.0 |
| No. of heat zones | 860 | 2.3 | D=1 if good | | |
| D·size | -0.9 | 2.7 | Average room size | -5.2 | 2.0 |
| D=1 if baseboard heat | | | Bathrooms | 800 | 4.0 |
| | | | D=1 if laundry hook-up | 760 | 3.6 |
| D·size | 0.45 | 2.6 | Reading % · Lot size | 0.0046 | 12.6 |
| D=1 if all hardwood floors | | | (Pupil/teacher) · Lot size | -0.02 | 3.7 |
| D=1 if 1-car garage | 790 | 4.4 | (No. of neighbors within 500 ft)·Lot size | -0.03 | 4.1 |
| D=1 if 2-car garage | 1270 | 5.0 | Lot size | 0.89 | 5.6 |
| D=1 if 1 fireplace | 830 | 4.4 | Lot size squared | -0.0000082 | 7.6 |
| D=1 if family room | 580 | 2.3 | Intercept | 36 | 5.7 |
| D·size | 0.8 | 2.0 | | | |
| D=1 if 1 story | | | | | |
| Age·size | -0.07 | 8.3 | $R^2$=0.79 | | |

*Source: Grether & Meiszkowski (1974)

Table 2

Regression Variables*

| | Variable | Coding |
|---|---|---|
| 1. | Living Area | Number of square feet |
| 2. | Rooms | Number |
| 3. | Baths | Number |
| 4. | Half baths | Number |
| 5. | Construction quality | Standard, good, superior |
| 6. | Physical condition | 1,2,3,4,5,6 (very poor-superior) |
| 7. | Fireplaces | Number |
| 8. | Dishwashers | Number (0,1,2) |
| 9. | Garbage disposals | Number (0,1,2) |
| 10. | Hip roof | 0,1 |
| 11. | Shake roof | 0,1 |
| 12. | Shingle roofing | 0,1 |
| 13. | Forced air heating | 0,1 |
| 14. | Electric ceiling cable heat | 0,1 |
| 15. | Baseboard heating | 0,1 |
| 16. | Exterior level siding | 0,1 |
| 17. | Carpeting | 0,1 |
| 18. | Land value | Last assessed value prior to sale |
| 19. | Residential street | 0,1 |
| 20. | Corner lot | 0,1 |
| 21. | Neighborhood trend: commercial encroachment | 0,1 |
| 22. | Garage | 0,1 |
| 23. | Garage size (number of cars) | 0,1,2,3,4 |
| 24. | Other improvements (driveways, sheds, etc.) | Number |
| 25. | Other improvements value | Dollar |

*Source: Gloudemans and Miller (1976).



pupil/teacher ratios, and the racial composition of the schools came from the New Haven Board of Education. Data on traffic flows were obtained from public authorities.

The estimates obtained from the multiple regression are displayed in Table 1.

The statistical results show that the authors were able to explain almost 80 percent ($R^2$ =.79) of the variation in prices paid for single-family structures by the physical characteristics of the buildings and the locational attributes of the house.

It should be pointed out that Grether and Mieszkowski were interested in developing a predictive model, as opposed to a purely explanatory one, and hence did not see it fit to discuss the extent to which there was correlation or collinearity* among the independent or right-hand side variables. The result is that they are able to retain more variables in their final model than would perhaps be the case if they had tried to deal with the more serious cases of multicollinearity in the model.

In another empirical study, Gloudemans and Miller regressed sales prices of duplexes on various housing characteristics for a sample of properties in Eugene, Oregon. The full set of 25 variables emplcyed, and the associated coding is displayed in Table 2. In order to eliminate the more serious cases of multicollinearity, the authors utilized a forward stepwise regression technique. The end result was that only nine variables out of the original set of twenty-five entered the final model. In Table 3 we see the final nine variables, their coefficients and associated t-valves (in brackets).

*Collinearity or correlation among independent variables violates the underlying conditions of least squares regression and leads to inconsistent estimates of the model coefficients.

The authors were able to explain 83 percent ($R^2$=.834), with a standard error of estimate of $3,508 or 11.3 percent of mean sales price, of the variation in sales prices using only nine housing characteristics.

Table 3

Regression Results*

| Variable | Step Entered | Coefficient | t-value |
|---|---|---|---|
| Living Area | 1 | 6.39 | (5.42) |
| Physical Condition | 2 | 3064 | (5.20) |
| Dishwasher | 3 | 2132 | (3.56) |
| Construction Quality | 4 | 2258 | (2.02) |
| Fireplaces | 5 | 955 | (2.02) |
| Baseboard heating | 6 | -2801 | (1.99) |
| Other improvements | 7 | 824 | (2.04) |
| Hip roof | 8 | 241 | (1.65) |
| Shake roof | 9 | 1686 | (1.58) |

*Source: Gloudemans & Miller (1976).

These studies are the models upon which the Allouez experiment will be patterned. A quick perusal of the preceding tables, however, indicates that only the structural characteristics and a few neighborhood attributes have been included. Other studies such as Stull (1974) have suggested that the zoning pattern and the distance to different land uses may be an important component of housing prices. These methods will be incorporated into this study and are described in the next section.

## PART III

## RESEARCH METHOD AND ALLOUEZ RESULTS

### A. The Data Base

On the basis of the previous literature review it is clear that the service flow from a particular house and, consequently, its market price and assessed value, will depend upon a great variety of physical and locational characteristics, of which the proximity to the Green Bay Reformatory may be an important factor. To begin the analysis, a large data base which includes most of the characteristics must be created. For our purposes this data base can be divided into 3 major subsets along with the source of each.

| Type | Source |
|---|---|
| 1. Physical characteristics | Allouez Assessor |
| 2. Neighborhood characteristics | U.S. Census and measured |
| 3. Interaction characteristics | Calculated |

The following discussion will examine each of these subsets in turn.

#### 1. Physical characteristics

The basic data source for this study has been Allouez City Assessor's Office. Tax assessor files are particularly detailed in their description of structural characteristics. Moreover, an assessor file exists for every residential parcel in Allouez. With the cooperation of the Allouez Assessor's Office, the 4000+ parcels in Allouez were numbered and a random sample of 600 parcels were selected for this study. Errors in selection reduced this figure to 587. The parcel pattern resulting from this random selection is displayed in Map #5.

For each of these parcels, information concerning physical characteristics of the house were collected and coded into machine-readable form. These variables

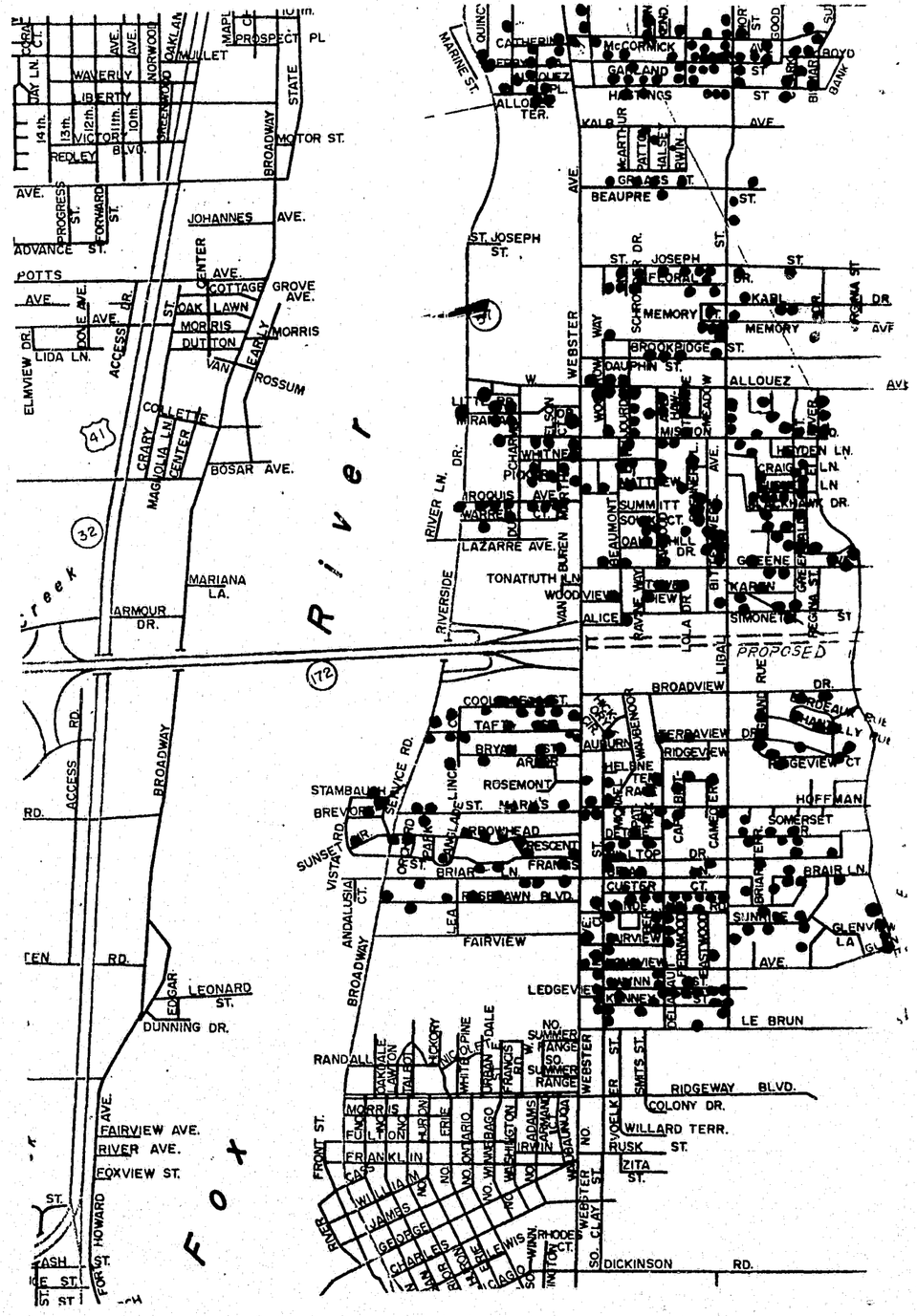
become the basic attribute set explaining the variation in the two dependent variables, market price and assessed value. The variables selected are displayed in Table 4.

Table 4

Green Bay Reformatory Study--587 Observations

Documentation for SPSS File Green 2

| Position | Variable Name | Variable Label |
|---|---|---|
| 6 | PRICE | Last sale price |
| 7 | SALYR | Year of last sale |
| 8 | ASDVAL | Assessment value |
| 9 | ASDYR | Assessment year |
| 10 | LNDVAL | Land value |
| 11 | LOTSIZ | Lot size |
| 12 | NQUALD | Neighborhood quality |
| 13 | NCONDM | Neighborhood condition |
| 14 | HOUSIZ | House size |
| 15 | NUMRMS | Number of rooms |
| 16 | NUMBAF | Number of baths |
| 17 | NUMFIR | Number of fireplaces |
| 18 | EXTWAL | Type of exterior wall |
| 19 | FINBAS | Finished basement? |
| 20 | HOUAGE | Age of house |
| 21 | GARSIZ | Garage size |
| 22 | GARTYP | Garage type |
| 23 | OBCOND1 | Observable condition--excellent or good |
| 24 | OBCOND2 | Observable condition--neither |
| 25 | OBCOND3 | Observable condition--fair or poor |
| 26 | TNOVER | Turnover due to sale |
| 109 | NUMSTR | Number of stories in structure |
| 110 | FAMDUM | Presence of family room=1, all else=0 |
| 111 | ROOFDM | Wood shingle roofing=1, all else=0 |
| 112 | FLORDM | Hardwood flooring=1, all else=0 |
| 113 | HEATDM | Forced air heating=1, all else=0 |



2. Neighborhood characteristics

Since it is recognized that neighborhood and area attributes affect the prices offered by demanders (homebuyers) and asked by suppliers (owners), recent housing price studies attempt to include variables that are hypothesized to represent some of the externalities associated with the residential location decision. These variables are derived from two sources. The first group of neighborhood variables are obtained from the U.S. Bureau of the Census, 1970 block statistics (third count) for the Town of Allouez. The level of disaggregation is the individual block in which a house is located. Thus we are able to relate other housing and population characteristics in the immediate area to the characteristics of the sample house. Although the census data represent the year 1970, we assume here that the structural characteristics of built up blocks have not changed significantly since 1970. The census neighborhood variables selected are displayed in Table 5.

A second category of neighborhood variables rests upon the findings of urban economists who have been able to show that the change in housing values is related to the distance of the residence fr positive and negative neighborhood externalities. For instance, we may hypothesize that a potential home buyer might willingly pay more for a home that is closer to a favored elementary school, or an attractive park, while bidding less for a home located close to a multi-family zone or a busy arterial. These variables are obtained directly from a map of Allouez by measuring the distance to the hypothesized positive and negative neighborhood attrubutes. These are also presented in Table 5.

Prison distance (PRIDIS) is one of these directly measured variables. If it is true that the prison exerts some downward pressure on residential prices, then we should find statistically that houses closer to the prison are valued



Table 5

Green Bay Reformatory Study--587 Observations

A. Data Obtained by Direct Measurement

| Position | Variable Name | Variable Label |
|---|---|---|
| 44 | PRIDIS | Distance of house from prison |
| 45 | ARTDIS | Distance to nearest arterial street |
| 46 | RETDIS | Distance to nearest retail location |
| 47 | SCHDIS | Distance to nearest school |
| 48 | PAKDIS | Distance to nearest park |
| 49 | MFUDIS | Distance to nearest multi-family unit |
| 54 | RRDIS | Distance to nearest railroad |
| 55 | CONLOT | Is this a corner lot? |
| 56 | PRISEE | Is this house within sight of prison? |

B. Data Derived from Census Statistics

| | | |
|---|---|---|
| 50 | AVGVAL | Average value of house in block |
| 51 | AVGRMS | Average number of rooms in block |
| 52 | POP18 | Percent of population under 18 in block |
| 53 | POP62 | Percent of population over 62 in block |

less by potential home buyers, who would be willing to offer less for a home near the prison than a comparable home located further away. Over time this would result in a housing value pattern in which houses nearer the prison sell for less and are assessed at a lower value than comparable homes further away.

Another prison related variable is a dummy variable (PRISEE) which takes the value of one whenever the prison can be seen from a sample home. This variable takes the value zero when the prison cannot be seen from a home. The basis for including such a variable arises from the intuitive supposition that the Green Bay Reformatory walls somehow add a note of insecurity or fear in the minds of potential buyers. We hypothesize that homes within sight of the prison will be valued less by potential buyers who will, on average, bid less for such homes. The statistical analysis will test this hypothesis.

3. Transformed variables

The final series of variables to be discussed are those that are calculated within the computerized statistical package being utilized. These transformations are created to test the extent to which such a transformation will provide a better "fit" of the data, i.e., the extent to which the actual observations are not linear and instead follow a nonlinear pattern. Two kinds of transformations can be distinguished: logarithmic and interaction terms. Both are presented in Table 6.

Table 6

Green Bay Reformatory Study--587 Observations

Calculated Variables

Documentation for the 124 Variables in the File 'Green2'

| Position | Variable Name | Variable Label |
|---|---|---|
| 57 | LNPRID | Natural log of distance to prison |
| 58 | LNARTD | Natural log of distance to arterial street |
| 59 | LNRETD | Natural log of distance to retail location |
| 60 | LNSCHD | Natural log of distance to school |
| 61 | LNPRKD | Natural log of distance to park |
| 62 | LNMFUD | Natural log of distance to multi-family unit |
| 63 | LNAVVL | Natural log of average land value in block |
| 64 | LNAVRM | Natural log of average number of rooms |
| 65 | LNP018 | Natural log of percent of pop. under 18 |
| 66 | LNP062 | Natural log of percent of pop over 62 |
| 67 | LNRRD | Natural log of distance to railroad |
| 68 | AGESZE | Age of house times lot size |
| 69 | LNAGSZ | Natural log of age of house x lot size |
| 70 | AGSQSZ | Age squared x house size |
| 71 | LNAGQSZ | Natural log of age squared x house size |
| 72 | LOTSSQ | Lot size squared |
| 73 | AVRMSZ | Avg. room size--house size over number of rooms |
| 74 | LNAVRMSZ | Natural log of average room size |
| 75 | AGGRSZ | Age of house x garage size |



| Position | Variable Name | Variable Label |
|---|---|---|
| 76 | LNAGGRSZ | Natural log of house age x garage size |
| 77 | SCHDSZ | Distance to school x house size |
| 78 | LNSCHDSZ | Natural log of school distance x house size |
| 79 | BASSIZ | Finished basement x house size |
| 80 | GRTYSZ | Garage type x house size |
| 81 | TNOVSZ | Turnover x house size |
| 82 | PRDSZ | Distance to prison x house size |
| 83 | ARTDSZ | Distance to arterial street x house size |
| 84 | RETDSZ | Distance to retail x house size |
| 85 | PRKDSZ | Distance to park x house size |
| 86 | MFUDSZ | Distance to multi-family unit x house size |
| 87 | RRDSZ | Distance to railroad x house size |
| 88 | CORDSZ | Corner lot x house size |
| 89 | PSEEZ | Within sight of prison x house size |
| 90 | EXTFSZ | External wall x house size |
| 91 | NQUALG | Neighborhood quality--good |
| 92 | NQUALA | Neighborhood quality--average |
| 93 | NQUSZ | Neighborhood quality--average x house size |
| 94 | NQUASZ | Neighborhood quality--good x house size |
| 95 | FIRDUM | FIREPLACE DUMMY = 1 if present, = 0 if no fireplace. |
| 96 | FIRESZ | No. of fireplaces x house size |
| 114 | SIZSTR | House size x no. of stories |
| 115 | SZSTSQRT | Sq. root of house size x stories |
| 116 | HAGESZ | Age of house squared x size of house |
| 118 | SIZDST | House size divided by stories |
| 119 | HOUAGSQ | Age of house squared |
| 120 | LNUMST | Log of number of stories |
| 121 | FAMDSZ | Presence of family room x house size |
| 122 | ROFDSZ | Wood shingle roof x house size |
| 123 | FLRDSZ | Hardwood flooring x house size |
| 124 | HEATSZ | Forced air heating x house size |
| 97 | EXGDCN | Excel. or good external condition |
| 98 | EXGDSZ | Excel. or good cond. x house size |
| 99 | FAIRCN | House in fair or poor condition |
| 100 | FRDSZ | House in fair condition x house size |
| 101 | TURNOD | Dummy for houses that never turned over |
| 102 | TRNDOS | Never turned over x house size |
| 103 | TRNDID | Turned over x house size |
| 104 | TRNDIS | Dummy for houses that have turned over |
| 105 | RPRICE | House price in constant 1967 dollars |
| 106 | NUMSAL | Number of sales in the year in which the sample house sold |

Fireplace

The logarithmic transformations are a rather basic and much utilized procedure for transforming nonlinear variables to linear form. A variety of models are used in this study including double and semi-logarithmic forms. For the purposes of this study, only the linear model results will be discussed, primarily because there is no significant statistical improvement in the model by utilizing the logarithmic forms and because the linear form is much easier for the interested reader to follow and understand.

Interaction terms recognize the existence of intercorrelation between independent variables and attempts to create an improved variable by using the product of two variables. Such a transformation usually improves the model because it utilizes the interrelationships between variables as an aid in explaining the variation in price or market value. The primary example is the use of house size (HOUSIZ) which is multiplied times a number of the variables in Table 6. Specifically, house size is a multidimensional characteristic which by itself is an important determinant of the consumer's willingness to bid for a home. Alternatively, it may be the attributes of a home associated with size that are more important in the consumer's preference pattern.

B. The Testing Procedure

Prison proximity may affect a community in various ways and many of these impacts will not be quantitatively measureable. This study concentrates on observable and measureable phenomena capable of statistical evaluation. Our working hypothesis is that, if the prison has an observable impact on the Allouez community, that impact can be detected statistically. Specifically we expect to see the measures of prison effect (PRIDIS and PRISEE) enter the regression equation as significant explanatory variables affecting the level of



assessed values and market prices in Allouez. Conversely, other variables may be better explanatory variables in which case the prison variables will be insignificant contributors to the explanation of assessed value or market price.

The procedure selected to test the significance of the prison variables and others is called a forward stepwise ordinary least squares (SOLS) regression and is one of many statistical procedures available in the omnibus computer package known as the Statistical Package for the Social Sciences (SPSS). SOLS was selected because it allows variables to enter the regression equation on the basis of their unique contribution to the explanation of the variance of the dependent variable. In this manner, variables that are highly intercorrelated with other independent variables do not enter the equation regardless of how highly correlated they may be with the dependent variable. The problem of multicollinearity and the inconsistent coefficients that result from its presence is thus minimized.

A second attractive feature of SPSS is its capabity to treat missing values in two different ways. Almost all of the 587 observations have some missing values for all variables. The statistically valid procedure is called listwise deletion and results in a much reduced data set since no observation is included in a calculation unless a non-missing value is present for every variable. Use of this option often reduces the 587 observation set to less than 300. The second option is called pairwise deletion and makes use of all available information even though it results in the use of a different number of observations for the calculation of many statistical routines. Used with caution, the pairwise option contains information about the distribution of variables in the absence of full information.

C. Descriptive Statistics

Preliminary analysis of the data revealed that approximately 70 per cent of the houses in the sample sold for $40,000 or less while the average sales price (PRICE) was almost $34,000 with a standard deviation (SD) of $16,000. The average assessed value (ASDVL) was $22,000 (SD=$10,000). Fully 95 per cent of the houses sampled were assessed at $40,000 or less. Table 7 displays the mean values and standard deviations of a subset of the variables employed in the study.

Table 7

| Classification | Variable | Mean | SD |
|---|---|---|---|
| 1. Assessor's Data | Lot size (LOTSIZ) | 11701.9 s.f. | 6271 s.f. |
| | House size (HOUSIZ) | 1236.5 s.f. | 945 s.f. |
| | No. of rooms (NUMRMS) | 8.0 | 13.6 |
| | Age of house (HOUAGE) | 18.9 years | 12.8 years |
| | Garage size (GARSIZ) | 451.5 s.f. | 141.8 s.f. |
| | Turnover (TNOVER) | 1.5 | 1.1 |
| 2. Measured Data | Distance to prison (PRIDIS) | 4508 ft. | 2619 ft. |
| | " " arterial (ARTDIS) | 2067 ft. | 1418 ft. |
| | " " retail (RETDIS) | 2393 ft. | 1422 ft. |
| | " " school (SCHDIS) | 2190 ft. | 1366 ft. |
| | " " park (PAKDIS) | 2656 ft. | 1331 ft. |
| | " " multi-family unit (MFUDIS) | 2746 ft. | 1272 ft. |
| | " " railroad (RRDIS) | 3600 ft. | 2108 ft. |
| 3. Census Data | Average value of house (AVGVAL) | $24923.80 | $8748.70 |
| | Average number of rooms (AVGRMS) | 6.4 | .95 |

D. Results and Conclusions from the Regression Model (Allouez)

Presentation of the results of the stepwise regression procedure will entail the display of a number of tables that are summarizations of a voluminous amount of computer printout. Over 50 stepwise regressions were completed, each testing an alternative structure. The overall procedure is one of reduction, starting with almost 100 variables and reducing the variable set



until only the most significant and least intercorrelated variables are allowed to enter the equation. Concomitantly, this procedure was carried out for two major dependent variables ASDVAL, assessed value and RPRICE Sale Price of Homes in constant 1967 dollars. Each will be given separate analysis.

1. Assessed Value Equations

Table 8 presents the results of the fourth round stepwise selection regression based on four alternative specifications. The difference between pairwise and listwise deletion is evident in line 16 which illustrates the reduction in the number of observations from 503 to 272 occasioned by the choice of the listwise procedure. The other major difference between columns is the inclusion or exclusion of AVGVAL within the model. Although it has a simple correlation of .71 with assessed value, AVGVAL is also intercorrelated with the other variables in the model in the range of .3 to .5, and with AVGRMS at the .80 level. This intercorrelation has the effect of changing markedly the size of the AVGRMS coefficient (line 6) in columns 2 and 4 compared to columns 1 and 3. The only other variables with severe intercorrelation problems are FIRDUM and NUMFIR which are clearly measuring much the same influence.

In general the model is quite stable with all variables except those mentioned above retaining roughly the same size coefficients regardless of whether pairwise or listwise deletion is employed. The $R^2$ (coefficient of determination) value indicates that all models explain 66 to 75 percent of the variation in assessed value.

Table 8

Summary Regression Results Using Assessed Value
As the Dependent Variable

| Variable entered | Table of Coefficients* Pairwise Deletion with AVGVAL (1) | Pairwise Deletion without AVGVAL (2) | Listwise Deletion with AVGVAL (3) | Listwise Deletion without AVGVAL (4) |
|---|---|---|---|---|
| 1. AVGVAL (Avg. value 1970 of homes in the block) | .563 | | .496 | |
| 2. CRTYSZ (Garage type x house size) | 3.06 | 4.15 | | |
| 3. NUMRMS (Number of rooms) | 1634 | 1764 | | |
| 4. SIZSTR (Size x no. of stories) | | | 3.79 | 4.00 |
| 5. GARSIZ (Garage size) | 11 | 12.8 | 13.8 | 15.75 |
| 6. AVGRMS (Avg. # of rms. 1970 per block) | -2234 | 1157 | -1910 | 1048 |
| 7. EXGDSZ (Excell. or good condition x house size) | 2.09 | 1.92 | 1.29 | 1.20 |
| 8. RETDIS (Distance to retail centers) | | .437 | | |
| 9. FIRDUM (Fireplace dummy variable) | 2222 | 3030 | | |
| 10. NUMFIR (No. of fireplaces) | | | 2387 | 3464 |
| 11. LOTSSQ (Lot size squared) | .000002 | .000002 | .000015 | .000022 |
| 12. RRDIS (Distance to nearest railroad) | -.294 | -.565 | | |

*All coefficients are significant at the 95% or 99% level of confidence.



Table 8 cont.

Summary Regression Results Using Assessed Value
As the Dependent Variable

| Variable entered | Table of Coefficients* Pairwise Deletion with AVGVAL (1) | Pairwise Deletion without AVGVAL (2) | Listwise Deletion with AVGVAL (3) | Listwise Deletion without AVGVAL (4) |
|---|---|---|---|---|
| 13. PRIDIS (Distance to prison) | | -.276 | | -.346 |
| 14. D.W. Statistic | 1.06 | 1.03 | 1.91 | 1.90 |
| 15. Constant | 2822 | -6611 | 7015 | -2217 |
| 16. Number of observations | 503 | 503 | 272 | 272 |
| 17. $R^2$ (adjusted) | .72 | .66 | .75 | .70 |
| 18. F-value | 141 | 100 | 92 | 93 |

*All coefficients are significant at the 95% or 99% confidence level.

2. Prison Distance

The variable of interest is, of course, PRIDIS, which measures the distance from each house in the sample to the Green Bay Reformatory. Intuition, in the absence of personal experience in Allouez, would suggest that as the distance to the prison becomes smaller, assessed value for homes should decline, a positive correlation. As discussed in previous sections, however, observation suggests just the opposite, i.e., homes nearer the prison are not valued less. This observation is borne out by the results of the regressions where AVGVAL is excluded in Table 8. PRIDIS is the last significant variable to enter the equation. The sign of PRIDIS is negative, implying that houses located closer

to the prison are assessed at higher levels than comparable homes located further away. The phenomena is significant, which means that it occurs with a regularity that could not be caused by chance alone. The overall magnitude of the effect is small, however. In Table 8, the fourth equation indicates a coefficient of -.346, which implies that for homes located 100 feet closer to the prison, assessed value will rise by $35, all other characteristics being held constant. This is a partial effect, however. The full effect must be measured by allowing all variables to change as well. The fact that PRIDIS enters the equation only when AVGVAL is excluded suggests that other neighborhood variables could easily inhibit PRIDIS from exerting any influence whatever. Moreover, the additional explanatory power obtained by adding PRIDIS is very small (.7%), although the equation in total explains 70% of the variation in assessed value.

3. Market Price Equations

The market price equations are similar in structure to the assessed value equations with the exception of the form of the dependent variable. Since market prices are recorded for different years, there is no constant base for cross-sectional measurement. To correct for inflationary effects, market price is divided by the CPI Index for Milwaukee owner-occupied housing which creates RPRICE, the market price of housing in constant 1967 dollars.

Table 9 presents the results of the listwise deletion regressions with RPRICE as the dependent variable. In general, the coefficients are quite similar to the coefficients obtained for the assessed value equations. As expected, each coefficient bears a common sense relationship to the variable it measures. NUMRMS, for instance, is associated with a coefficient of 1373 and 1621 (line 4) in the two equations presented in Table 9. This implies that the addition of



one more room to a house in the sample, holding all other variables constant, would increase market price by $1373 to $1621, depending on whether the average value of homes in the block (AVGVAL) is included in the equation. Similar interpretations hold for number of fireplaces (NUMFIR) and number of baths (NUMBAF).

It has also been suggested that homes located closer to the prison would turnover in the market place much more often, or be offered for sale more often or be listed on a multiple listing service for a longer period of time. No information has been obtained for the last two suppositions, however it is possible to test the first supposition, namely that homes located closer to the prison sell more often. TNOVER is a variable that measures the number of times that a home has been sold as recorded by the assessor's office. With 385 valid observations the Pearson correlation between TNOVER and PRIDIS is -.11. The test is not significant at the 95% level of confidence, i.e., the true population correlation coefficient could be zero by chance alone more than 5 times out of 100. If we are willing to accept a 90% confidence level and risk being wrong 10 times out of 100, it can be said that there is a very weak positive association between prison proximity and the number of times a house has sold.

4. Prison Distance

In the market price equations, PRIDIS does not enter the equations in Table 9 which implies that other variables explain a greater amount of the variation in market price than does prison distance. The simple correlation between price and prison distance is -.285. This is a measure of simple association and is significantly different from zero at the 95% level of

Table 9

Summary Regression Results Using Market Price
As the Dependent Variable

| Variable entered | Table of Coefficients (Listwise Deletion)* with AVGVAL | without AVGVAL |
|---|---|---|
| 1. AVGVAL (average value, 1970, of homes in the block) | .3726 | |
| 2. SIZSTR (house size x # of stories) | 1.93 | 1.84 |
| 3. LOTSSQ (Lot size squared) | .000016 | .000021 |
| 4. NUMRMS (Number of rooms) | 1373 | 1621 |
| 5. GRTYSZ (Garage type x house size) | 2.19 | 2.87 |
| 6. AVGRMS (Average number of rooms in block, 1970) | -1730 | 906 |
| 7. NUMFIR (Number of fireplaces) | 1797 | 2632 |
| 8. NUMBAF (number of baths) | 1835 | 2060 |
| Number of observations | 229 | 229 |
| Constant | 6641 | 1515 |
| $R^2$(adjusted) | .71 | .67 |
| F-value | 70 | 79 |

*All coefficients are significant at the 95% level of confidence.



confidence. The sign is negative, which indicates that, should PRIDIS enter the equation, the relationship observed in the assessed value equations would still hold i.e., as the distance to the prison becomes greater, the market price falls. The observations made in earlier chapters are once again confirmed: proximity to the prison is associated weakly with increased market price or house value. These results are not generalizable directly to other prison sites but do indicate that it is certainly possible to place prison structures in such a way that the impact on property values is insignificant and possibly even positive.

ALLOUEZ SUMMARY CONCLUSIONS

The preceding chapters have verified the following set of conclusions:

* The town of Allouez is composed of relatively new homes with above average values.
* The observed character of the neighborhoods surrounding the reformatory show no deleterious effects as a result of proximity to the prison. Indeed, the opposite appears to be the case.
* Statistically, the characteristics of the house and neighborhood explain approximately 70% of the variation in assessed values.
* The equation structure is stable and insensitive to the introduction of other structural characteristics. Other neighborhood and urban characteristics may improve the equation, however.
* Proximity to the prison does enter the equation for assessed value. It explains less than 1% of the variation in assessed value while all the variables combined explain 70% of the variation.
* Prison proximity affects assessed value positively. The closer to the prison a house happens to be, the higher its assessed value. The

effect is small, however. Prison proximity raises the assessed value of a home by $27 to $35 for every 100 foot increment toward the prison with all other variables held constant.

* The equations for both assessed value and market price are composed of variables that are quite similar to the findings of other studies.
* The market price equations are similar to the assessed value equations in the number and kind of variables which enter the model.
* Proximity to the prison does not enter the equation with a coefficient that is significantly different from zero. If it were to enter the equation, its coefficient sign would be negative, indicating that prison proximity increases market price.
* We conclude that prison proximity does not adversely affect assessed value and has no significant impact on the market price of homes in Allouez.
* In general other variables are much more important in determining house value than are variables associated with distance to the prison or the fact that the prison can be seen from a particular house.



# THE WAUPUN STUDY

## PART IV AREA DESCRIPTION

### Introduction

Waupun is a city of 8,000 people located on the banks of the Rock River in south-central Wisconsin, 70 miles northeast of Madison, the state capital. Waupun was first settled in 1839 and the state prison was located there in 1851. In 1909 the Central State Hospital was located in Waupun. Both institutions have contributed to the city's growth and have made for a stable economy over the years. The county line for Dodge and Fond du Lac counties constitutes Waupun's main street. To the south and east U.S. Highway 151 forms the city's southern and eastern boundaries. Also to the southeast lies Horicon Marsh, the 20,000 acre National Wildlife Refuge. The rest of the land surrounding Waupun is farmland.

City Boundaries. U.S. Highway 151 limits the growth of the city of Waupun in the south and east directions. The Rock River once limited growth to the north but new subdivisions have been built on the north side of the river in recent years. To the north and west lie farmland. State highway 49 runs east-west along Main Street, the county line, and most residential development occurs along this road. The farms and smaller communities outside the city limits share in some of the city's services, such as education.

Topography. The terrain of the entire city and its environs is flat. The Rock River, where it travels through Waupun, is barely more than a stream, being only 15 feet wide in most places. The Rock River does form a small pond in the north-central part of the city.

Transportation Linkages. U.S. Highway 151 runs to the south and east in a NE-SW direction between Madison and Green Bay. State Highway 26 lies to

the east in a north-south direction connecting Janesville and Oshkosh. State Highway 49 travels through the center of Waupun in an east-west direction. During the autumn, Highway 49, just east of Waupun where it crosses the Horicon National Wildlife Refuge, is a much favored spot for viewing white-tailed deer and the thousands of migrant Canadian geese.

Two key Greyhound Bus lines cross the city, the Chicago-Minneapolis run and the Green Bay-Duluth run. There is also a growing locally owned school bus and charter bus service. Freight service is provided by the Milwaukee Road, which runs north-south through the center of the city. There are also a number of locally owned trucking services. In addition, to the southewst of the city is one of the best small airports in the state.

The city streets of Waupun are well laid out and travel from one part of town to another is fairly easy. Traffic and automobile parking is not a problem in Waupun except around the prison during visiting hours. Many smaller roads connect Waupun with the other small towns in the area, such as Fox Lake and Brandon.

Population and Employment. The population for revenue sharing in 1977 was 8,099 with 5,344 being residents of Dodge County and 2,755 being residents of Fond du Lac County. The population of Waupun has been stable for years. In 1976, approximately 1,044 people were residents of the Wisconsin State Prison and 260 were residents of the Central State Hospital. Other Waupun industries include:

Berlin Seating, Inc.
Carnation Company
East Central Breeders Association
Electri-Wire, Inc.
King Manufacturing Corp.
M & M Gray Iron Foundry
Nasco Industries, Inc.
National Rivet and Manufacturing Co.
Medalist Sand-Knit, Inc.



The Shaler Company
Waupun Concrete Products
Waupun Foundry, subsidiary of Hanes Mfg. Co., Inc.

Just outside Waupun are the Alto Co-op Creamery and theWaupun Ready-Mix Company.

In addition, Waupun is a bedroom community for many people who travel the few miles to their jobs in the larger cities of Beaver Dam, Juneau, and Fond du Lac. The last two are county seats of government.

Education. Waupun has a new senior high school, a middle school, and three elementary schools, one each on the west, central, and east side of town. There are also five elementary schools in the outlying areas, which form a joint school district with Waupun. In addition, Waupun also has three private Christian schools. Children attend the elementary school nearest their home. Exact boundaries vary each year to keep the attendance at the three schools in balance. Learning disability programs are provided at the two newer and larger schools, Jefferson and Washington. Washington also has a behavioral disabilities program.

Social Life and Social Services. Waupun has an ultra-modern 100 bed hospital built in 1951 with donations from the community. Fifteen different Christian churches are located in Waupun. There is also a public library built in 1968, with 33,000 volumes, and 4,000 stereo records. A 27,000 square foot community center provides space for hockey games, ice skating, trade shows, and exhibitions. There is a Heritage Museum and a Historical Society. A Senior Citizens Center provides nutritious meals as well as a full schedule of crafts, games, and fellowship. There is a prominent Little League as well as organized softball leagues for men and women.

Parks and Recreation. The Fond du Lac County Park, one mile west of the city, contains 94 acres of virgin timber, a large heated swimming pool, picnic facilities, concession stand, pavilion, and campsites. Within the city limits

there are four parks with playground and picnic equipment:

Wilcox Park on S. Watertown Street

West End Park on Beaver Dam and Grace Streets

McCune Park and Beach on North Grove Street

Dodge Park on S. Madison Street

A major recreation attraction is the Horicon National Wildlife Refuge located to the southeast of Waupun on Highway 49. The northern portion of the Marsh (20,796 acres) is Federal Government owned and is designated a wildlife refuge. The southern portion (10,857 acres) is state-owned. During the past decade, public use of the area has increased tremendously. Hunters, fishermen, sight-seers and students come from long distances for recreation and education. All of the state portion and certain areas of the Federal portion are open to fishing. Hunting for geese and deer is allowed in certain areas at certain times of the year. Waupun tourist facilities share in the recreational revenue generated by the marsh.

Land Use. The commercial and retail development in Waupun has been largely limited to both sides of Main Street and extends a couple of blocks from Main St. in each direction on Madison St. Main St., between Commercial St. and Carrington St., could be considered the central business district of the city and is the location of the City Hall, the banks, and the major retail stores. To the West along Main St., certain farm-related businesses, such as tractor sales and grain storage, have prospered. As the population has moved further west, small new shopping centers have been built along Main St., consisting mainly of food and hardware stores.

Industrial development has been limited to the outskirts of the city for new industries and to Jefferson, Brown and Franklin streets in the center of the



city for old industries, such as foundries and mills, which were built earlier in the century. The State Prison lies just to the south of the center of the city. It and its power plant and the Central State Hospital cover a considerable area.

There are very few multi-family apartment units in Waupun. Two new areas, to the southeast and southwest, have been designated in the new city plan as permissable multi-family areas. Since there is a recent ban on the extension of city sewer lines these areas remain largely vacant lots for the time being. By far the major land use in Waupun is single family residences. Small areas, designated on the land use map, are set aside for parks and conservation. All the outlying land is agricultural and is actively farmed.

Waupun is mainly a working class city. The people are neigher extremely poor nor extremely wealthy. Most of the homes, particularly in the older, central part of town, are small bungalows, built before the War. They can be characterized as neat and well-maintained. The city assessor, Mr. Jon Dobbratz, states that there are no areas of declining property value in Waupun. There are areas of rising property values where new development is occurring to the northwest and to the southwest. Mr. Dobbratz also states that Waupun is a very stable community with most residents having stable, dependable and adequate incomes. Consequently, there is little turnover in housing each year.

The Waupun State Prison. The Wisconsin State Prison, with approximately 1,000 inmates, is a maximum security prison for adult males and is located just south of the central business district of the city. The prison is a large, three-story, stone building covering four square blocks. Surrounding the entire building is an eighteen foot high concrete wall. The wall to the front of the prison has arched, barred openings permitting a view into the prison grounds

and the carefully maintained chrysanthemum gardens. Directly behind the prison is the prison's power plant. To the southeast is the Central State Hospital, another maximum security prison for adult males with a population of 260 residents. The grounds of the hospital resemble a park, with long, rolling expanses of lawn and many groupings of shrubs and trees. The hospital building cannot be readily seen from the city streets one block removed.

Currently, the state prison is overcrowded and the hospital will be converted into a proper prison with a high wall in the near future. This overcrowding has been partially responsible for past dissension. The prisoners at Waupun rioted about three years ago, demanding relief from the overcrowded conditions. During that riot, the streets adjoining the prison were cordoned off and people who lived on these streets were not allowed to drive to their homes. The state prison has been located in Waupun since 1851 and the city and its population have grown up with the prison in its midst. To the people of Waupun the prison has always been there and they accept its existence as part of life.

The state prison is located in the center of the city, two streets south of Main St. This central area is the oldest part of the city; all new housing has been constructed on the periphery. Most of the homes and neighborhoods in the older part of the city are very similar to each other, with the exception of Carrington St. which has many large, old, expensive homes. The state prison fronts on Madison St. and extends from E. Brown to E. Olmstead. Small, old, single family homes and one small apartment building face the prison on the opposite side of the street. One home, directly opposite the front of the prison, has been for sale for four months. Slightly farther south of the prison, on Madison St., is a church and a park. The view of the front of the prison is not particularly unattractive, as photographs number 19 and 20 indicate. The south

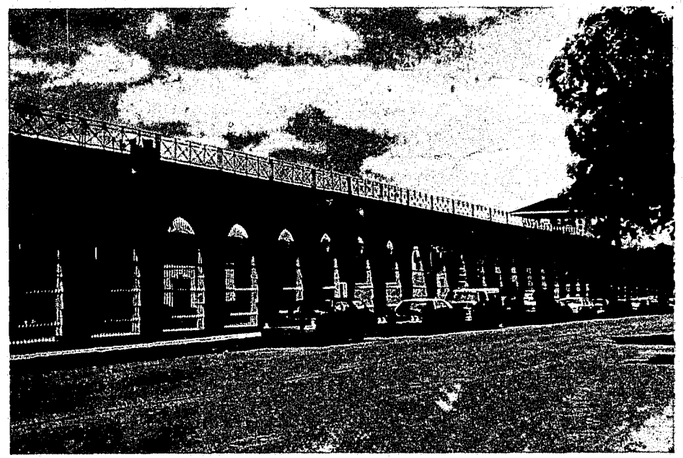


Photo #19

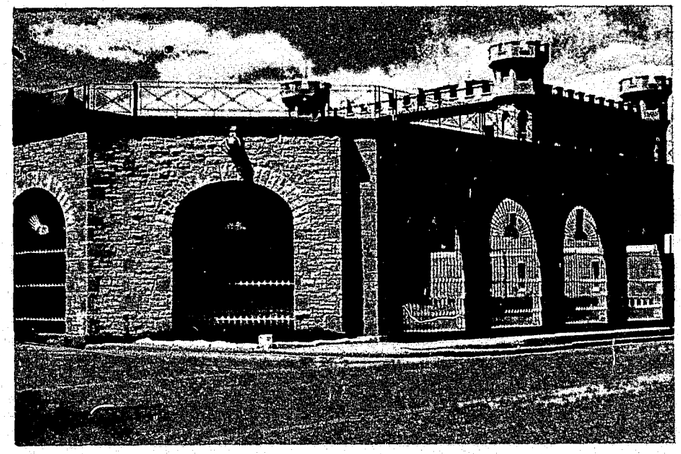


Photo #20

side of the prison is separated by an alley from the backyards of the small, old, single family homes that line East Elmstead Street. Because of the many large, old trees in yards and along the sidewalks the prison wall can be seen from only a few places along Olmstead Street.

The back or west wall of the prison directly abuts the sidewalk on South Drummond Street. Houses on the opposite side of the street have the high prison wall as a view from the front of the house and the railroad tracks to the rear. The location on this street is subjectively less desirable than elsewhere near the prison. Photograph number 21 presents the view of the prison from these houses along South Drummond Street on the west side of the prison.

Photo #21

The north side of the prison borders East Brown Street where only a few small single family homes face the prison. Brown Street also marks the beginning



of the Waupun industrial and commercial zones. The commercial buildings are quite old and of brick construction. The location of these firms near the prison does not seem to be a deterrent to their economic viability.

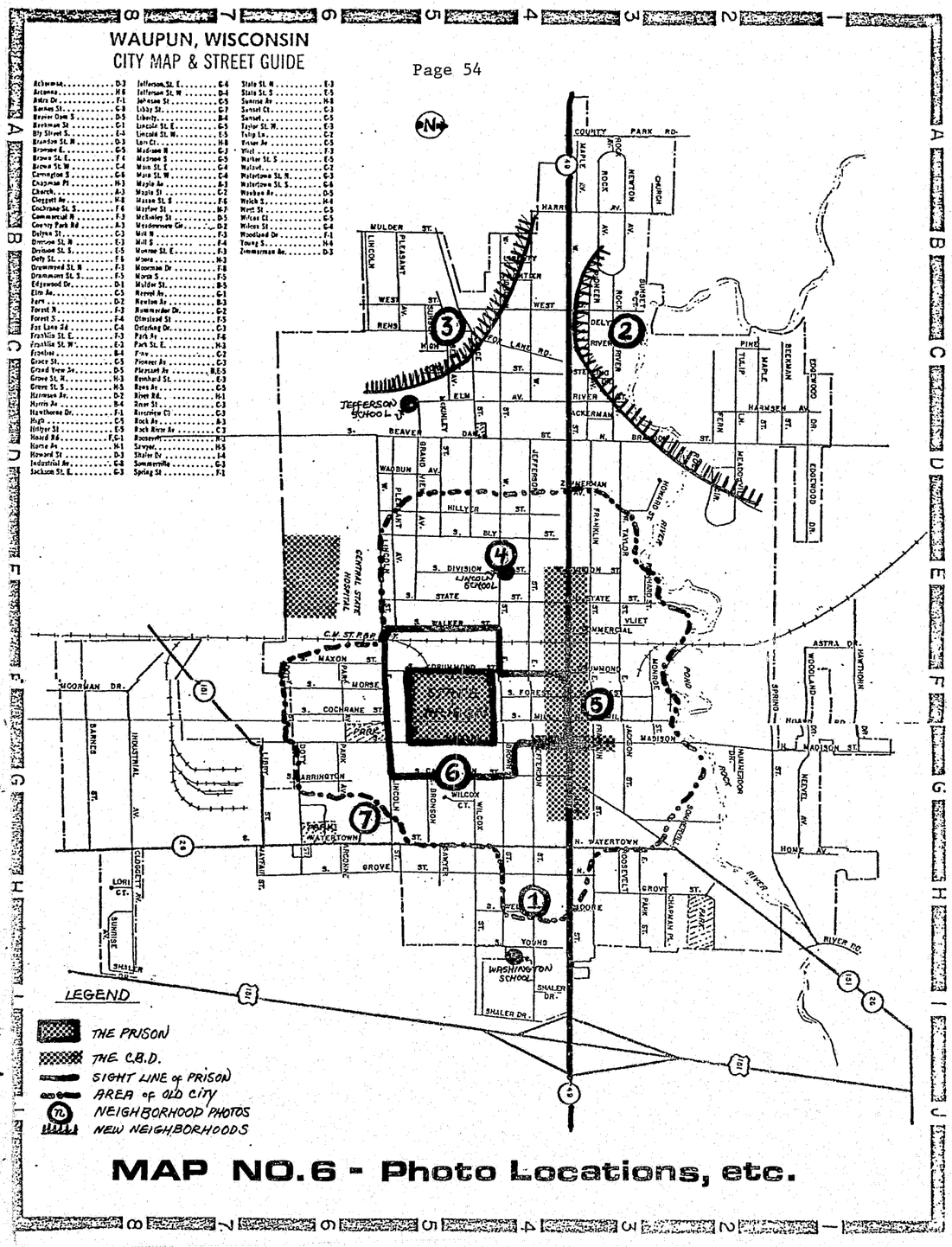
The prison wall is visible occasionally along Main Street, the prime commercial arterial. On the other three sides of the prison, the walls are effectively screened by mature shade trees within one block of the prison. Map 6 helps to illustrate the visual impact of the prison through the use of sight lines. Outside of these lines the prison cannot be seen at all. Inside the line, along Walker, Lincoln, and Carrington streets the prison wall can be seen only occasionally through the trees. Along the rest of the streets within these sight limits the prison is clearly visible. Map 6 also includes a tracing of the old city, where most of the houses were built before WWII and where a high degree of similarity exists between one neighborhood and another.

Neighborhood Descriptions

Perhaps the easiest way to gain an understanding of the characteristics of Waupun neighborhoods is through the use of photographs. To this end Waupun was subjectively divided into seven areas with reasonably distinct neighborhood characteristics. Map 6 depicts the location of these neighborhoods. The following pages describes the important features of each neighborhood.

Neighborhood #1: E. Jefferson St. at Welsh St.

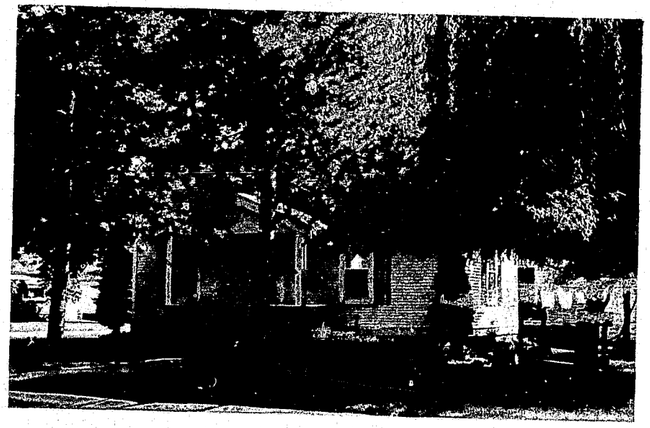
The homes here are typical of the homes found around the prison: small, one-story, sometimes with a bedroom in a gable, neat, well-maintained, having a small amount of shrubbery and flowers around the house and mature trees lining the sidewalk. The houses are usually of wood, with asphalt shingle roofing. They predate WWII as typified by the single detached garages when garages are




MAP NO.6 - Photo Locations, etc.

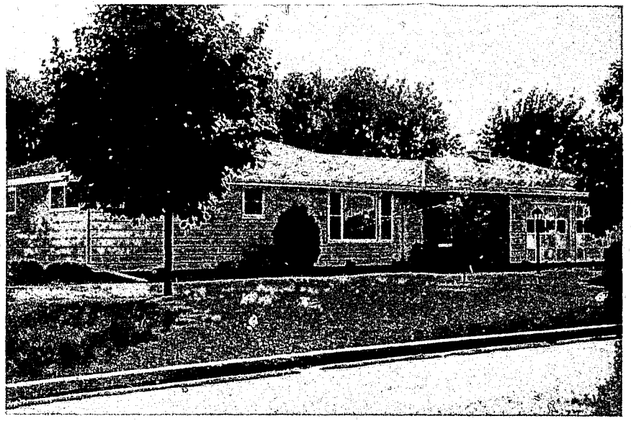


present, and the presence of small backyards. Below is a photograph of a typical house in this type of neighborhood.



Neighborhood #2: Rock River Ave. between Riverview and Delynn

This is a relatively new subdivision. The homes here are typical of the homes built in the subdivisions north of Main Street and also those built north of the Rock River. The houses here are typically one-story ranches occupied by middle income groups. Houses are built of wood, with asphalt roof shingles, two car attached garages, and some landscaping with immature trees. The homes in this neighborhood are the farthest removed from the prison. They are in one of the two new, growing areas of the city and are also near the farms on the outskirts of the city. The photographs on the next page show typical homes in the area.



Neighborhood #2

Rock River between
Riverview and Delynn Court



Neighborhood #3: Visser Ave. between Rens Ave., and West St.

This is also a fairly new neighborhood. Homes here are more expensive than in most other areas of Waupun. The houses here are larger, more elaborate, and have more interesting landscaping than elsewhere in Waupun. This is a new, growing, status neighborhood near to the Jefferson elementary school and to the Christian elementary and high schools. Below are photographs of two typical homes. This neighborhood is quite far removed from the prison and borders on the farmland near the outskirts of the city.

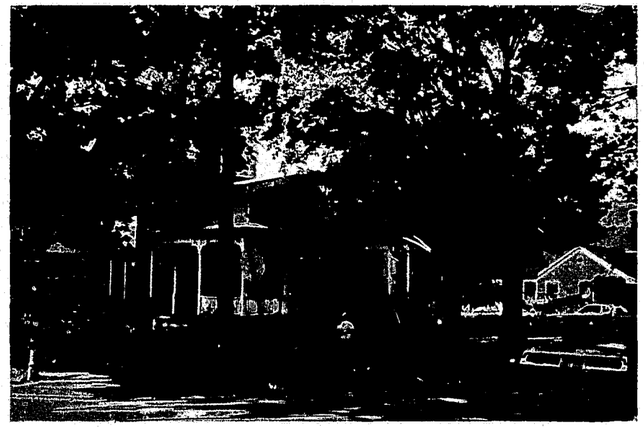
Neighborhood #4: W. Brown St. at S. Division St.

This neighborhood is in the old, central part of the city. Lincoln elementary school is on the NW corner. The houses here are old, small, usually two-storied, and are made of wood with asphalt roof shingles. Garages are single car and detached when present. Mature trees shade the sidewalk and streets although landscaping within yards is minimal. The prison cannot be seen from this neighborhood. Below are photographs of typical homes in the area.



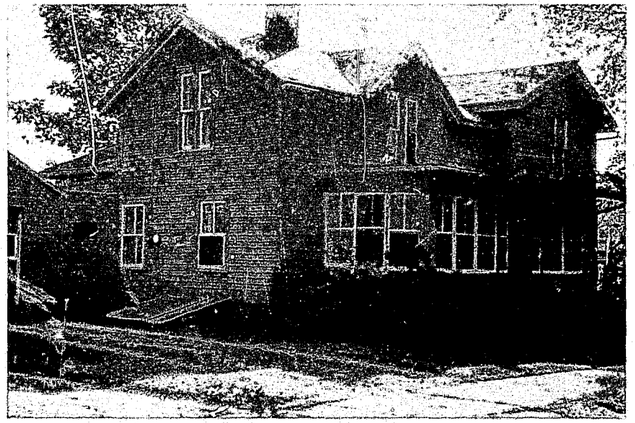
Neighborhood #5: E. Franklin St. at N. Forest St.

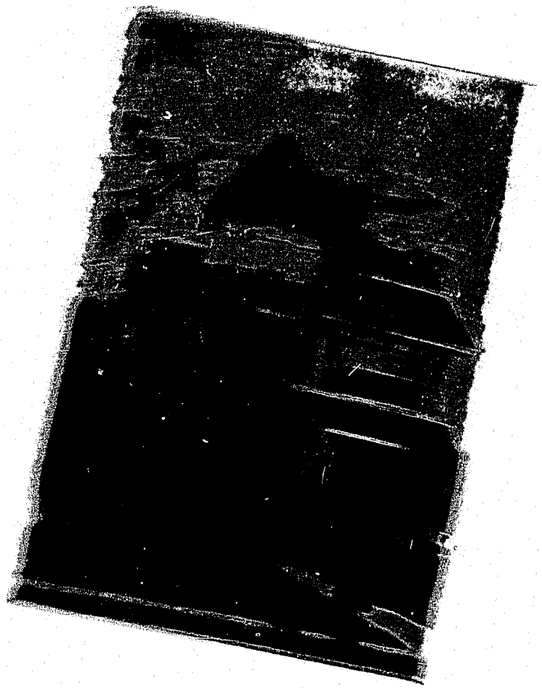
This is an older neighborhood in the central part of the city directly behind the commercial strip (Main Street). Homes in the neighborhood are in greater disrepair than anywhere else in Waupun. The houses are old, made of wood, and are either small, one-story bungalows, or larger two-storied homes. Garages are single and detached when present. Parking and traffic are proble in this neighborhood due to the nearness of the retail stores on Main Street. The prison wall can sometimes be seen when crossing the streets. Below are examples of typical homes in the neighborhood.



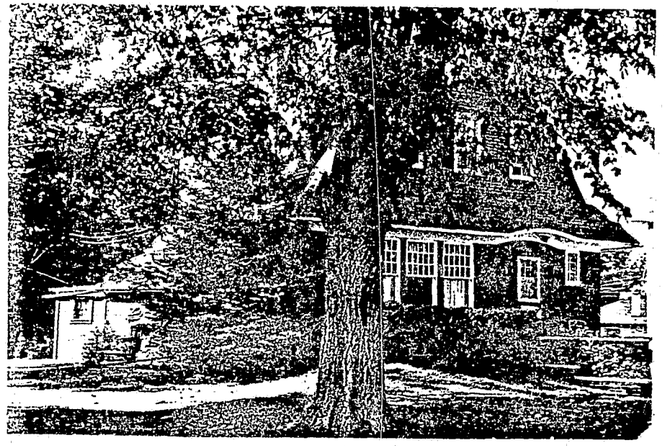
Neighborhood #6: Carrington St. between E. Brown and E. Lincoln Sts.

Carrington is one street east of the prison. It is an older, upper class neighborhood. All the old mansions appear to have been built only on Carrington Street. Consequently, this one street is a neighborhood by itself. The homes are all large, of interesting architecture, and make use of stone and brick in their design. The homes and grounds are spacious and the landscaping is more elaborate and mature than elsewhere. The front walls of the prison can occasionally be seen from between the trees on Carrington Street. The following photographs are typical of the homes in the area.





Neighborhood #7
Beverly Court





D. Descriptive Summary

The casual observer to Waupun cannot help but be impressed by the neat and orderly character of the town. Removed from the economic mainstream of urban Wisconsin, it has managed to retain much of the stability, character and charm of small town living while at the same time conscientiously and intelligently adapting to orderly growth on the periphery.

The prison is clearly one of the main contributors to the economic health of the community and has participated in this role since 1851. The homes proximate to the prison are very old by suburban standards and very well kept. The Waupun visitor would find it difficult to locate areas of residential property value decline. He would find it next to impossible to attribute that decline specifically to a prison effect.

Waupun's size has helped to isolate it from the many urban ills that now beset central cities: problems of non-white unemployment, white migration to suburban life styles, high crime rates and declining property values. Consequently, the impact of prison proximity can be measured independently of these peculiarly urban influences. The three dimensions of housing value and price described in Part II should be capable of capturing the impact of prison proximity on housing values in Waupun.

# PART V

## RESEARCH METHOD AND WAUPUN RESULTS

### A. The Data Base

On the basis of the literature review appearing in Part III and the observations made in Part IV, it appears plausible to expect that the model utilized for the Allouez analysis will apply equally well to Waupun. Briefly we hypothesize that the service flow from a particular house and, consequently, its market price and assessed value will depend upon a variety of physical and locational characteristics, of which proximity to the Waupun State Prison may be an important factor. The data base used for the Waupun Study is similar to that used in Allouez and consists of 3 subsets. For discussion purposes these are again presented here:

| Type | Number of Variables | Source |
|---|---|---|
| 1. Physical Characteristics | 26 | Waupun Tax Assessor |
| 2. Neighborhood Characteristic | 13 | U.S. Census and Measured |
| 3. Interaction Characteristic | 149 | Calculated |

Since many of the variables are identical to the Allouez model, the following discussion will examine each of the subset only in summary form by highlighting the differences between Allouez and Waupun.

1. Physical characteristics

The basic data source for the study was obtained through the cooperation of the Waupun City Assessor's office. A zoning map of Waupun, which divided all the land into parcels, was obtained from the city assessor's office. All land parcels on the map that were single-family residential were numbered



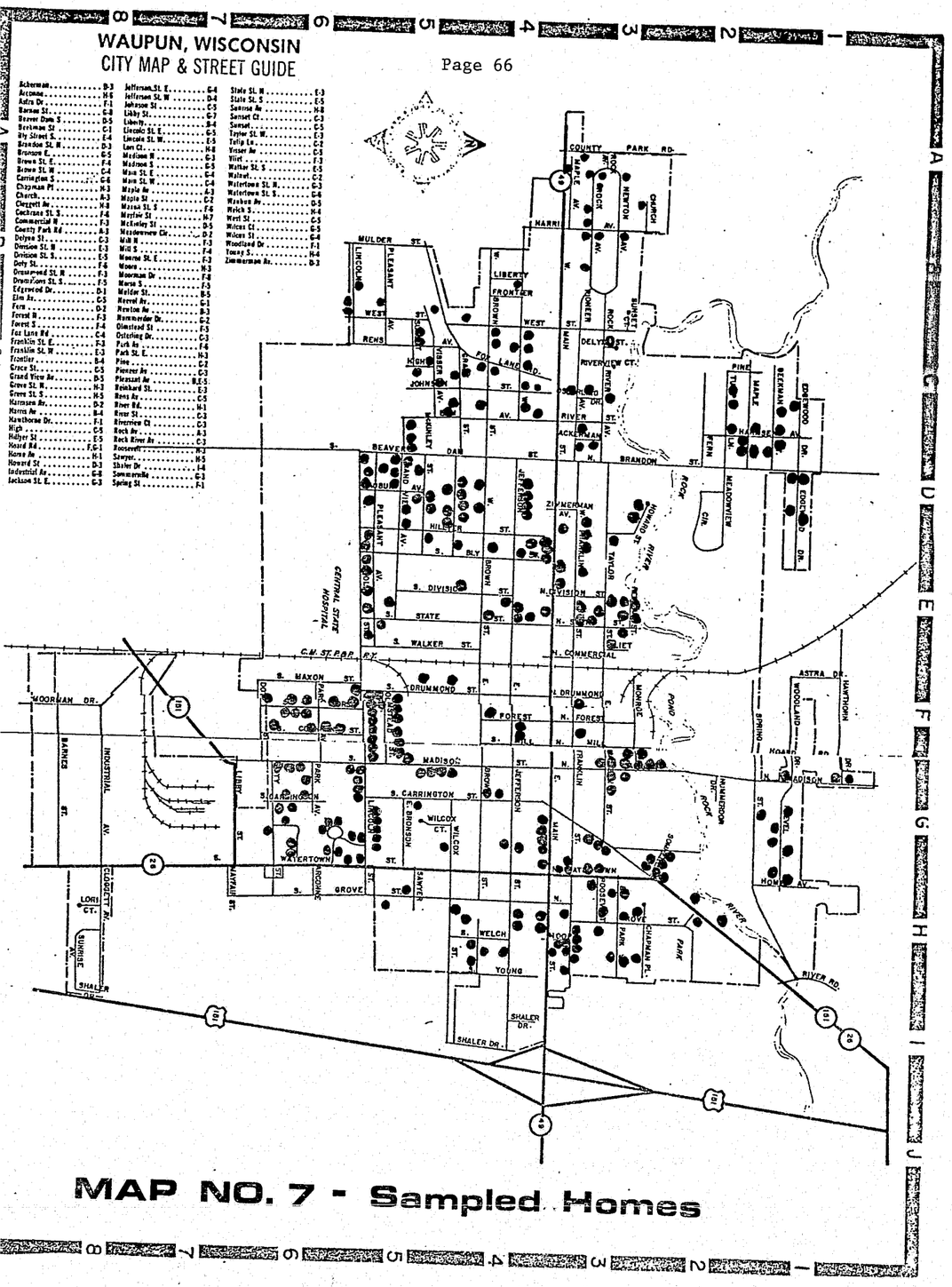
consecutively from 1 - 2050. For statistical validity a random sample of about 300 is needed from a population of 2000. A random number table was used to generate 350 random numbers between 1 and 2050. The parcels on the map bearing these numbers became the random sample. As neither the addresses nor the parcel numbers could be obtained from the zoning map, the map with the sample marked was sent to Mr. Dobbratz, the Waupun Assessor, who then copied the corresponding assessment files. 323 useful files were obtained from the sample. Information from these files was then coded into machine readable form. Errors and omissions reduced the data set to 315 observations. The variables selected were identical to those obtained for Allouez. These are referenced in Table 4 (p. 28). Map #6 on the following page displays the spatial distribution of homes sampled throughout Waupun.

2. Neighborhood characteristics

Once again a variety of census and distance measures including distance to the prison (PRIDIS) and homes within sight of the prison (PRISEE) were hypothesized to represent the effect of neighborhood characteristics upon the value of single family residential homes. These variables are discussed beginning on page 30 and displayed in Table 5 (page 31). Once again the variables measured are identical to those created for Allouez.

3. Transformed variables

By far the largest set of variables used in the Waupun study are those transformed from the original data. The primary reasons for such transformations are, first, the underlying non-linear character of many relationships between assessed value/market price and the explanatory variables and second, the extent to which two independent variables are so closely related that they explain a common amount of variance in addition to a






unique amount of variance in the dependent variable (assessed value/market price). In both cases a transformation helps the regression equation to more effectively explain the total variation in the dependent variables.

The transformed variables are similar to those used in Allouez and are described on page 32.

B. The Testing Procedure

As in Allouez, Prison proximity may effect a community in a variety of ways, many of which are not quantitatively measurable. For example, in Waupun reference has already been made to parking and congestion problems during visitor hours at the prison. This activity, occurring frequently, may well irritate area residents, but it is not amenable to analysis of the type used in this study.

Another example concerns the effect of past prison upheaval. To the extent that nearby residents are willing to sell their homes at a lower price because of an increased sense of insecurity or fear and this propensity decreases with distance from the prison, then such a market response will be captured by the model utilized in this study if there are sufficient market transactions where this pricing policy is evidenced. It is also possible, however, that all residents in the community may feel less secure, in which case no specific effect will be measurable in the model employed here. Such a community wide reaction would likely evidence itself in an increased level of out migration, homes for sale, and home abandonment. Such has not been the case in Waupun where the number of homes for sale is very small relative to suburban markets, reflecting the stability of the town's social and economic climate.

A final example concerns the length of time that a home remains on the market once it is offered for sale. The casual observer may notice that

a home located across from the prison may remain unsold for a longer period of time than a home located in a neighborhood removed from the prison. Turnovertime, however, is due to many market characteristics including traffic noise, house characteristics, school proximity, neighborhood factors and market volume. Thus simplistic statements such as "The prison will make it more difficult to sell my home" are naive at best and must be examined very carefully with respect to the overwhelming importance of the market forces in operation at that time. A variable such as turnovertime could be included in the model utilized here but the results would be statistically unreliable because the number of market transactions occurring is quite small in Waupun.

The primary hypothesis of the Waupun study, as in Allouez, is that, if the prison has an impact on Waupun propeorty values, that impact can be detected statistically using the quantitatively measurable variables already described. Specifically, we expect to see the measures of prison effect (PRIDIS and PRISEE) enter the regression equation as significant explanatory variables affecting the level of assessed values and market prices in Waupun. Conversely, other variables may be better explanatory variables in which case the prison variables will be insignificant contributors to the explanation of assessed value or market price.

The procedure selected to test the significance of the prison variables and others is called a forward stepwise ordinary least squares (SOLS) regression and is one of many statistical procedures available in the omnibus computer package known as the Statistical Package for the Social Sciences (SPSS). SOLS was selected because it allows variables to enter the regression equation



on the basis of their unique contribution to the explanation of the variance of the dependent variable. In this manner, variables that are highly intercorrelated with other independent variables do not enter the equation regardless of how highly correlated they may be with the dependent variable. The problem of multicollinearity and the inconsistent coefficients that result from its presence is thus minimized.

C. Descriptive Statistics

Preliminary analysis of the data revealed some interesting differences between the Waupun and Green Bay housing markets. About 80 percent of the houses sampled in Waupun sold for $30,000 or less. For Green Bay, approximately 70 percent of the houses sampled sold for $40,000 or less. The average sale price (PRICE) in Waupun was $19,320 with a standard deviation (SD) of $12,780 while in Green Bay it was almost $34,000 (SD = $16,000). These figures support the observed differences between the two towns.

The mean assessed value (ASDVAL) of $13,760 (SD = $5,334) for Waupun contrasts sharply with the average Allouez assessed value of $22,000 (SD = $10,000) whereas fully 90 percent of the homes in Green Bay were assessed at $40,000 or less, in Waupun 99 percent of the houses are assessed at only $30,000 or less. This difference, however, could be due to variations in assessment procedures in the two cities. But, all things being equal, the lower the market price of a home, the smaller will be the assessed value.

Further comparisons between the Waupun and Green Bay housing markets can be made by referring to Table 10 which displays the average values and standard deviations for a subset of the variables employed in the study.

Table 10

DESCRIPTIVE STATISTICS: COMPARISONS BETWEEN WAUPUN AND ALLOUEZ

| Classification | Variable | Waupun Mean | Allouez Mean |
|---|---|---|---|
| Assessor's Data | Lot size (LOTSIZ) | 10267.3 s.f. | 11701.9 s.f. |
| | House size (HOUSIZ) | 1321.1 s.f. | 1236.5 s.f. |
| | No. of Rooms (NUMRMS) | 6.3 | 8.0 |
| | Age of House (HOUAGE) | 43.9 years | 18.9 years |
| | Garage size (GARSIZ) | 389.2 s.f. | 451.5 s.f. |
| Measured Data | Distance to prison (PRIDIS) | 2388.0 ft. | 4508 ft. |
| | Distance to arterial (ARTDIS) | 1388.1 ft. | 2067 ft. |
| | Distance to retail (RETDIS) | 3622.0 ft. | 2393 ft. |
| | Distance to school (SCHDIS) | 2006.3 ft. | 2190 ft. |
| | Distance to park (PAKDIS) | 1049.9 ft. | 2656 ft. |
| | Distance to multi-family unit (MFUDIS) | 2671.9 ft. | 2746 ft. |
| | Distance to railroad (RRDIS) | 2164.5 ft. | 3600 ft. |
| Census Data | Average value of house (AVGVAL) | $15,561.00 | $24,923.00 |
| | Average no. of rooms (AVGRMS) | 5.9 | 6.4 |



Interestingly, average house size varies by less than 100 square feet between the two cities, even though the average house in Waupun is 25 years older than in Allouez. The major distance variables, which measure linkages between neighborhoods and the city, are generally smaller for Waupun reflecting its smaller city size characteristics. The exception is the variable measuring the distance to retail services. In Allouez postwar strip commercial development provides essential retail consumer services at scattered locations while Waupun retains primarily city center service orientation.

D. Results and Conclusions from the Regression Model (Waupun)

As in the Allouez study, presentation of the results of the stepwise regression procedure will entail the display of a number of tables that represent the end product of a voluminous amount of computer printout. Over 50 stepwise regressions were completed, each testing an alternative structure. The overall procedure is one of reduction, starting with almost 200 variables and reducing the variable set until only the most significant and least intercorrelated variables are allowed to enter the equation.

In contrast to Allouez, the procedure was carried out for three major dependent variables:

*ASDVAL -- Assessed Value

*ASDVLR -- Assessed Value in Constant 1967 Dollars

*PRICE -- Market Price of Sold Homes in Constant 1967 Dollars

Each of these equations will be described in the following paragraphs. Also in contrast to Allouez, only the listwise deletion procedure is utilized. Thus the number of observations is reduced somewhat but the statistical validity of each equation is enhanced since the model is based on the same set of observations for every variable entered.

Table 11

Summary Regression Results (WAUPUN) Assessed Value Equations

| Variable Entered | Table of Coefficients* ASDVAL Assessed Value (A) | ASDVLR Assessed Value (1967 Dollars) (B) without PRIDIS | (C) with PRIDIS |
|---|---|---|---|
| 1. HSZSQ (house size squared) | .0012 | .00088 | .00088 |
| 2. HSUAGE (house age) | -140 | -93.7 | -105 |
| 3. LNUMST (log of number of stories. | 3446 | 2391 | 2276 |
| 4. EXGLTSZ (Ex. or Gd. Condition Times Lot Size) | .210 | .130 | .136 |
| 5. HOUAGSQ (house age squared) | .678 | .410 | .477 |
| 6. NUMBAF (number of bathrooms) | 1381 | 953 | 958 |
| 7. GARSIZ (garage size) | 2.6 | 1.96 | 2.00 |
| 8. NUMFIR (number of fireplaces) | 1380 | 1133 | 1103 |
| 9. ARTDIS (distance to arterial) | .418 | | |
| 10. RKDSQ (distance to park, squared) | .00007 | .00006 | .00008 |
| 11. VALPRRM (value per room in the block). | .331 | .364 | .352 |
| 12. ASYRSQ (assessed year squared) | | -3.86 | -3.77 |
| 13. PRIDIS (distance to prison) | | | -1.94 |
| 14. Constant | 8619 | 27169 | 27430 |
| 15. Durbin-Watson Statistic | 1.69 | 1.51 | 1.51 |
| 16. Number of Observations | 222 | 221 | 221 |
| 17. $R^2$ (adjusted for D.F.) | .758 | .749 | .751 |
| 18. F-value | 64 | 61 | 56 |

*All coefficients are significant at the 95% or 99% level of confidence.



1. Assessed Value Equations

Table 11 presents the results of the fifth and final round stepwise regression based on three alternative specifications. These include assessed value (ASDVAL) and assessed value in Constant 1967 dollars (ASDVLR), a dependent variable obtained by dividing each of the assessed value observations by the Milwaukee housing cost index (1967 = 100). This measure helps to remove the effects of inflation from assessed valuation by adjusting all observations to a common base year, in this case, 1967.

The results in Table 11 can be described as follows:

*The equations using either ASDVLR (Column B) or ASDVAL (Column A) are remarkably similar. The effect of inflation has not altered the structure of the model. As a result the same variables enter the ASDVLR or ASDVAL equation.

*The major difference between the ASDVLR and ASDVAL equations is the inclusion of the variable measuring the assessment year (ASYRSQ) in line 12. Acting as a time trend, ASYRSQ varies inversely with the dependent variable ASDVLR (Column B) indicating some decline in real assessed property values in more recent years.

*The coefficient of determination ($R^2$) in line 17 is approximately 75% for all three equations. These equations explain 75% of the total variation in the dependent variables.

*The variable coefficients are of the correct sign and magnitudes:

a) Assessed value decreases when the age of the house increases

b) Assessed value increases when

1) house size increases

2) the number of stories increase

3) lot size increases and house condition improves

4) the number of bathrooms increases

5) garage size increases

6) the number of fireplaces increase

7) the farther a home is from an arterial

8) the farther a home happens to be from a park

9) the higher the value per room of other houses on the block

Prison Distance Effects

Proximity to the prison never enters the assessed value equations as a variable with a statistically significant effect. Other variables are clearly more closely related to assessed value than are the prison proximity variables. To illustrate this lack of significance, PRIDIS can be "forced" into the equation. The result is presented in column C of Table 11. PRIDIS has very little effect on the other variables and contributes .03% of the total explanatory power of the equation. If we choose to accept being wrong only 1 time out of 100 then we cannot say that the coefficient of PRIDIS is significantly different than zero. We have inadequate confidence that PRIDIS has any effect on assessed values. If however, we are willing to risk being wrong 5 times out of 100, then we can say that the coefficient of PRIDIS is not zero and, in fact, varies inversely with assessed value. The assessed value of a home, as in Allouez, increases as we mover closer to the prison, all other variables being held constant. The inference to be drawn is not that the prison itself increases property values, but that the neighborhood where the prison itself is located contains homes of comparable quality characteristics that influence assessed value positively. As we move further from the prison, those quality characteristics influence assessed value to a lesser extent.



2. Market Price Equations

Because the number of single family home sales since 1970 in Waupun have been few, the number of valid observations upon which a model can be constructed is reduced to 67. In our view, this is not a sufficient number of randomly distributed observations to assure structural stability within the estimating equations. Other variables not included may easily prove to be critical in the explanation of market price variations. The results that follow are presented for primarily informational purposes, not as a firm statement of the influence of prison proximity on market prices.

Table 12 presents the results of the market price equation based on two alternative specifications. Both specifications represent the best set of variables possible given the twin goals of maximizing the amount of variation explained and minimizing the effects and extent of inter-correlation. A third goal, the minimization of the degree of auto correlation, was not achieved and both specifications are positively auto correlated as indicated by the low Durbin-Watson statistic. Both equations overestimate the market price of homes at the low end of the price scale and underestimate homes in the higher price ranges.

The first specification (Column A) explains 62.4% of the variation in market price with the help of an interaction term PRDAGE, defined as the product of Prison distance (PRIDIS) and house age (HOUAGE). The variable is difficult to interpret, however, and it is suspected that house age is the variable responsible for the significance of PRDAGE. Other variables carry the expected signs and appear intuitively plausible. As expected the size of the house (SZSTSQRT), the number of rooms and the age of the house (NRMAGE), the garage size (GARSIZ), neighborhood quality (NQALTSZ)

Table 12

Market Price Equations

| Variable Entered | Table of Coefficients* with PRDAGE (A) | without PRDAGE (B) |
|---|---|---|
| 1. GARSIZ (size of garage) | 8.93 | 6.44 |
| 2. PRDAGE (Prison distance times age of house) | -.033 | |
| 3. PRCDIF (difference between the average value of) (houses on the block and the assessed) (value of the house in the observation) | -.209 | -.183 |
| 4. NQALTSZ (neighborhood quality times lot size) | .220 | .329 |
| 5. SZSTSQRT (the square root of the house size times the number of stories) | 286 | 247 |
| 6. NRMAGE (number of rooms times house age) | -9.53 | |
| 7. MFDSQRT (square root of distance to multi-family units) | 489 | 92.4 |
| 8. MFUDIS (distance to multi-family units) | -4.94 | |
| 9. HOUAGE (age of house) | | -134 |
| 10. REIDIS (distance to nearest retail center) | | -.455 |
| Number of observations | 67 | 65 |
| Constant term | -7610 | 3120 |
| $R^2$ (adjusted for D.F.) | .624 | .593 |
| F-value | 15 | 14 |
| Durbin-Watson Statistic | .889 | .861 |

*All coefficients are significant at the 95% or 99% level of confidence.



and a neighborhood variable, the distance to multi-family units (MFUDIS and MFDSQRT) are all significant determinants of market price.

One variable appears here for the first time and requires additional explanation. It is recognized that the bid price for a home as well as the asking price may be partially determined by the degree to which the subject house is different than others in the neighborhood. A comparatively run-down home should bring a somewhat reduced price while a well-kept home should bring a premium in the market place. Such a differential may be captured by the variable PRCDIF defined as the difference between the 1967 average value of houses on the block and the 1967 assessed value of the house in question. In both specifications this variable was a significant contributor to the explanation of variation in market price.

The second specification in Table 12 (Column B) presents the results of a stepwise regression that excludes the complicated interaction term PRDAGE and allows PRIDIS and HOUAGE to enter if they are found to be significant. As expected,HOUAGE is the first variable to enter the equation. Other variables enter the equation with roughly the same size coefficients as in Column A. Additionally, RETDIS enters in the column B specification and measures the change in market price as the distance from the retail center of town increases.

Prison Distance Effects

It should be noted that in the column B specification, PRIDIS does not enter the equation in Table 12 suggesting that this variable does not add a significant amount of explanation to the model being tested. Other variables explain a greater amount of variation in market price. The simple correlation between market price and prison distance is .365. This is a measure of

simple association and is significantly different from zero at the 99% level of confidence. The naive inference is that market price will be higher as distance from the prison increases. However, such an inference assumes that PRIDIS acts independently of all other sources of variation and is unaffected by them. In reality, the market price is determined to a greater extent by the structural and neighborhood effects, rather than by PRIDIS alone.

This observation is verified by two characteristics of the regression model. First, PRIDIS does not enter the model in a stepwise selection procedure as discussed above. Second, the partial correlation, a measure of association holding all other variables constant, is approximately -.14, a value which is not significantly different from zero, while exhibiting a negative sign, the opposite of the simple correlation mentioned. The partial correlation indicates the association between PRIDIS and RPRICE after the effects of all the other variables have been evaluated. It indicates that, should PRIDIS enter the equation, the sign of the coefficient would be negative, implying that market price increases the closer a home is to the prison.

Once again, this statistical analysis confirms the observations of previous chapters: proximity to the prison is associated only weakly if at all with market price or assessed value. Instead, the many structural and neighborhood variables characteristic of housing in Waupun explain the variation in property value to a much higher degree. In the town of Waupun at least, the long term effects of prison proximity are not obvious to the casual observer nor are they detectable by this form of statistical analysis. Indeed, with proper planning, it is possible to place prison structures in such a way that the impact on property values is insignificant and possibly even positive.



## WAUPUN SUMMARY CONCLUSIONS

The preceding chapters have verified the following set of conclusions:

*The town of Waupun is composed of relatively older homes with below average assessed values in comparison to statewide statistics or to Allouez.

*The observed character of the neighborhoods surrounding the prison supports the impression that no deleterious effects to property values have occurred simply because of location proximate to the prison.

*The strongest impression gained from neighborhoods proximate to the prison is that of integrity exemplified by well maintained homes, clean streets and yards.

*Statistically, neighborhood variables and the structural characteristics of the houses in Waupun explain approximately 75% of the variation in assessed values in real or money terms.

*In the case of the weaker market price equations, approximately 60% of the variation in market prices is explained by the structural and neighborhood variables.

*The assessed value equations are stable and insensitive to the introduction of other structural characteristics. Further improvement would require the introduction of variables measuring other neighborhood, urban area, or consumer preference characteristics.

*Prison proximity does enter the assessed value equations. It explains less than .2% of the variation in assessed value while all the variables combined explain 75% of the variation.

*Prison proximity affects assessed value positively. The closer to the prison a house happens to be, the higher its assessed value, all other things being equal. The effect is quite small, however. Prison proximity raises the assessed value of a home in Waupun $19 for every 100 foot increment towards the prison with all other variables held constant.

*The equations for assessed value are composed of variables that are quite similar to those obtained in other studies.

*The market price equations are dissimilar to the assessed value equations and are based on a much reduced data set because of the lack of recent sales in Waupun. The degree of confidence in the market price equation is thus much lower.

*Proximity to the prison does not enter the market price equation with a coefficient that is significantly different from zero. If it were to enter the equation, its coefficient sign would be negative, indicating that prison proximity increases market price.

*We conclude that prison proximity does not adversely affect assessed value in Waupun and has no significant impact on the market price of homes in Waupun.

*In general, other variables are much more important in determining residential property value than are variables associated with distance to the prison or the visual impact of the prison.

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