ABSTRACT

THE LAND INVENTORY DATA BANK AND ELECTRONIC DATA PROCESSING IN PLANNING

by Frank William Brutt

The purpose of this thesis is to define a land inventory data bank, describe the items of data and how they were collected, their source and value for planning functions. In conjunction with an analysis of the data bank, the use and value of processing data bank information by electronic data processing techniques is described.

The land inventory data bank which has been analyzed is a function of the Metropolitan Area Planning Commission of Pulaski County, Arkansas, more commonly known as Metroplan. This data bank is made up of 26 items of information on more than 102,000 parcels of land.

During the researching of the data bank and electronic data processing for this thesis the author was Senior Planner on Metroplan's staff and was present during the acquisition, processing and use of the data.

Practical applications of the data processing were made under the direction and partial supervision of the author. Thus this evaluation is by personal contact with the subject matter.

A through analysis has been made of the data bank items and how these items were collected and processed for

transferring to data punch cards. An analysis of the cost of collecting and preparing data items for punching into punch cards is included as an important part of this study. The source document, data punch card and analysis sheets are illustrated and described regarding format, design and use.

The method of transferring data from the source document and the functions of the data processing machines while processing Metroplan's data were analyzed. During this phase of the research a comparison was made of the cost and time required for the hand manipulation of the data vs. electronic data processing of data. The data file maintenance and updating procedure were analyzed along with a cost analysis of this continuing function.

A description of how data bank information may be used with electronic data processing for mapping, analysis of land use, zoning and other studies has been made. In addition to these descriptions two practical applications of the data bank have been analyzed. The first relates to a land use-zoning study for a 96 block area. This analysis deals in depth of a method using the data bank to compare area of land used for a function to areas zoned for the same purpose. For the second application an analysis was made of an urban renewal project area, using the data bank information. The study of the renewal area illustrated the value of the data in preparation of structure condition maps, and determining the value of land and structures according to structure condition classification.

A data bank as extensive and complex as Metroplan's with an inventory of more than 2,500,000 items of information is a very valuable tool for planning. By the use of field surveys it was determined that a very high percentage of the acquired items of data were found to be accurate. The data bank has been found useful for land use, zoning and building condition analysis and similar data analysis functions.

The major disadvantage of the data bank used with electronic data processing is the high cost involved. It has been estimated by Metroplan staff that approximately $150,000 has been spent for the acquisition and preparation of the data items, transferring the data to punch cards and the preparation of an audit, land use and zoning listings of the 102,000 parcels of land.[1] The cost of updating and maintaining the data bank will require an estimated $6,000 for annual salaries.

Thus, although a data bank is useful for planning studies and its information is valuable, and rapidly retreived, its acquisition is a costly and time consuming proposition. Prior to a communities undertaking the development of a data bank as extensive as Metroplan's it should first investigate the total cost and have concrete ideas on how the data will used.

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[1]Interview with John S. Harrington, Asst. Director of Metropolitan Area Planning Commission, Little Rock, Arkansas February 3, 1964.

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INTRODUCTION

The purpose of this study is to analyze the basic ingredients of a land inventory data bank, how the ingredients are collected, recorded, processed by electronic data methods and their use in determining the solution of planning problems.

City and regional planning functions are being overwhelmed by the amount of statistical data necessary to properly perform the planning process. This data must be readily available, it must be accurate, complete and up to date.

Without a land inventory data bank containing thousands of items of information on the existing development pattern and knowledge of the development potential of raw land many of the problems of urban development could not be evaluated.

However, the vast number of necessary items of data are of practical value to a planning function if these items can be retrieved, manipulated and the desired results extracted in a useable form. These requirements have necessitated the use of electronic data processing methods to provide an economical and practical method of processing the data bank information.

The land inventory data bank under consideration includes the items of information concerning each parcel of land and the three articles in and on which the data items

are contained.

The land inventory data bank analyzed in this study is a function of the Metropolitan Area Planning Commission of Pulaski County, Arkansas.

The data collection and transferring of data to electronic data punch cards had been underway for many months prior to the research on this topic. Thus this thesis is limited in part to a discussion of how the previously chosen items of information may be used for planning, rather than an explanation of why they were chosen.

CHAPTER I

LAND INVENTORY DATA BANK

Explanation of a Land Inventory Data Bank

A land inventory data bank is a collection and tabulation of information pertinent to the realm of planning.

The primary factor upon which all emphasis of urban planning is based is an item called land. The development, use, and conservation of this irreplaceable item is the basis upon which the discipline of urban planning has developed. In order to prepare a plan for the existing and future uses of this critical item, an inventory of existing land should be taken and analyzed. It is an essential element of planning to know the condition, capabilities, and functions of land and the controls which may have been placed on the development of this land prior to the analysis and preparation of future land plans.

Since the basic commodity which planners deal with is land, one of the first items of information which must be obtained on this land is its location, area, existing condition, use, and future development potential. A study of this type would be considered the primary analysis of land in its raw state. After an analysis of raw land, its assests and the limitations it poses for development, plans for

future development and/or holding in a conservation state may be determined. A land inventory must also take into consideration the condition and use of developed area of land. Guide lines for future development and/or redevelopment and the potential use of the land must be also taken into consideration.

In the second stage of an analysis of land, such items as the development patterns, development trend, type and condition of development should be taken into account. Detailed information concerning this developed land must be collected and processed. Block statistics, housing, land use, traffic and population data are all necessary in a planning operation. These individual items are part of the information collected for a land inventory data bank.

Parts of the Metroplan Land Inventory Data Bank

The data bank of the Metropolitan Area Planning Commission of Pulaski County, Arkansas, more commonly known as Metroplan, has been divided into 3 parts.

Basic data tabulation sheet

The basic data tabulation sheet, Figure I, is the source document on which is listed the information obtained on each parcel of land. This information includes such items as the parcel location, size, appraised value, zoning, and use. Most of these items of information were obtained from the Pulaski County Tax Assessor's card. Figures 2 and 3.

METROPLAN BASIC DATA TABULATION SHEET

Map No _____ Comp _____ Date _____
SUBDIVISION NAME GRAY'S ADDN Ck _____ _____
SECTION 30 RANGE 12W TOWNSHIP 1N

	Assessor's Card No	SUBDIVISION Block	SUBDIVISION Legal Lot Description	Census Tract	Census Section Number	Census Blocks	Census Block Number	ADDRESS Street Number & Name	ADDRESS City	ADDRESS Sch District	LAND Front Width	LAND Depth	LAND Area acres	LAND Area sq ft	APPRAISED VALUE Land	APPRAISED VALUE Imp	Source Code	Land Use Code	SIC Code	Zoning Code	Off Street Parking	BUILDINGS No Main	BUILDINGS No Acc	BUILDINGS No Stories	BUILDINGS No Units	BUILDINGS No Baths	BUILDINGS Coverage sq ft	BUILDINGS Total Flr Area sq ft	BUILDINGS Const Yr	BUILDINGS Bldg Cond	Control	Number 2nd Card
				2	2	3	2	16			3	3	6		4	3	2	4	4	2	2	1	1	2	2	2	4	4	2	-	-	-
LINE 1	7757	1	LOT 4					7708 ILLINOIS	1	1	100	187			56	121	33					1	0	1	1	00	15	15	51	1		
LINE 2				22	00	139	19											0100	8811	10	00											
LINE 3													187																	0	0

Figure 1.-- The basic data tabulation sheet is used to record the desired information on each parcel of land. A separate sheet is used for each census tract. Only the information to the right of the double line is transferred to the punch card. Items of information on line 1, are obtained from the tax assessor's card. The information on line 2, is obtained or designated by Metroplan's staff. The item on line 3, is calculated by the data processing computer.

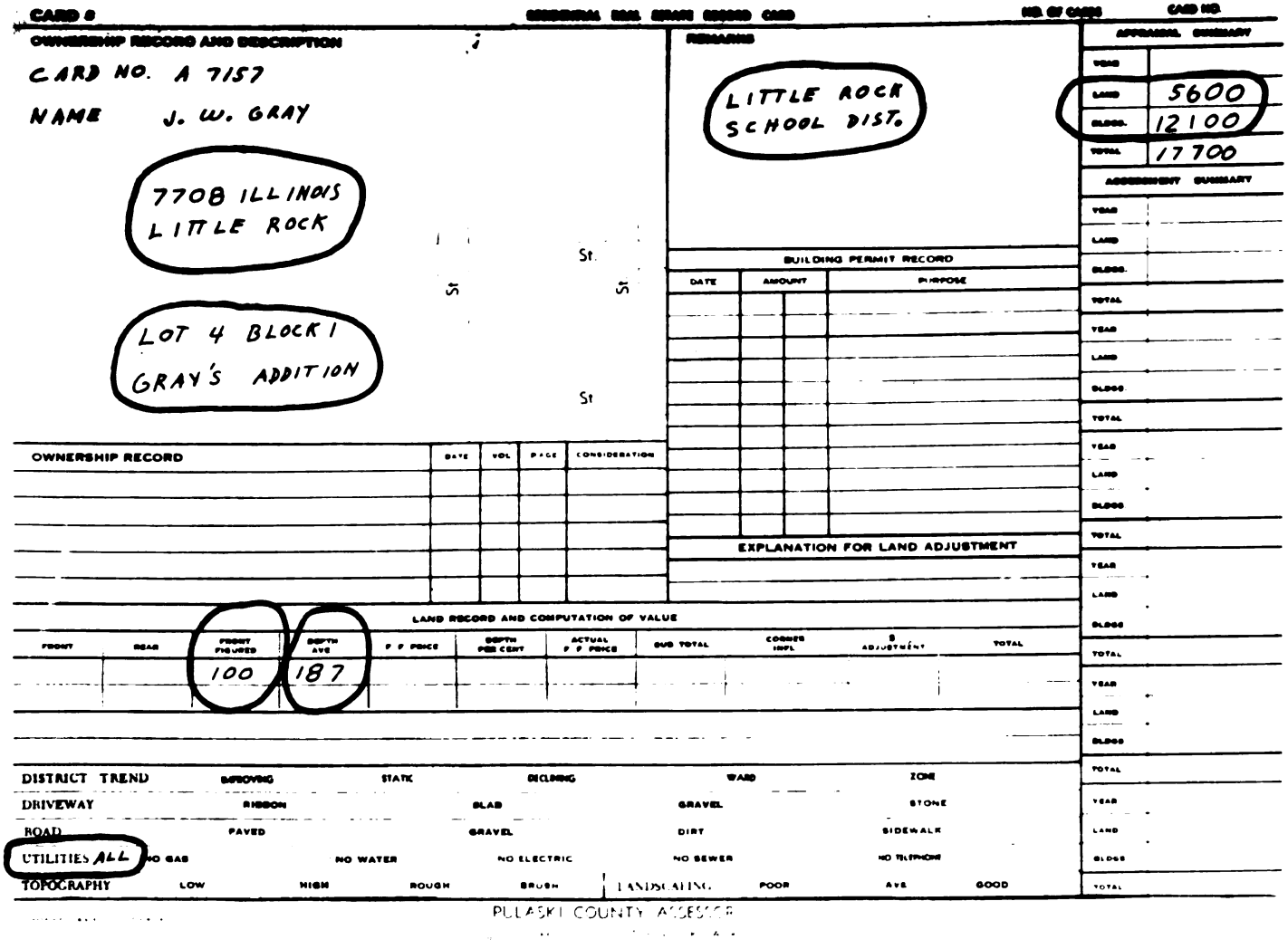

Figure 2.-- Information obtained from the front of the Pulaski County Tax Assessor's card and transferred to the basic data tabulation sheet are circled in black.

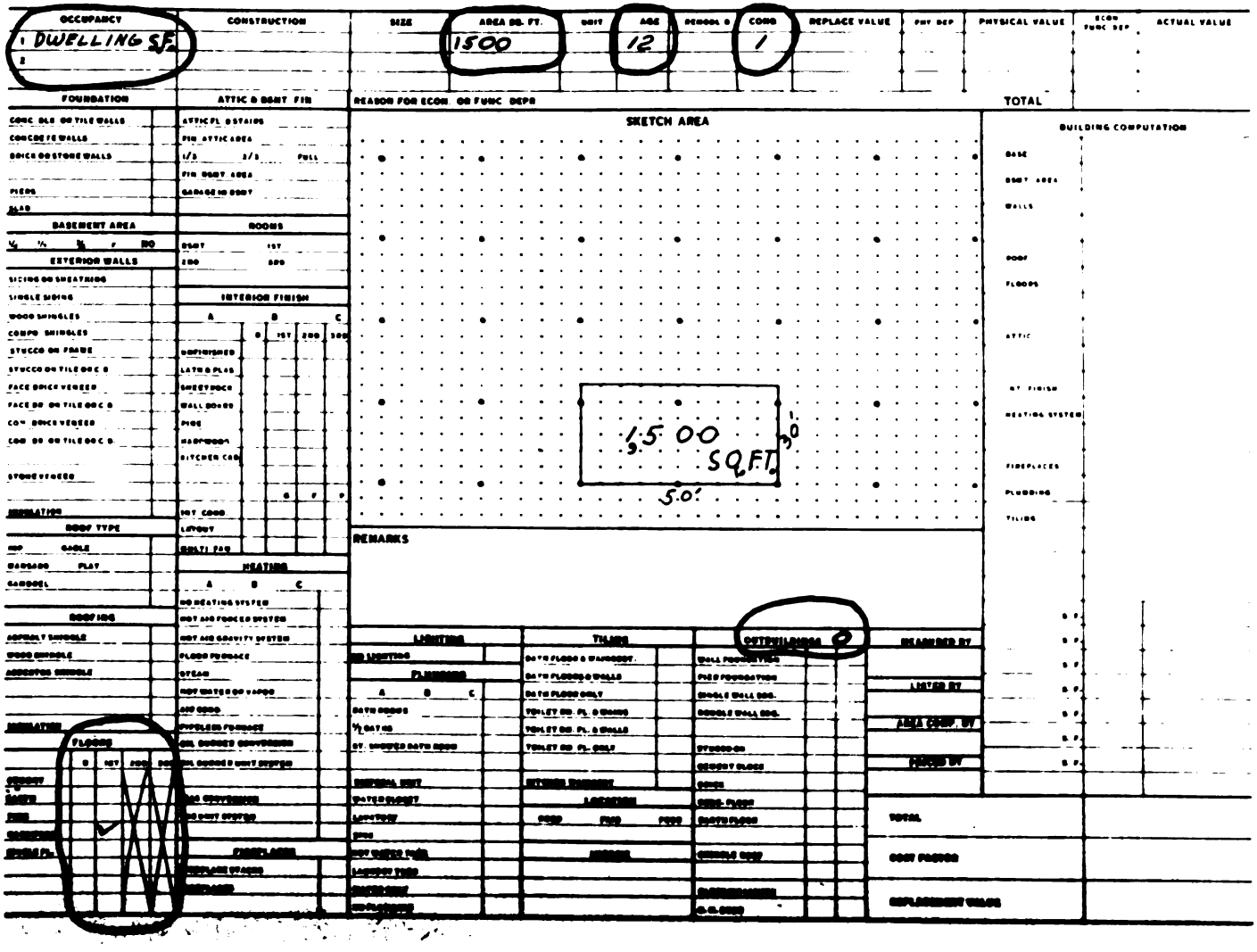

Figure 3.-- Information obtained from the back of the Pulaski County Tax Assessor's card and transferred to the basic data tabulation sheet are circled in black.

Data punch card

The second part of the data bank is the International Business Machine data punch card, Figure 4.[1] Each data punch card contains information on only one parcel of land. The information contained in and on the data punch card is transferred directly from the basic data tabulation sheet.

Analysis listings

The third part of the data bank, is the result of the electronic data processing of the information listed on the basic data tabulation sheet and contained in the punch cards.

Audit listing

The audit listing Figure 5, is a printed list in numerical order of all the parcels by census tract, block and parcel.[2] A separate line of the listing sheet is required for each punch card.

Land use listing

The land use listing is a list of all parcels having

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[1] The author's experience with electronic data processing has been limited to machines manufactured by the International Business Machine Corporation. Thus this discussion will deal only with IBM equipment and methods.

[2] A parcel is a continous unit of land under single ownership regardless of size and use. Thus if 3 single-family houses were located on adaquate lots, owned by 1 person the 3 units and total land would be 1 parcel. According to the land use code this parcel would be listed as a 3 family parcel. According to standard industrial code it would be listed as 3 single-family units.

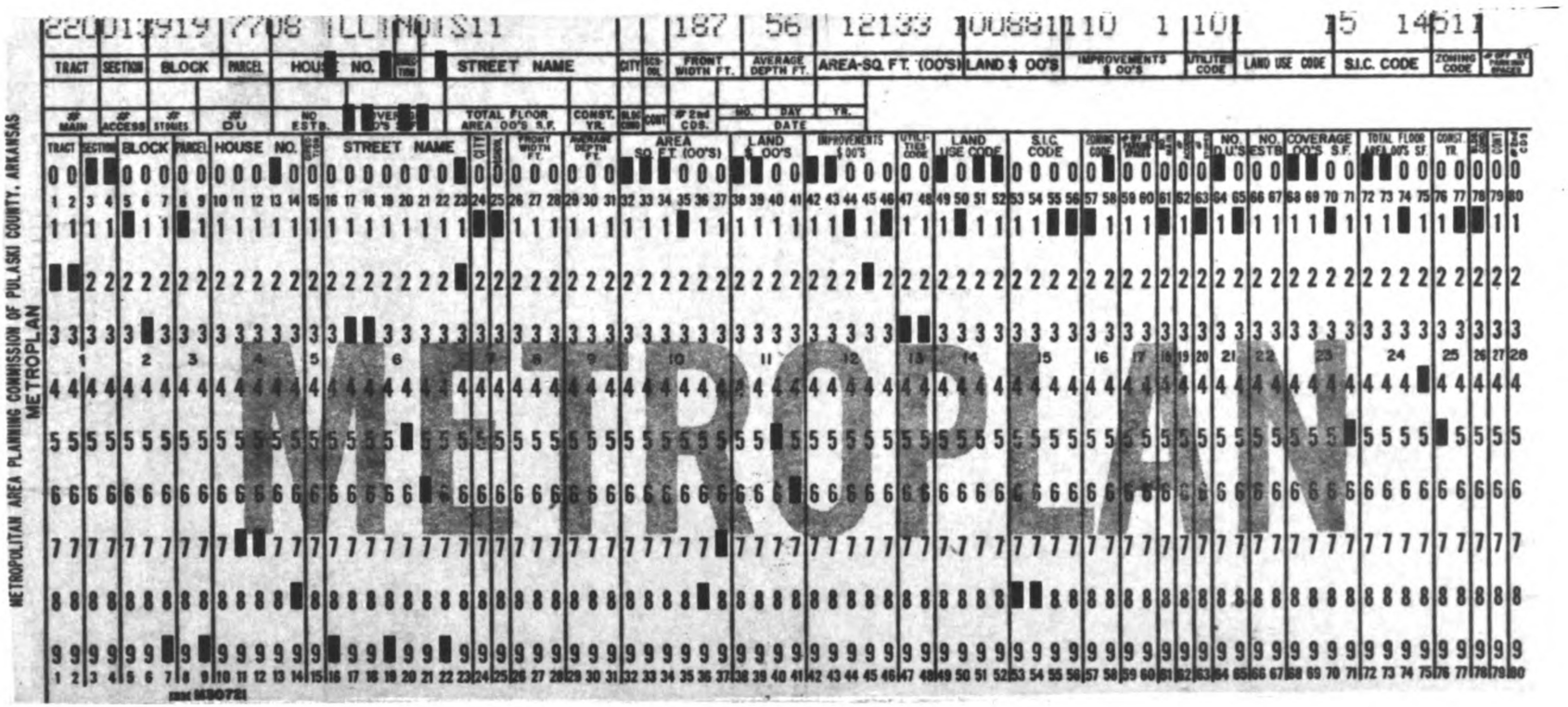
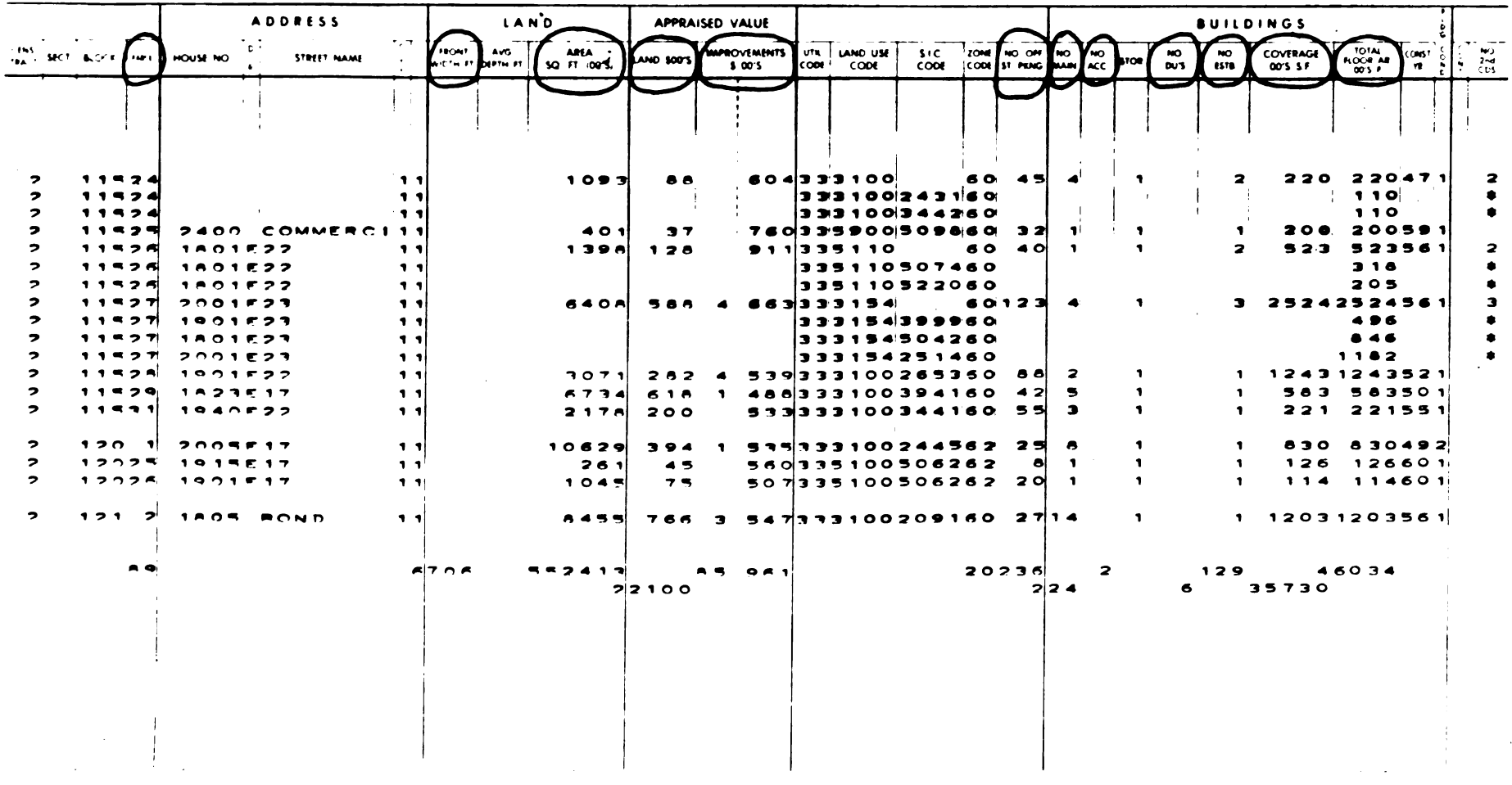


Figure 4.-- The punch card format is similar in design to the basic data tabulation sheet. The desired parcel information is transferred directly to the card. Information punched in the card is also printed directly above the respective number or letter.

METROPOLITAN AREA PLANNING COMMISSION - BASIC DATA



				ADDRESS		LAND			APPRAISED VALUE		BUILDINGS												
INST DA	SECT	BLOCK	PART	HOUSE NO	D I R	STREET NAME	TYP	FRONT WIDTH FT	AVG DEPTH FT	AREA SQ FT (00'S)	LAND $00'S	IMPROVEMENTS $ 00'S	UTIL CODE	LAND USE CODE	S I C CODE	ZONE CODE	NO OFF ST PKNG	NO MAIN	NO ACC	STOR	NO DU'S	NO ESTB	COVERAGE 00'S S F	TOTAL FLOOR AR 00'S F	CONST YR	CODE	NO 2nd CDS
2	11524						11			1093	88	604	333100			60	45	4		1		2	220	220	471		2
2	11524						11						333100	243160										110			*
2	11524						11						333100	344260										110			*
2	11525			2400		COMMERCI	11			401	37	760	333900	509860		32	1	1		1		1	200	200	591		
2	11526			1801	E	22	11			1398	128	911	335110			60	40	1		1		2	523	523	561		2
2	11526			1801	E	22	11						335110	507460										318			*
2	11526			1801	E	22	11						335110	522060										205			*
2	11527			2001	E	23	11			6408	588	4 663	333154			60	123	4		1		3	252	425	245	61	3
2	11527			1901	E	23	11						333154	399960										496			*
2	11527			1801	E	23	11						333154	504260										846			*
2	11527			2001	E	23	11						333154	251460										1182			*
2	11528			1901	E	22	11			7071	282	4 539	333100	265350		88	2	1		1		1	243	1243	521		
2	11529			1823	E	17	11			6734	618	1 488	333100	394160		42	5	1		1		1	583	583	501		
2	11531			1940	E	22	11			2178	200	533	333100	344160		55	3	1		1		1	221	221	551		
2	120	1		2005	E	17	11			10629	394	1 595	333100	244562		25	8	1		1		1	830	830	492		
2	12025			1915	E	17	11			261	45	560	335100	506262		8	1	1		1		1	126	126	601		
2	12026			1901	E	17	11			1045	75	507	335100	506262		20	1	1		1		1	114	114	601		
2	121	2		1805		BOND	11			8455	766	3 547	333100	209160		27	14	1		1		1	1203	1203	561		
		89						6706		552413		85 961				20236		2		129			46034				
										22100						224		6		35730							

Figure 5.-- The analysis sheet corresponds to the format of the basic data tabulation sheet and the punch card. This sheet may be used for the audit, land use, zoning or other listings. Totals may be accumulated and printed by the accounting machine for the circled headings.

the same land use classification. The land use classifications are separated into major land use categories of residential, commercial, industrial, and public uses and also minor land use categories.

Zoning listing

The zoning listing is a list of all parcels with the same zoning code.

Standard industrial classification listing[1]

The standard industrial classification listing is a list by categories of use of establishments. Whereas the land use code deals with the parcel use, the industrial classification code relates to the specific use of the establishment.

Procedures Used in Processing Land Inventory Data Information

The basic source of information for Metroplan's data bank are the tax records of the Pulaski County Tax Assessor. The desired items of information are transferred from the tax assessor's cards to Metroplan's basic data tabulation sheets.

The legal description of the parcel, is written on the basic data tabulation sheet but not transferred to the punch

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[1]Bureau of the Budget, Standard Industrial Classification Manual, (Washington: U. S. Government Printing Office, 1957)

card. The legal description is used by a Metroplan staff member to locate and plot the parcel on base maps which are drawn at a scale of 1 inch to 200 feet. If the tax assessor's legal description is not adequate to enable the plotting of the parcel, subdivision plats, deed maps or other sources of information are used. The parcel of land is plotted on the map as a means of locating the parcel and assigning it a parcel number. This parcel number becomes the primary means of locating and identifying the parcel.

As the parcels are located and plotted a parcel map of the entire area is drawn. Maps at 1 inch to 200 feet have been drawn for most of the urban area of Pulaski County and are a very important by-product of the data inventory system. Unfortunately the drawing of these maps requires a great amount of time and money.

Information not available from the tax assessor but required for each parcel is obtained and listed by a Metroplan staff member. These additional items include the zoning, number of parking spaces, standard industrial classification code and in some cases the land use code. The basic data tabulation sheets are then edited to ascertain that all desired items of information are listed. Figure 6, illustrates the flow of data for the land inventory data bank.

The punch cards, Figure 4, are then punched, verified and sorted by census tract, section, block and parcel. When all the parcel data has been transferred to punch cards

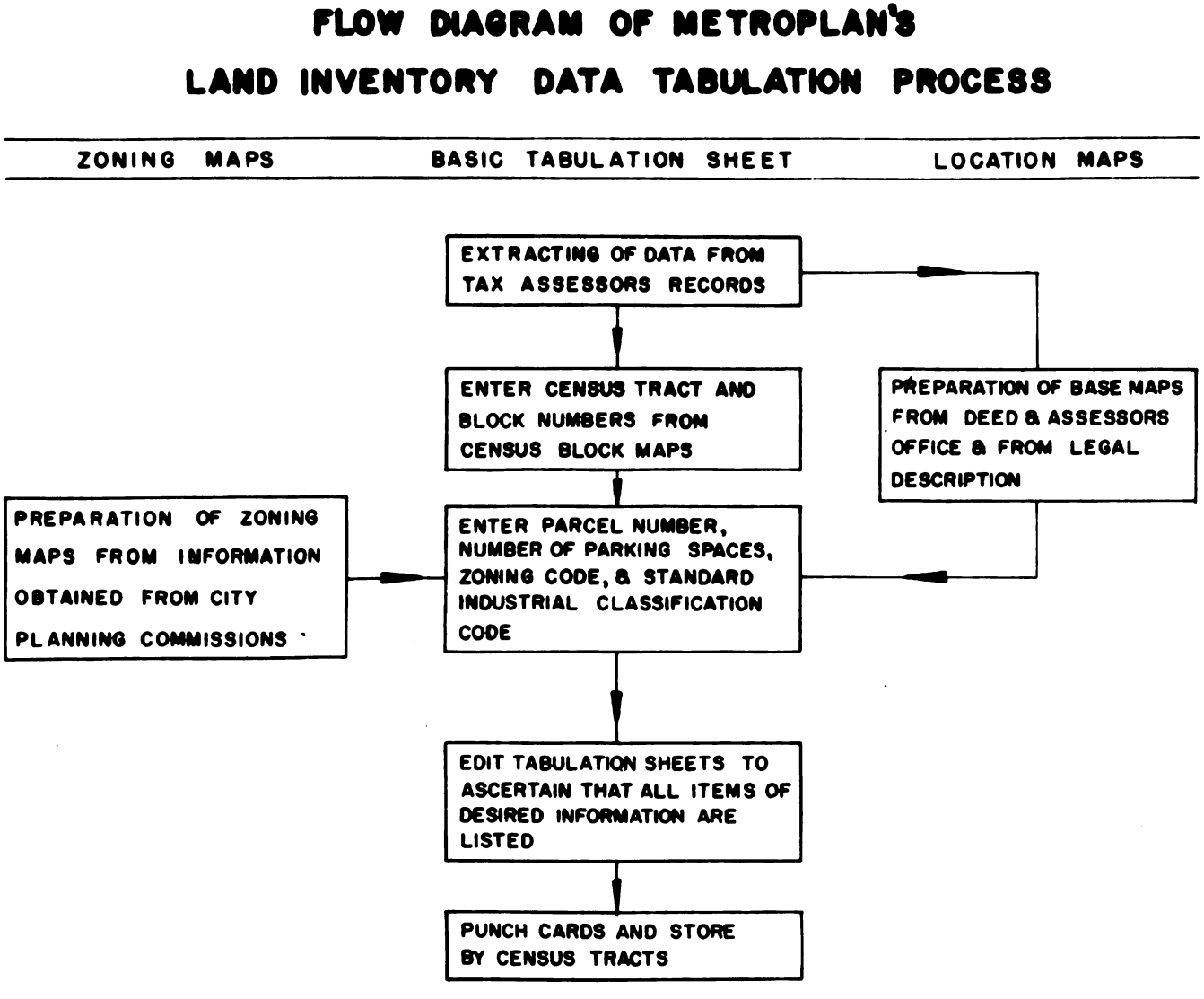

Figure 6.-- Flow diagram of Metroplan's land inventory data tabulation process.

the cards are sorted for the various analysis listings. The listings are printed and sent to Metroplan for planning studies.

Parcel Identification System

A major portion of the statistical information available for planning purposes is obtained from the United States Census of Population and Housing. Since detailed census information is tabulated with reference to census tracts and census blocks, Metroplan decided to use the Census Bureau's tract and block system as the means of establishing parcel location for the land inventory data bank. Each parcel of land in a census block was given a parcel number. This number was recorded on the basic data tabulation sheet and the parcel map. Parcel maps, drawn at a scale of 1 inch to 200 feet, designate the census tracts, blocks, parcel numbers and boundaries.

The basic data tabulation sheet Figure I, and the punch cards, Figure 4, provide 2 columns for recording the census tract number, 2 columns for the section number, 3 columns for the census block number and 2 for the parcel number.

In the urban area, where the census tracts are comparatively small, the allocation of 3 punch card columns was sufficient to record up to 999 blocks which could occur within a census tract. However, since some of the census tracts in the rural area are of such size that urban development could result in the formation of more than 999 blocks, the large census tracts were divided using legal townships as the means of division. A township consists of 36 legal sections, each section approximately a mile square.

A code number was assigned to each of the legal town-

ships beyond the urban area where the township number replaced the census tracts, Figure 7.

The township number, when used, is punched in the punch card in the 2 columns designated for the census tract. The legal section number, which is used in conjunction with the township number, is punched in the 2 columns assigned for the section number. If a parcel of land is located in the urban area the actual census tract number is used. The legal section number is not required in the urban area, thus, 00 is punched in the section columns.

The 1960 Census of the Population divided Pulaski County into 43 census tracts, numbered 1 through 43.[1]

To avoid confusion between the township numbers and census tract numbers, the townships were numbered beginning with number 61.

The legal sections, numbered 1 through 36, were divided to aid in the location of blocks and parcels. Block numbers 1 through 99 were reserved for the northeast quarter section or 160 acres. Numbers 100 through 199 were reserved for possible blocks in the northwest quarter section. Numbers 200 through 299 were reserved for the southwest

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[1] U. S., Bureau of the Census, Census Tracts, Little Rock-North Little Rock, Ark. Standard Metropolitan Area, Eighteenth Census of the United States: 1960.

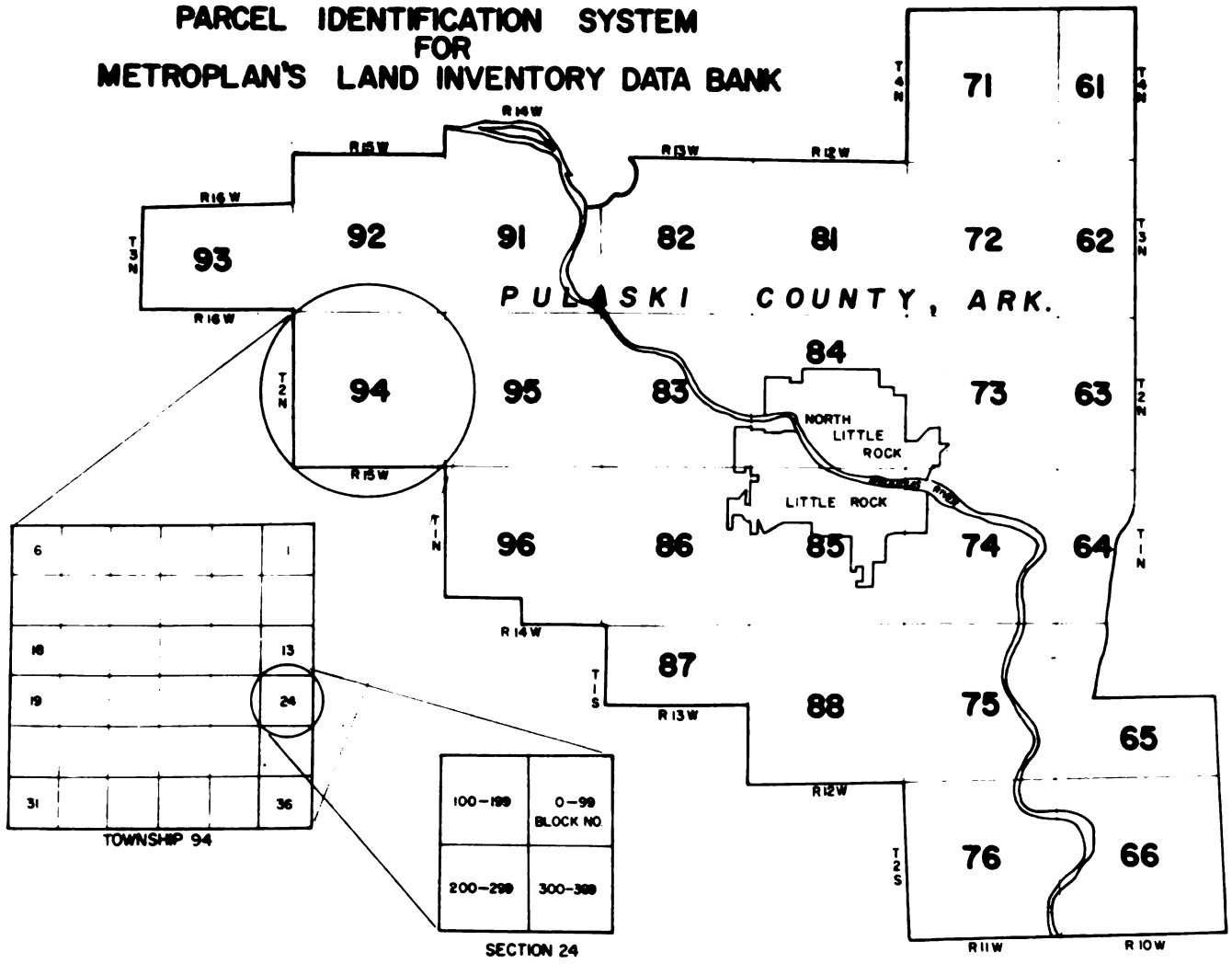

Figure 7.-- Parcel identification system for Metroplan's land inventory data bank.

quarter and numbers 300 through 399 were reserved for the southeast quarter.

There is little or no chance of all 99 blocks being formed in a 160 acre tract, however, the third digit aids in the block number location.

Generally a block of land in an urban area is that land which is surrounded by streets or other physical features. However, since rural area are often not divided by streets the definition of a block must be more fexable.

A block of land may be a piece of land under 1 ownership or numerous ownerships. If a large tract of land owned by 1 person was located in the southwest quarter of section of 22, township 76 it would be coded by a block number between 200 and 299. This piece of land being under single ownership would be numbered parcel number 1. It's code location would be: township 76, section 22 block 200, parcel 1.

If numerous parcels were located in the northeast quarter of a section, the person plotting the land would group approximately 40 acres of parcels into a block. This block would be numbered according to the block numbering system for blocks in the northeast quarter, a number between 1 and 99. The parcels within this block would be numbered as consecutively as possible.

The individual plotting the blocks would attempt to include all of the parcels from the same quarter section and legal section in this block. However, as this is not

always possible a block and the parcels within a block may cross township, section or quarter section lines.

The person assigning block and parcel numbers cannot divide a tract of land under 1 ownership into 2 parcels even if the parcel is cut by a street or railroad. This is because the parcel is the lowest division of land. If parcels under various ownership are bound by streets or railroads these 2 physical features serve as block boundaries.

If a subdivision is created from a large area which was previously 1 block, that block number is maintained for the unsubdivided land. The new blocks created by the subdivision's streets are given respective block numbers depending upon the quarter section in which they are located. Each lot is given a parcel number after the lot has been recorded as part of the subdivision by the county recorder.

If a block of land consisting of but 1 parcel takes up more than a section, or lies between 2 sections, the lowest number reserved for the block in which most of the area is located would be designated to the block. In the same manner if a block lies in 2 quarter sections the block number will be designated using the number reserved for the quarter section in which the largest area of the block lies.

After the assignment of block and parcel numbers, these numbers are transferred to the basic data tabulation sheet and labeled on the parcel maps.

To illustrate how the numbering system works a hypothetical parcel location will be described. Census tract

13, section 00, block 99, parcel 5. Since the number under the census tract heading is less than 61 this parcel of land is in the urban area where the census tract numbers are used. The section number 00 also indicates that the parcel of land is in the urban area. Block 99 is the census block 99 and parcel 5 is the number assigned to the fifth parcel in block 99.

For example of how the system functions in the rural areas another illustration will be made. Census tract 94, section 24, block 10, parcel 18. The number 94 under the census tract heading indicates that the parcel is outside the urban area and would be located on the township numbering system map, Figure 7. Section 24 is legal section 24 of township 94, block 10 would indicate the block is in the northeast quarter of the section. Parcel 18 would be the number assigned to the eighteenth parcel in block 10.

The Source of the Information Obtained on Each Parcel of Land

Residential Parcels

The following items of information on more than 96,000 parcels of residential land in Pulaski County have been acquired from the Pulaski County Tax Assessor.[1]

1. the assessors card number
2. the legal block number
3. legal lot description
4. legal section, range, and township number
5. subdivision name
6. house number if one is used
7. street name
8. front width of parcel
9. average depth of parcel
10. appraised value of land
11. appraised value of the improvements
12. utilities available
13. description of the land use
14. number of main buildings
15. number of accessory buildings
16. number of stories
17. number of dwelling units

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[1] Items 1 through 5 are recorded on the basic tabulation sheet for reference purposes only and are not transferred to the punch card.

18. number of establishments
19. amount of building coverage of the lot
20. total floor area
21. year of building construction
22. condition of the building

Since the tax assessor does not visit the parcel each year there are bound to be some discrepancies in the accuracy of the available information. However, the data bank information is not construed to be of such accuracy as to be used for an individual parcel of land, especially for building appraisals, but with numerous parcels of land pooled together in a study. In other words, over appraisal in one block will more than likely cancel out under appraisals in another block. Most of the information acquired from the tax assessor's cards can be considered valid. However, one of the discrepancies noted by field checks of certain areas is the building condition. It is suggested that there should be more than 3 catagories for building condition and that the individuals who make the building inspections should be more throughly trained in building condition analysis.

Items of information acquired from the local planning commission or designated by the members of Metroplan's staff are:

1. Location of the parcel as it relates to:
   a) Census tract or coded township number
   b) Section number

c) Census block

d) Parcel number

2. Standard industrial classification code of the parcel
3. Zoning category of the parcel
4. Number of off-street parking spaces on the parcel

In most cases, the information which is forwarded to Metroplan from the Little Rock and North Little Rock Planning Commissions, such as zoning districts, is up to date or if not up to date the staff members of the local planning commissions indicate which areas need reviewing.

Current land use information, if not available from the assessor's card, is obtained by Metroplan staff members conducting windshield surveys. This method has been used on some of the older areas of the City of Little Rock where the assessor's information was not considered up to date. However, since windshield surveys are expensive both in time and money, they are only used in special cases.

Other sources of data for land use information are; aerial photographs, Sanborn Atlases, Polk City Directories, and the familiarity of the local area by staff members.

Commercial Parcels

The commercial parcels of land are recorded on Commercial tax assessment cards by the assessor. Information on approximately 6,000 commercial parcels was transferred from the commercial tax cards to the basic data tabulation sheets.

Data obtained from the commercial tax cards is similar to the data obtained for the residential parcels. Additional data relating to the use of a commercial structure and the area and use of each establishment within the structure has also been obtained.

Location maps of the commercial parcels were made from plat maps and land use maps supplied by the Planning Commissions of Little Rock and North Little Rock. The legal description of the commercial parcels obtained from the tax assessor's cards were used to plot the parcels on Metroplan's maps.

Sanborn structure maps were used to make tracings of all commercial buildings and each floor of the buildings. To determine the actual use of each commercial structure and each floor within the structure, field survey teams interviewed the building managers or tennants. The desired area and use information was scaled directly on the tracings and then transferred to the basic data tabulation sheets. Information on each separate establishment within a structure, its area, and standard industrial classification code were recorded on a separate line on the basic data tabulation sheet and required a separate punch card.

Industrial Parcels

Industrial parcel assessment information is recorded on industrial assessment forms. The information desired by Metroplan on the approximately 500 industrial parcels was

copied directly from the tax assessor's cards or the detailed industrial tax books.

The industrial parcels were plotted on the same maps used for the commercial parcels and in the same manner.

Using tracings made from the building sketch on the tax assessor's cards the field teams interviewed the management of each industrial establishment and the area and use of each separate establishment was recorded.

This information was transferred to the basic data tabulation sheets and then punched into cards.

The location of the parcel, its zoning, standard industrial classification code and number of parking spaces was designated by Metroplan's staff and listed on the tabulation sheets.

As of January, 1964, information on slightly more than 102,000 residential, commercial and industrial parcels of land had been listed on the basic data tabulation sheets and transferred to punch cards. The audit land use, zoning and industrial classification listings have also been prepared from the punch cards. It is estimated that the cost of the acquisition of the data, punching the cards and producing the audit, land use and zoning listings, has cost $150,000.[1]

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[1] Interview with John S. Harrington, Assistant Director, Metropolitan Area Planning Commission, Little Rock, Arkansas Feb. 3, 1964.

Value of Information Obtained for Planning Purposes

Location

The location of a parcel of land is a most important feature of the land inventory data bank. Without a means of relating the parcel of land to the street on which it is located, to the neighborhood of which it is a part, and to the city in which it is located, there is little value of compiling information about a parcel of land. Discussions were held by Metroplan's staff of the feasibility and usefulness of identifying the parcels using a grid system. It was, however finally decided that the information would be more usable and valuable to other public and quasi-public agencies if the parcel information was identified by street address number.

The census tract, section number, block and parcel are included in the location system as a means of rapidly locating and extracting the required data by large areas.

Under the city and school headings are coded the location of the parcel of land as it relates to the respective city and school district. Since school districts and city boundaries are not similar this information aids in determining the location and number of dwelling units in each school district,.

Land area

Under this heading are listed the front width, average

depth, and parcel area in 100's of square feet. The front width aids in determining the amount of commercial frontage on a particular parcel or street. Although the average depth is not of major importance, it is necessary for the computation of the parcel area.

Without a means of computing the land area by parcel, land use, and zoning categories, an analysis of existing land uses as related to a study area or the entire community would not be possible.

Appraised value

The appraised value of the parcel of land and improvements on the land in 100's of dollars are indicated beneath this heading.

This information may be useful to such agencies as the highway department, planning commisssion or urban renewal authority. For example, if a park is to be located within a certain area, this information would aid in determining the cost of the site or alternate sites. Similarly this data will aid the highway department in determining the approximate right-of-way acquisition costs. Also a determination of the ratio of the value of land improvements to buying power of an area may be made using this data.

Utility code

The utility code designates the availability of gas, electricity, water and/or sanitary sewer system to the parcel of land.

The knowledge of available utilities, can be of major importance in determining the development potential of land areas. This information in conjunction with other data is helpful in determining which areas are prime for development and may aid in the preparation of plans for future community facilities.

Land use code

The land use code was developed by Metroplan to facilitate categorizing the land use of a parcel of land.[1] It is possible with the 4 number code to identify 76 land use classifications including residential uses and divisions within residential uses, i.e., 1 family, 2 family or multi-family; commercial and divisions within the commercial grouping; public and industrial uses. The land use code may also be used to indicate mixed land uses such as a grocery store and residence on the same parcel.

Information regarding the land use of parcels and totals by land use codes aides the planning function by determining the type and amounts of development by land use category. This information can aid in planning for required utilities and services to serve the area under study. Land use code information is also valuable in determining the areas of development, the types of development, growth trends, future needs, and future problems as they may occur in certain places. For instance, comparative analysis of land

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[1] J. R. Stephens and Ed Hromanik, Basic Data Tabulation Study (Little Rock, Arkansas: Metroplan, 1960) pp. 22-40.

uses within an area taken on a 3 or 5 year basis can be helpful in indicating changing development patterns and aid in the planning of schools and parks.

Standard industrial classification code

This code has been developed by the United States Bureau of the Budget and is used as a means of identification of specific residential, industrial, wholesale, retail and manufacturing types. Whereas the Metroplan land use code which pertains to the land use of the parcel is general, so that its broad categories may be used for map presentations and general analysis, the standard industrial classification code is specific.

The land use code, as used in Metroplan's data bank relates to the parcel use. The standard industrial classification code relates to the actual use of the establishment. For example, a parcel of land with 3 single-family units on it would be coded multi-family by the land use code, but as 3 single-family units by the standard industrial classification system.

A parcel of land from which are ice dealer sells ice would be coded 1000 by the land use code and 5984 by the standard industrial classifications system.[1] Similary the land use code for a hardware store is 1000, and 5251 by the standing industrial classification code.[2]

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[1] Ibid., p. 23.
[2] Bureau of the Budget, Standard Industrial Classification Manual, p. 155.

The value of the standard industrial classification code becomes apparant when a study of a specific type of commercial use is required. If the planner or other interested person desires to know the number of furniture stores in the Metropolitan area or the number of square feet devoted to furniture sales, this information may be acquired using the standard industrial classification code.

This code will also aid zoning administrators in determining the amount of land in each use and whether or not there is a need for additional lands zoned for a particular use.[1]

Zoning code

The zoning code may be used to determine the location and amount of land zoned for a particular use. This information in conjunction with land use information may be used to make a comparison of the land zoned as to the amount of land used for a specific purpose.

Off-street parking

This item of information is important in determining the parking capability of a location and the potential number of vehicular arrivals and departures. The number of available off-street parking spaces may be a factor used

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[1]Roger L. Creighton, "Utilization of Data Processing In Transportation Research," Automatic Data Processing, Its Application to Urban Planning, (Michigan State University, East Lansing:1961) p.50

by zoning administrators in permitting the expansion of an existing commercial or industrial function. The number of off-street parking spaces may also be used to illustrate the deficiences of employers or apartment owners in providing adequate parking for employees, customers or residents.

Main buildings

Knowing the number of main buildings on a parcel aids in determining the use of the structures and parcel use. For example, a parcel of land with 2 single-family structures on it would have a land use code of 200, if 2 main structures were listed under this heading it could be accertained that the parcel had two residents on it and not a 2 family house.

This column will also aid in determining the number of residential structures in an area.

Number of stories

Knowledge of the number of stories in a building can be useful in determining which strucutres are capable of conversion from single to multi-family uses. Knowing the sections of the city with structures capable of conversion to multi-family units may be useful in determining possible future population densities. This information may also be used in zoning studies to determine the floor-area-ratio of multi-storied structures, and for an analysis of the structures within a flight path of a runway.

Number of dwelling units

This information may be used to estimate the population of an area and the resulting requirements of the population for schools and parks. The number of vehicular trips generated by a parcel may also be determined from this information.

Number of establishments

The number of establishments listed for a parcel of land indicates the number of structure uses on the parcel. A commercial parcel might have 25 separate functions conducted within it. The lead or primary punch card for the parcel would indicate the total number of establishments, total floor area and type of mixed land use. For each separate commercial function a follow up punch card would indicate the type of establishment by the standard industrial classification code, the floor area and number of dwelling units, if present.

This information is valuable in determining mixed usage in a structure or a parcel. Also this information may be used to determine whether or not the mixed land usage on a parcel is within the main structure or if a second structure is used for the second land use. For example, the main building might be residential structure and the second establishment might be a car repair shop. By knowing the number of establishments it is possible to make an intelligent guess that the mixed land use is not in the same building but in 2 buildings.

Building coverage

This information indicates the area of buildings on a parcel. This figure may be used in a comparison of existing coverage to the building coverage permitted by the zoning ordinance. The information may also be used to determine if sufficient land area is available on a lot to permit construction of an additional structure and still conform to the zoning requirements.

The total building coverage of an area may be used to determine the amount of rainfall which will run off buildings and must be carried through sewers or storm drainage ditches.

Total floor area

The total floor area of buildings on a parcel may be of value for zoning, residential, commercial or industrial studies. For residential studies, it is an excellent method of determining the amount of floor area per dwelling unit. In commercial and industrial studies, it provides the planner with data on the amount of area within a building or if the building has only one use the floor area for this use may be determined.

Using the land use code, the standard industrial classification code or the zoning code as the classifying factor, it is possible to determine the total amount of floor area for categories of these three codes. It is possible using the total floor area figure to determine if an area has

sufficient retail floor space to serve the individuals living within the service area.

Construction year

The construction year is used to determine the age of a structure or neighborhood and may provide an indication of potential slum areas. It is a safe assumption that older structures are given less maintenance and are inclined to become blighted.

Building condition

The building condition is determined by the tax assessor during his assessing procedure and periodic surveys. Although the assessor only codes the condition as (1) good, (2) fair, (3) poor, if the building is graded as poor by the assessor it is generally in the advanced stages of blight.

The building condition may be used to determined the location of the areas of blight or dilapidation. The information may also be used to determine the location of structures which could be cheaply acquired for such facilities as parks, public parking lots or other public uses.

Control

The control column is used by the punch card processor to indicate whether or not a certain function has taken place. For instance, information from the first card is used in the reproduction of the same information in a second card. A hole punched in the control column will serve as an indication

that the second card for the parcel has been prepared. Other uses may be made of this column as required by the punch card processor.

Number of second cards

A second or follow up card is used to describe information about the secondary uses of a parcel of land. For example, the first card may have a land code of 9310, which indicates a mixed commercial land use for the parcel of land. The first card would indicate the total amount of building area, the floor area and value of the structure and structures. By the use of an asterisk (*) under the column heading, "number of second cards", the audit listing would indicate that this particular card is the primary card for the parcel.

The follow up cards are numbered consecutively and are listed beneath the primary card on the listing sheet. The follow up cards indicate the floor area of the secondary parcel uses as separated from the primary land use by the standard industrial classification code.

Since there might be as many as 25 follow up cards for a large commercial building it was decided to number the cards as a means of determining that all the cards has been included in the listing.

Additional Information Which Will be of Value to the Land Inventory Data Bank

In addition to the previously described items of information obtained for each parcel of land, other data must be acquired. Such studies as a comprehensive plan, transportation study and school plan will require the following items of information.

As the first punch card for each parcel required the use of all 80 columns, a second card has been designed. The second parcel punch card is related to the first card using the census tract, section, block and parcel number. Items to be recorded on the second card are:

1. Planning analysis area
2. Neighborhood code
3. Future land use code
4. Parcels which are now or have been in an urban renewal-public housing project
5. Orgin-destination zone
6. Year parcel of land was subdivided
7. The month and year the residential building permit was granted for the parcel
8. The date the water meter connection was made to the parcel

Description of Additional Data Items

The planning analysis area is a statistical area generally comprised of one or more census tracts. The neighbor-

hood is a sub unit within a planning analysis area which as closely as possible relates to the elementary school within the local area. The future land use code, is the designation by Metroplan indicating the proposed land use of an undeveloped parcel. This designation will be the basis upon which the comprehensive plan and school plan will be developed.

By coding the future land use for each undeveloped parcel of land according to the comprehensive plan, it will be possible to determine and locate the total amount of proposed residential, commercial, industrial or public land. This information will be valuable in determining the future needs for each of the previous land use categories, such as schools and parks for residential areas or additional traffic ways and off-street parking for commercial areas.

The shopping center designation will be given to parcels within the existing shopping centers and also to those parcels of land which are designated for shopping center use. The next item of information, urban renewal-public housing, will identify those parcels of land which are or have been part of an urban renewal or public housing project. This information may be used for an analysis of the effectiveness of these two programs.

Origin-destination information will be used in a major transportation study in Pulaski County. In order to locate parcels in an origin-destination zone and facilitate using the other data Metroplan has on every parcel of land, the origin-destination zone will be punched into the second code.

A proposed school plan will make use of information pertaining to the development of raw land into subdivisions. The first item of information for a school study will be the year the parcel was subdivided. This information which will be provided monthly by the City Planning Commissions of Little Rock and North Little Rock, will be used to update the data bank regarding the changing of raw land to developed land. The date the residential building permit is given for a parcel will be recorded by month and year. This data will be supplied by the city engineers' offices. The last item of information obtained for this second punch card is the month and year of the water meter connection. This information is extremely useful as it indicates the date of occupancy of the dwelling unit and may be used to determine the total population of an area.

These 3 items of information, the date of subdivison, date the building was constructed and the date of occupancy will be valuable in delineating those areas in which residential growth is taking place and will indicate the areas in which school needs will soon be occurring.

Method of Maintaining and Updating the Land Inventory Data Bank

A data bank is only as valuable as the accuracy of the information contained within it. It is understandable that the data regarding parcels of land will change in a dynamic community. Therefore, the influences which will effect the existing information have been separated, and a system developed to implement the updating of the data bank. There are 4 types of changes which may effect the data bank, Figure 8.

The first type of changes to the data bank are those made by Metroplan, such as changes to the planning analysis boundary, neighborhood boundary or orgin-destination zone. Since these changes are initiated by Metroplan they are the easiest to note on the basic tabulation sheet. The punch cards of the affected parcels are removed from the card file and new cards punched to indicate the appropriate changes.

The second type of changes are those resulting from the action of the city councils or planning commissions on such matters as zoning changes or subdivision approvals. Information regarding these changes is sent to Metroplan on a monthly basis.

When a subdivision plat has received final approval from the planning commission a copy is sent to Metroplan. Approval of a new subdivision requires the correction of the existing maps and the basic data tabulation sheet designation of block and parcel numbers for the subdivisions blocks and

FLOW DIAGRAM OF METROPLAN'S DATA FILE MAINTENANCE AND UPDATING PROCESS

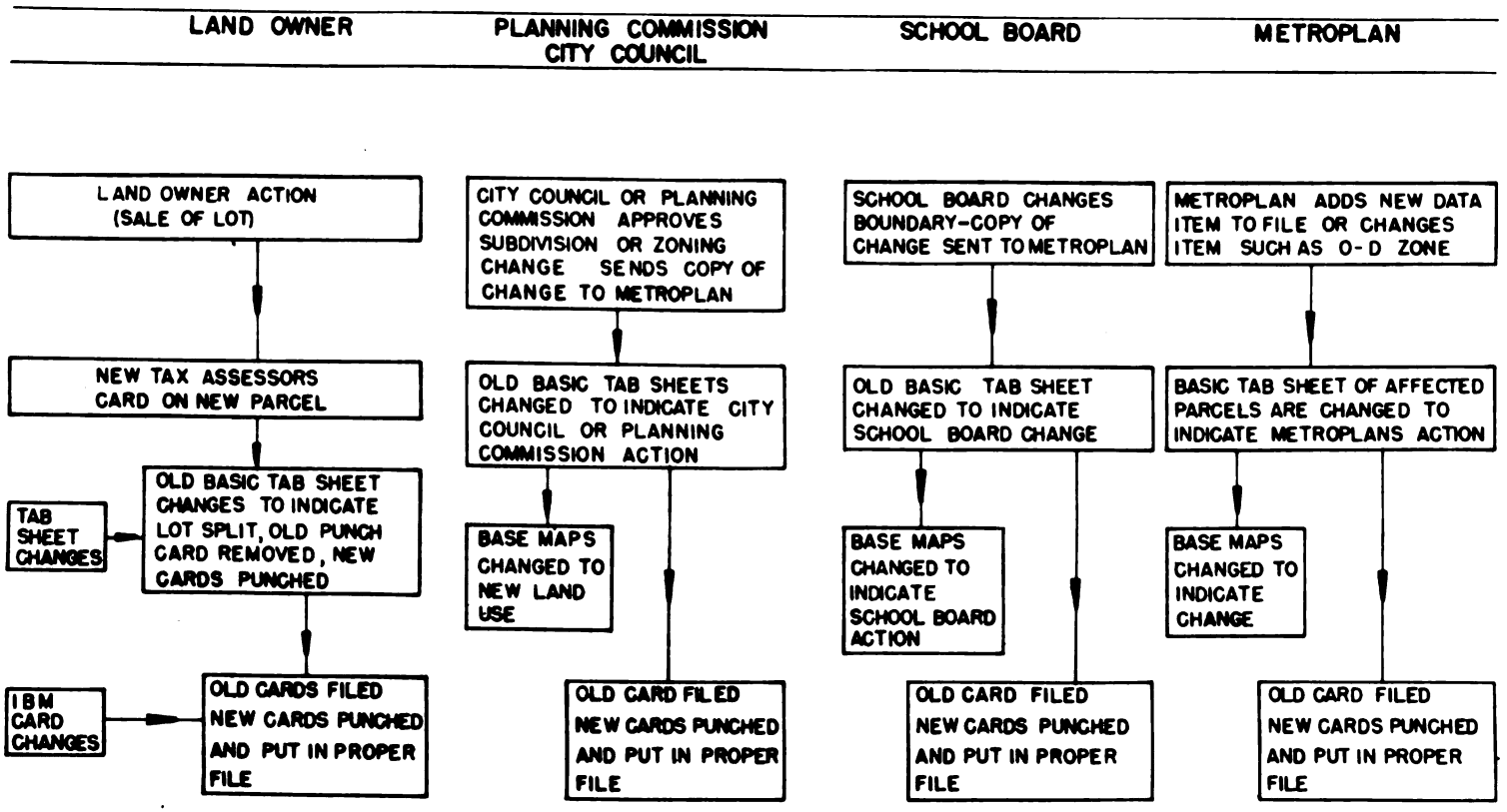

Figure 8.-Flow diagram of Metroplan's data file maintenance and updating process.

lots. Next the parcel card, which previously contained information of a large area of land will be removed from the data bank and new punch cards made for each lot in the recorded subdivision.

In the case of zoning changes, the basic data tabulation sheet will be changed to indicate the zoning change. The respective punch cards of the parcels affected by the zoning change will be pulled from the card deck and repunched to conform with the new zoning of the parcel.

The third type of change are those instituted by agencies such as the school board or the water works. In the case where a change in the school district boundary is made by the school board, Metroplan will be sent a copy of the change. The basic data tabulation sheets will be corrected and the respective punch cards will be repunched to indicate the change.

An improvement by the water works, such as the installation of a new distribution main, may necessitate changes in the parcel utility code. Therefore, the water works has been requested to send Metroplan a copy of areas served by the new mains. The parcels affected by this improvement would have their respective punch cards and tabulation sheet records changed to indicate the availability of water.

The fourth type of change which will require updating of the data bank is a change or improvement made by the owner of a parcel. The construction of a building on the parcel would require changes to the basic data tabulation sheet and

the parcel punch card. Construction information within the city limits is recorded by a building permit, and a copy of each permit is sent to Metroplan for the updating of the data bank.

Information on construction beyond the city limits is noted by the tax assessor during his periodic surveys. A system has been devised whereby the tax assessor will provide Metroplan a list of parcels on which improvements or changes have been made. The updating staff will use these lists to review the tax assessors cards and obtain the desired information. The basic data tabulation sheets are changed to indicate the changes and new punch cards are punched to record the new data.

To update the commercial parcel information, relating to the establishments within a structure, annual surveys are planned. Considering that there are more than 6,000 commercial parcels the difficulties of updating a data bank of this magnitude become obvious. To some degree the Polk City Directory and Criss-Cross Directories are helpful but only through field work can the commercial information be kept accurate and up to date.

The cooperative effort of the various agencies from whom Metroplan acquires information is the crux of the updating system. In all cases the individual agencies have been very cooperative in submitting the desired data.

Following are copies of letters of cooperation between

Metroplan and the Planning Commissions of Little Rock and North Little Rock, Figure 9 and Figure 10.

DEPARTMENT OF COMMUNITY DEVELOPMENT

LITTLE ROCK, ARKANSAS

304 City Hall
HENRY M de NOBLE
Director

Planning
Permits & Inspections
Traffic

October 29, 1963

Mr. Stuart Eurman, Director
Metropolitan Area Planning Commission
Room 216, Pulaski County Courthouse
Little Rock, Arkansas

Dear Mr. Eurman:

Your letter received October 28, 1963, requesting the Department of Community Development of the City of Little Rock to provide certain items of information pertaining to zoning changes and subdivision approvals has been received by this commission. It is understood that these items of information will be of value to you in compiling and updating your land inventory data bank. The Commission has agreed to provide this important information to you according to your desired schedule of zoning changes on a monthly basis and a copy of the subdivision plat after the final approval of the plat.

If any other items of information are desired by Metroplan in the updating and approving of your land inventory data bank, our staff will be most happy to comply with your request for this necessary information.

Respectfully yours,

Henry M. de Noble, Director
Community Development Department

Figure 9.-- Letter of cooperation between Metroplan and the Little Rock Community Department.

Planning Commission
• city hall
• north little rock
• arkansas
• FRanklin 5-4409

August 23, 1963

Mr. Stuart Eurman, Director
Metropolitan Area Planning Commission
Room 216 - Pulaski County Courthouse
Little Rock, Arkansas

Dear Mr. Eurman:

Your request of the North Little Rock Planning Commission to provide Metroplan with certain items of information has been discussed by our Commission and our Commission has requested that I inform you that our staff will comply with your request.

We understand that the zoning changes and subdivision platting data are important items of information required by Metroplan to maintain and update the land inventory data bank. A zoning request form similar to those we will be sending you is enclosed for your records. It is understood that you desire such zoning change information on a monthly basis along with a copy of subdivision plats which have been given final approval.

If we may be of service to you in any other manner, please do not hesitate to call.

Yours very truly,

L. W. Winget, Director
North Little Rock Planning Commission

LWW:ph

Encl.

Figure 10.-- Letter of cooperation between Metroplan and the North Little Rock Planning Commission.

CHAPTER II

ELECTRONIC DATA PROCESSING

A Definition of Electronic Data Processing

In its broadest sense "electronic data processing" is (1) the manipulation in any manner of (2) any form of data by (3) electronic means.[1]

1. "Manipulation in any manner" could include any of the following:

   a) preforming arithmetic operations

   b) preforming logical operations

   c) recognizing input (source) information

   d) storing information

   e) recording output (result) information

   f) rearranging (editing) information

2. "Any form of data" —— basically data can be considered as either of the following:

   a) Analogue information —— a continuous flow of information of some physical measurement

   b) Digital information —— discrete units of alphabetic or numeric characters

3. "Electronic means" —— Various electronic systems

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[1]Cecil Gillespie, Accounting Systems, (Englewood Cliffs, New Jersey: Prentice Hall, 1961), p.532.

can be mentioned.

a) Teletype transmission

b) Radio or Television transmission

c) Paper handling systems (check sorters in large banks)

d) Scheduling systems (airlines reservations systems)

e) Computers or "gaint brains"

An analysis of how the previous definition and description interrelates to Metroplan's land inventory data bank is as follows:

a. preforming arithmetic operations —— computing the area of the parcel from width and depth figures.

b. preforming logical operations —— accumulation of desired totals by the accounting machine as it prints the land use listing.

c. recognizing input (source) information —— the sorting machine preforms this operation as it recognizes the groups of information or particular land use code.

d. storing information —— the storing of totals by groups within the accounting machine.

e. recording output (result) information —— this operation is preformed by the accounting machine as it prints the information from the punch card to the analysis sheet.

f. rearranging (editing) information —— the accounting machines rearranges the information from the punch card and prints it where desired on the analysis sheet. The accounting machine also edits the card information and selects only those items which are desired.

In Metroplan's particular case digital information is used, the numerical units 1-9 and 0; and alphabetic characters.

The "electronic means", as used for the processing of data bank information pertains to the use of computers.

Electronic Data Processing Machines and their Function in Processing Metroplan's Data

Key punch

The data punch card, is the vehicle that carries the recorded information throughout the data processing system. The card is made a part of the system by inserting information from the tabulation sheet, (source document) in the card by the key punch machine.

The key punch machine has a key board similar to that of a typewriter. The depression of a key causes the punching of a hole in a card column corresponding to the letter or digit on the tabulation sheet. Data may also be printed on the top of a card by the use of a interperting punch machine. An interperting key punch has been used for Metroplan's cards, and prints the letter or number directly above the column in which it is punched.

Each line of information on the tabulation sheet relates to a parcel of land and each parcel requires an individual punch card.

Verifier

When the key punch operator has completed transferring the information from the data tabulation sheets to the punch cards, she passes the cards and basic data tabulation sheets to the verifying machine operator. The verifier operator receives the cards in the same order as they were punched by the key punch operator. As the cards pass through the veri-

fier, the operator hits the keys on the verifying machine to duplicate the key punch operators function. If the information being tapped on the keyboard of the verifier is the same as that which is in the card, no impression is made on the card, however if there is a variation in a column the verifying machine cuts a notch in the punch card directly above the column in which a variation has occured.[1]

If the key punch operator has made an error in a card she re-types the card and it is again verified.

Interperter

The term interperting as used in the International Business Machine System of electronic data processing is the translation of holes into printed information on the punch card. Whereas the interperting key punch machine prints the letter or number directly above the respective column, the interperter prints the letter or number in any desired location.

The Metroplan punch card was designed and printed to have the interperter print the data in various boxes, Figure 4. However, it has been found that printing the numbers and letters directly above the respective columns by the interperting punch is a more satisfactory system.

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[1] International Business Machines Corporation, Machine Functions, (White Plains, New York: 1957), p. 7.

Calculator

Calculating is the computing of a result by multiplication, division, addition or subtraction. Any combination of these calculations may be preformed, often in one pass through the machine. Factors to be calculated may be extracted from each card or a series of cards, emitted by a device within the machine or be developed by the accumulation of a series of calculations. One or several results may be punched in each card in a trailing card which follows a group of cards carrying the factors.

For Metroplan's operation, the calculator calculates the parcel area by multiplying the depth times the front width and punching the result in 100's of square feet in the appropriate field. Although this operation is rather simple and could be preformed by Metroplan staff, the machine has the ability to compute this information at the rate of 2400 cards per hour.[1]

Sorter

Sorting is the grouping of cards in numerical or alphabetical sequence according to any classification punched into them. In Metroplan's particular case, this machine is used to sort the cards by census tracts, land use codes, zoning codes, standard industrial classification code or any other

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[1]Interview with Harry Pickens, President of Computer Service Company, Little Rock, Arkansas, July 1, 1963.

classification. This machine has the ability to sort cards at the rate of 1,000 per minute.

Collator

A collator is a machine which has the ability to merge 2 decks of punch cards into 1 deck in a pre-determined order. Cards which have been extracted from their normal position in a card deck may be merged back into proper order as the 2 groups of cards pass through the collator.

This operation may be accomplished at speeds of 240 cards per minute.

Reproducing punch

A reproducing punch, reproduces data from 1 punch card to another. Desired information from a lead card is automatically punched into another card asthe 2 cards are fed through the machine.

This machine will be used in the punching of certain information from the first card to the second punch card for each parcel. Such items as the census tract, section, census block, parcel number, land use and standard industrial classification code will be punched into the second card.

This machine, which is capable of punching 100 cards a minute, will elimate the need to key punch the desired data for the second card.

Accounting machines

The accounting machine has 2 functions; to print

alphabetic and numerical data from punch cards, and to total data by selected classifications.

To preform Metroplan's requirements the machine prints a list of all the data contained in the punch cards as the cards pass through the machine, each card requiring a separate line. This process is known as listing. During the listing process, the machine is capable of adding, subtracting, cross subtracting, editing and printing.

The machine may also be used to add certain items of information from all the cards as they pass through the machine and print totals.

A listing of the information and any combination of desired totals may be preformed at the rate of 100 cards per minute.

CHAPTER III

PLANNING STUDIES AND MAPPING WHICH MAY BE ACCOMPLISHED EASIER OR FASTER USING THE LAND INVENTORY DATA BANK AND ELECTRONIC DATA PROCESSING

Mapping of Data

Land use map

The audit listing and parcel location maps may be used to prepare a land use map. Since the audit listing of parcels is printed in numerical order, by block and parcel number, a land use map may be produced by transferring land use information from the audit sheet to the respective parcel using a color code system.

In an analysis of a 96 block area, the parcel land use was transferred from the audit listing to the parcel map. Aerial photographs and city directories were then used to determine the accuracy of the information obtained from the tax assessor's records. After the land use maps were made staff members went to the area and compared the land use from the audit listing to that which actually existed in the area. Within this 96 block area of mixed land uses there was less than a 5 percent variation between the map prepared using the audit listing and the check made by windshield survey. This 5 percent variation may be large to some persons but is was

concluded that a windshield survey of an area of this size and diversity would have inherent errors of about the same percentage. The major advantage of producing a land use map using the data bank, is a reduction of employee's time and elimination of costly driving up and down streets.

Zoning

A zoning map may be produced in the same manner as a land use map from audit sheets. In most cases the only method of obtaining zoning information is to extract the zoned area from an official zoning map. This procedure is time consuming and in most cases, since special studies are always needed immediately, the percentage of errors will be greatly increased by a rush job. However, since the zoning information is already listed on the audit sheet, the transferral of this information is a mechanical process with a reduction in error and time required. In order to update zoning information within a study area, a Metroplan staff member reviews the zoning changes and variances granted since the date of the last revision and makes the necessary changes.

Building condition map

The building condition information may also be transferred directly from the audit sheet to the parcel map. This information is recorded by the tax assessor during his review of the property. The tax assessor uses only 3 categories in the description of building condition. It has been found that although this 3 way breakdown is adequate for some

studies, detailed studies for urban renewal require more complete information and for this reason the building condition must be checked in the field.

Age of structure map

Mapping the age of structures may be accomplished directly from the audit sheet. In most cases, this information is accurate, especially within the Cities of Little Rock and North Little Rock. Copies of building permits are sent to the tax assessor by the city engineers' offices, and this information is used to create tax cards. Annual surveys are made by the tax assessor for new construction beyond the city limits. New structures are added to the assessors cards and the date of construction copied from the cards to the basic data tabulation sheet. In most cases, the recorded age and structures have been found to be accurate and therefore field surveys are usually not made to check the age of the structure.

Appraised value map

The appraised value of buildings and land may be obtained from the audit sheet and transferred to the parcel maps. Although in some cases structures may have been built since the last survey, it is estimated that the changes in appraised value will be minor in relation to an entire study area.

Analysis of Existing Land Use

As a pre-requisite of a land use planning study, basic information concerning the area under question must be gathered and analyzed. If required, the parcel land uses must be separated, categorized and totals for desired information obtained. To do this, the desired items of information must be decided upon and those contained within the punch cards extracted.

For a land use study, the operator of the punch card sorting machine separates the desired punch cards according to the land use categories. For example the 100 land use code is single family residential, 1000 commercial, 3100 industrial, 5100 wholesaling. After the punch cards have been separated by land use categories and put into proper block and parcel order, they run through the accounting machine, which if required, prints a numerical listing by block and parcel. Totals by census block may be printed on the sheet, if desired, and the total of the entire land use grouping may also be printed on the analysis sheet. Thus, by separating land uses within the study area into categories and processing these cards through the accounting machines a printed listing by land use groupings is obtained. Totals by land use grouping which may be acquired from the accounting machine include:

1. The number of parcels of the land use group
2. Total of front lot width of all parcels in same

use group

3. The area in square feet of the land use group
4. The appraised land value
5. The appraised value of the improvements
6. The number of off-street parking spaces
7. The number of main buildings
8. The number of accessory buildings
9. The number of dwelling units
10. The number of establishments
11. Coverage in square feet of the building on the parcels
12. The floor area of all buildings

In the Census Tract Six study CHAPTER IV, in which more than 1,000 parcels were studied, the machine operator required less than 2½ hours to sort all of the parcels into respective land use groupings and print the analysis sheet. This sheet listed the desired information by land use code with totals by block and the entire study area.

Analysis of Existing Zoning

To analyze the existing zoning within an area the punch cards of the desired parcels must be extracted from the card deck. The desired cards would be retreived according to the study area location and then sorted by zoning categories.

After separation by zoning category in numerical block and parcel order, the cards would be processed by the account-

ing machine which would print the information contained in the cards on an analysis sheet. The information would be printed in numerical order by block and parcel.

Block totals and area totals for the area by zoning category, or value by zoning category or any of the 12 items of information as previously described may be printed if desired. For example, to determine the amount of commercial frontage on a street by zoning category, an additional sort must be made. The parcel punch cards which have been sorted according to zoning category must be fed into the sorting machine for separation according to the desired location. After this additional sort is made the total commercial frontage on a street may be totaled and printed on the analysis sheet.

Analysis of Existing Land Use to Existing Zoning

This study is basically a combination of the 2 previous studies to determine a comparison between the existing land use and zoning. Area comparisons may be made of the amount of land zoned for a particular use as it relates to the actual use of the land. Through an analysis of the data bank information, it is possible to determine whether there is an excess or deficiency of land zoned for a particular requirement.

Analysis of Commercial Uses and Needs Determined by a Ratio of Population to Commercial Area

By electronic data processing all the commercial parcel

punch cards in the Little Rock Metropolitan area, the total commercial area was determined. A ratio of suburban population, as determined by census block data, to suburban retail space was found to be 13 square feet per person.[1]

This ratio of 13 square feet of retail sales area per person may be used to determine future retail space needs. To determine the future retail sales area 3 steps are required. First, total the existing retail sales area using the data bank commercial cards and electronic data processing. Second, determine the population of the commercial service area from census data or by multiplying the number of dwelling units, as determined from the data bank, by 3.2. A comparison of the existing population to commercial area will indicate the existing ratio and illustrate the present retail requirements. To determine future commercial needs the future population potential must be ascertained.

A resonable estimate of the future population of an area may be found by determining the vacant acres of land in the study area, less 30 percent for the streets, parks, etc., times 10 for the average number of persons per acre.

The resultant estimated future population used with the ratio of required square feet of retail space will provide a projected retail space requirement.

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[1]Stephans and Hromanik, p. 59.

Analysis of Recreation Facilities and Other Community Facilities as Related to Existing and Future Population

To analyze the adequacy of a community facility, a comparison of accepted standards regarding the size of the facility to the population which is expected or required to use it must be made. The population of the community facility service area may be determined by multiplying the existing dwelling units as determined by the data bank by 3.2. The potential dwelling units which may be built on the vacant land may be determined as previously described. These population figures when compared to the recreation facility under question will permit an analysis of the adequacy of the facility to serve the existing or future population.

Method of Using Information From the Land Inventory Data Bank for Studies Such as Listed Above Without Electronic Data Processing

Information which has been recorded on the basic data tabulation sheets may be used for planning purposes without the use of electronic data processing. The major reason for recording information on the basic data tabulation sheet is for a record and source document for transferring this information to the punch card for electronic data processing. However, in some cases, the cost of electronic data processing small volumns of information will be in excess of the cost and time saved by copying the data from the basic data tabulation sheets and hand tabulating the desired information.

An example of this situation would be the preparation of a zoning map for a 2 block area surrounding the parcel in question. In a small study such as this, it would be easier, faster, and more economical to select the tabulation sheets for the blocks surrounding the parcel under consideration and tabulate the desired information by hand. Other examples of direct retreival from the basic data tabulation sheet would be the case of a right-of-way acquisition for a small number of parcels of land or other studies dealing with a small land area.

CHAPTER IV

AN EXAMPLE OF A PRACTICAL APPLICATION USING INFORMATION CONTAINED IN A LAND INVENTORY DATA BANK PROCESSED BY ELECTRONIC DATA PROCESSING EQUIPMENT FOR ADMINISTRATIVE PLANNING

This particular practical application was undertaken at the request of the Little Rock Planning Commission by Metroplan for an analysis of the existing land use and zoning in Census Tract Six.

Study area

The study area in this particular undertaking was all of a census tract south and adjacent to the central business district of Little Rock, Arkansas. The area is composed of some 96 blocks in which there were 1,108 parcels of land. The area has been in a state of transition from single-family residential to commercial and multi-family for a number of years. Interstate Highway 30, the interstate highway route from North Little Rock through Little Rock southwest to Texas is adjacent to the study area. Also within the area are 2 traffic arteries and shopping facilities for the population of the census tract and the residential areas to the east, south and west.

Method of Analysis

Metroplan had recorded information on every parcel of land in this census tract and this information had been transferred to punch cards prior to the request for this study. In addition to information from the land inventory bank, field surveys and the characteristics of the census tract were obtained from the 1960 United States Census of Population and Housing.

In this study, the 3 analysis listings as previously described were used. The audit listing, was used in the preparation of an existing land use map. The draftsman transferred the existing land use from the audit analysis sheet to the individual parcel of land using appropriate color codes. After preparing the land use map, field crews were sent to the area to check and record changes which had taken place since the last survey by the tax assessor. Those parcels on which changes had taken place were noted and the appropriate changes were made on the existing land use map. It is interesting to note that although the area has been in transition for the past number of years, the percent of variation in a comparison of the assessor's information to the present situation was less than 3 percent of the total parcels of the area. In other words, of the 1,108 parcels within this area, the information taken from the tax assessor's cards were correct except for 30 parcels which had conversions from single-family to multi-family units.

These conversions may not have been obvious to the assessor in his survey of the property.

The next step was the analysis of the land use listing. Table 1, which is a table from the report produced by Metroplan lists the land use categories and areas in square feet, the area in acres and the percent of the total area.[1] As indicated by Table 1, residential uses were separated into single, two-family and multi-family uses. The commerical uses were separated into retail, professional services and 5 other groupings. Industrial uses were manufacturing and wholesaling. The public and semi-public uses were divided into their respective groups. A category for mixed residential and other uses was listed, plus the amount of vacant land, amount of land used for streets, and total area. All this information, except the area in streets, was obtained directly from the analysis sheet by members of Metroplan's staff. The area of street right-of-way was determined from the master street plan map.

The next phase of the study was the analysis of the zoning listing. Such information as the amount of land zoned for residential, commercial, and industrial uses was obtained from the zoning analysis listing. The amount of land not zoned was determined by subtracting the amount of land zoned from the total study area. Table 2, illustrates comparison between the existing land use and existing zoning

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[1] Future Land Use and Zoning Plan for Census Tract Six (Little Rock, Arkansas: Metroplan, 1963), p. 10.

Table 1. -- Existing land use, Census Tract Six

Land use category	Area (sq. ft.)	Area (acres)	Percent of total area
Residential			
Single-family	3,448,200		
2 family	2,086,600		
Multi-family	2,023,700		
Total	7,558,700	173.5	55.2 %
Commercial			
Retail	326,800		
Personal services	64,600		
Automotive services	84,200		
Eating & drinking	49,000		
Office & real estate	36,500		
Professional service	22,100		
Business services	202,100		
Total	785,100	18.0	5.6 %
Industrial			
Wholesale	32,200		
Manufacturing	27,600		
Total	59,800	1.4	0.4 %
Public & semi-public			
Churches	251,400		
Public schools	180,000		
Private schools	41,300		
Public hospital	22,700		
Private nurse & san.	61,500		
Fraternal	70,300		
Total	627,200	14.4	4.6 %
Mixed			
Residential & other	306,600	7.0	2.2 %
Vacant	576,000	13.2	4.2 %
Total land exc. streets	9,913,400	227.6	72.1 %
Streets	3,819,050	87.7	27.9 %
Total area	13,732,450	315.2	100.0 %

Table 2.-- Comparison of existing land use and zoning, Census Tract Six

Land use category	Amount land used sq.ft.	acres	Amount land zoned sq.ft.	acres
Residential				
Single-family	3,448,200	79.2	166,200	3.8
2 family	2,086,600	47.9	5,674,300	130.3
Multi-family	2,023,700	46.4	2,681,300	61.5
Total	7,558,500	173.5	8,521,800	195.6
Commercial				
Office	260,700	6.0	60,000	1.4
All other commercial	524,600	12.0	410,700	9.4
Total	785,300	18.0	470,700	10.8
Industrial				
Manufacturing	27,600	0.6	275,800	6.4
Wholesale	32,200	0.8	167,500	3.8
Total	59,800	1.4	443,300	10.2
Public & semi-public	627,200	14.4		
Mixed	306,600	7.0		
Vacant	576,600	13.2		
Not zoned			477,600	11.0
Total	9,913,400	227.6	9,913,400	227.6

within this study area.

Time required for data processing

The preparation of the audit, land use and zoning listings from the parcel punch cards, by the Computer Service Company required 2 days. Included in the processing of Metroplan's work order was the wiring of the control panel which provides instructions to the accounting machine,

A similar punch card processing request was later made by Metroplan, of the data processor, on another census tract which had 135 blocks in it and a total of 1,609 parcels. In this particular case the computer company started on Metroplan's study immediately and returned an audit, land use, and zoning listing in less than 8 hours. Thus it is obvious that the amount of time taken in the processing of the information is negligible. It should be emphasized however, that the amount of time and money spent gathering the information from the tax assessor's cards and other sources is considerable.

Of major value to a planner is the availability of information in concise, complete form which can be rapidly obtained to aid in determining an analysis and solution which the planner desires. Although some of the land use and zoning information had to be field checked, the data bank and electronic data processing were a major time saver for this project.

The reason for the City of Little Rock asking Metroplan to do this study is that over the years the Little Rock Plan-

ning Commission has been plagued with variance requests to the existing zoning ordinance. The existing zoning ordinance for the City of Little Rock was produced in 1937 and since that time it has had many amendments. The city officials acknowledged that the zoning ordinance is outdated and intend to have a new ordinance drawn up in the near future. Since this new ordinance is a few years away, the Little Rock Planning Commission requested Metroplan to make an analysis of the existing land use, zoning and conditions which will effect this area and prepare a future land use and zoning plan. An analysis of Table 2,"Comparison of Existing Land Use and Zoning", indicates the amount of land zoned for commercial use as to the amount of land used for that purpose. It should be stated that the industrial zoning classification in Census Tract Six would, in most ordinances, be considered commercial and not industrial. Calculations indicated that there are some 900,000 square feet of land zoned for industrial and commercial uses; and slightly more than 840,000 square feet used for these purposes.

After an analysis had been made of the types of commercial uses in the census tract and the population which supported their operation, it was determined that the amount of commercial area zoned was adequate for the existing commercial needs.

An analysis of commercial areas as compared to population in this area indicated that 13 square feet of retail commercial space is the present ratio of retail area to pop-

ulation.[1] The future land use and zoning plan for this area provides approximately 19 square feet of retail area per person.

Although it is not the purpose of this thesis to indicate how the future land use and zoning plan were produced it is felt that information used in the preparation for the future plans acquired from the data bank should be stated.

Major conclusions of the information from the data bank processed by electronic data processing are:

1. The study area is predominantly residential in character.
2. There is some scattering of commerical uses, particularly on Main Street.
3. There are no commercial uses on Broadway between 15th Street and 24th Street.
4. Existing major commercial areas are on Main Street between 14th and 19th Street, at a shopping center on Broadway and Roosevelt and an older Shopping area at the intersection of Arch and 23rd Street.
5. Residential uses in the study area are generally a mixture of single-family, two-family and multi-family uses.

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[1]Stephans and Hromanik, p. 59.

6. There is an obvious deficiency of parks and recreation areas.
7. Commercial lands comprise 5.6 percent of the total and are predominantly of retail and business service nature.
8. Industrial uses comprise only .4 percent of the total land, although 5 percent of the area is zoned for industry, a very disproportionate amount.

Information about the existing zoning which was obtained from the punch cards and electronic data processing:

1. An excessive amount of land is zoned for industrial uses. Existing industrial uses in the study area are negligible and the few uses in this category should be classified as heavy commercial.
2. The amount of land zoned for industrial and commercial uses, only slightly exceeds the amount of land used by these combined uses.
3. There is a need for more land zoned for multi-family use and a corresponding need for the amount of land zoned for two-family use.

Summary and Conclusions

Electronic data processing was not used to a great extent in the development of the future land use and zoning plan. However, the amount and form of the information delivered to the planner in a short period of time is conclusive

evidence that this type of study is greatly aided by a land inventory data bank and electronic data processing.

The amount of time required to obtain information from the tax assessors cards, zoning maps and other sources is substantial and must be taken into consideration when analyzing the value of electronic data processing. However, except for updating, the acquisition of data for the data bank is a one time function. If this study had required a windshield survey for the land use and computing the land use areas with a scale and a calculator, the time required to do both of these processes would be greater than the time required to transfer the information to the tabulation sheet, punch parcel cards and print listings.

It should also be stated that the Computer Service Company, who processed the parcel cards had to wire the control panel which instructs the accounting machine. Now that this study has been accomplished and a control panel has been wired and filed for Metroplan's work, future studies will be faster and cheaper.

Figures 11 and 12 indicate the proposed, "Future Land Use" and "Proposed Zoning", for the Census Tract Six study area. Meetings were held with the Little Rock Planning Commission and Board of Directors, and except for minor changes this plan was adopted as developed.

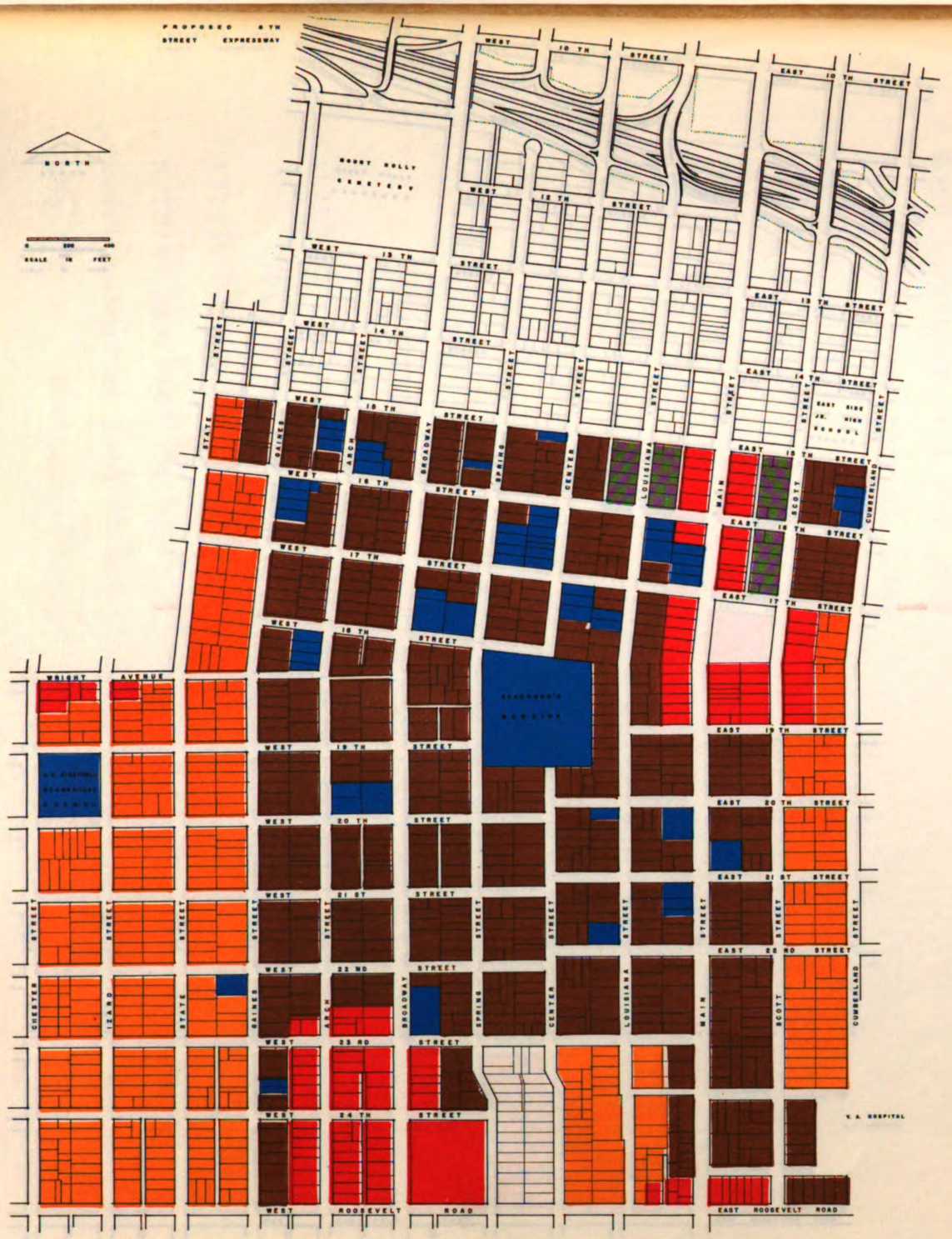

Figure 11

CENSUS TRACT 6

LITTLE ROCK, ARKANSAS JANUARY 1963

A COMPREHENSIVE STUDY OF THE AREA BOUNDED BY THE 6TH STREET EXPRESSWAY ON THE NORTH, ROOSEVELT ROAD ON THE SOUTH, CHESTER & STATE STREETS ON THE WEST, AND CUMBERLAND STREET ON THE EAST.

FUTURE LAND USE

- PUBLIC AND QUASI-PUBLIC
- DESIRABLE PARK SITES
- TWO FAMILY
- MULTI-FAMILY "D" APARTMENT
- MULTI-FAMILY "E" APARTMENT
- COMMERCIAL

PREPARED BY THE LITTLE ROCK DEPARTMENT OF COMMUNITY DEVELOPMENT

HENRY M. DEROBLE - DIRECTOR JAMES M. WEBB - DESIGNER

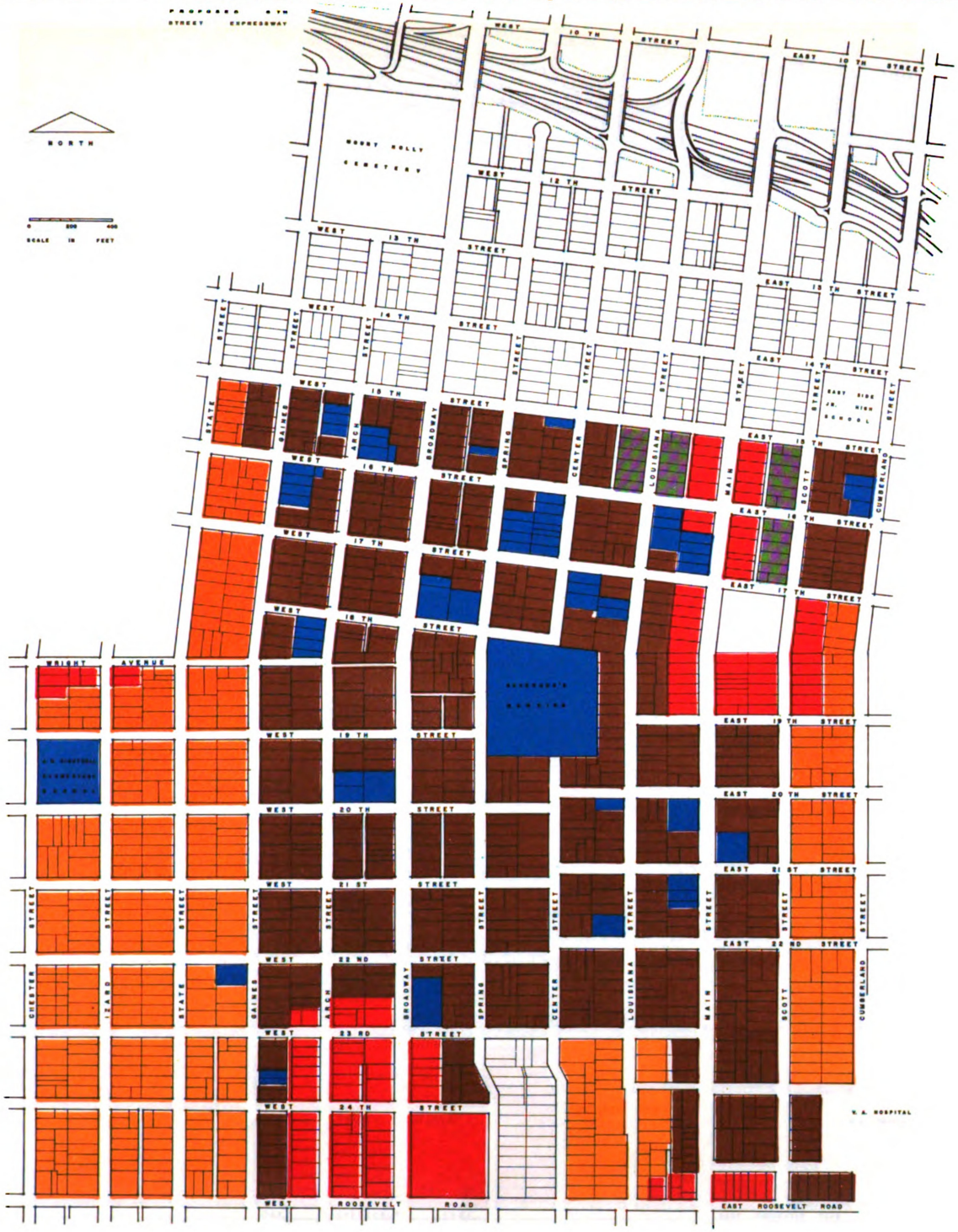

Figure 11

CENSUS TRACT 6

LITTLE ROCK, ARKANSAS JANUARY 1965

A COMPREHENSIVE STUDY OF THE AREA BOUNDED BY THE 6TH STREET EXPRESSWAY ON THE NORTH, ROOSEVELT ROAD ON THE SOUTH, CHESTER & STATE STREETS ON THE WEST, AND CUMBERLAND STREET ON THE EAST.

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CHAPTER V

AN EXAMPLE OF THE PRACTICAL APPLICATION OF ELECTRONIC DATA PROCESSING OF INFORMATION CONTAINED IN A LAND INVENTORY DATA BANK FOR URBAN RENEWAL STUDIES

Electronic data processing was used in this particular urban renewal study to extract information from Metroplan's Land Inventory Data Bank regarding all of the parcels of land within an urban renewal area. The desired information including totals of the 12 main items on each parcel of land as listed in CHAPTER III and in addition, other detailed information was obtained and summarized for the study. Specialized items of information obtained through electronic data processing of the land inventory data bank included:

1. Condition of all structures
2. Location of dilapadated structures
3. Appraised value of all structures by housing condition grouping

Purpose of study

This study, which was undertaken at the request of the Little Rock Housing Authority served 2 purposes. The primary purpose provided the housing authority information concerning every parcel of land in a 66 block study area in an extremely short time. The secondary purpose was to provide Metroplan

data to determine the value of electronic data processing of data bank information for urban renewal studies.

Method

The first step in this study was to delineate the area under consideration. Since Metroplan's data is located by census tract and block, it was necessary to list the census tract and block for the blocks within the study area. The listing of the desired blocks was delivered to the Computer Service Company which processed and maintains Metroplan's data bank punch cards. The Computer Service Company was instructed to prepare 4 listings of the parcels of land within the study area. These were an audit listing, a land use listing, a zoning listing and a special listing.

The first 3 listings stated above are common to other land use studies which Metroplan has conducted; however, for this particular urban renewal study, a special listing was required.

Listing by building condition

This listing lists all buildings by the 3 category condition code: good, fair, or poor.

By determining the number of housing units in each condition category, it is possible to estimate the number of persons displaced if structures in deteriorated condition must be removed. This is accomplished by multiplying the number of dwelling units of deteriorated condition by a factor of 3.2

persons per dwelling unit.

The value of buildings by condition grouping was also obtained using the building condition listing. This information aids in determining the approximate cost of acquisition of the structure and parcels in the project area by condition category.

Using this building condition listing it is also possible to transfer the building condition information from the analysis sheet and produce a building condition map.

By comparing the building use with the study area's zoning, it was possible to determine the non-conforming structures. If a zoning map illustrating the variances is desired, such a map may be prepared from the audit listing which lists the zoning of each parcel.

A land use map was prepared utilizing the audit listing and transferring the land use information to a parcel map. In the case of this urban renewal project study, after a land use map and building condition map were completed, field checks were made to test the completeness and accuracy of the prepared maps.

Table 3, "Existing Land Use", was computed from the statistical information obtained from the land inventory data bank.[1] This table illustrates the various major categories of land use information which were extracted from the data bank. Within each major land use category, minor parts

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[1] Suggested Land Use Plan for Capitol View Urban Renewal Project (Little Rock, Arkansas: Metroplan, 1963), p.10.

Table 3.-- Existing land use, renewal study area

Land use category	Area (sq.ft)	Area (acres)	Percent of total area
Residential			
Single-family	3,062,400	70.3	
Two-family	1,089,600	25.0	
Multi-family	562,200	12.9	
Total	4,714,200	108.2	43.6 %
Commercial			
Retail	85,200	1.8	
Personal services	51,700	1.1	
Automotive service	124,800	2.7	
Eating and drinking	28,500	.6	
Office, real estate, finance	46,300	1.6	
Professional service	41,100	.9	
Business service	4,700	.1	
Total	382,300	8.8	3.6 %
Industrial			
Wholesale & warehousing	82,200	1.8	
Manufacturing	232,900	5.5	
Total	315,100	7.3	2.9 %
Public & semi-public			
Churches	169,500	3.9	
Public schools	121,500	2.9	
Public Hosp. & sanitorium private nurse home	336,400	7.7	
Total	627,400	14.5	4.9 %
Mixed			
Residential & other	172,100	3.9	1.6 %
Parking	147,100	3.3	1.4 %
Vacant	573,300	13.1	5.2 %
Total land exc. streets	7,459,500	171.3	68.0 %
Streets	3,455,500	79.4	32.0 %
Railroad right-of-way	528,000	12.1	4.8 %
Total area	10,915,000	250.6	100.0 %

of the land use category were obtained. Under the heading of commercial uses, information concerning divisions of commercial use such as retail, personal services, automotive services, eating and drinking establishments, office and real estate establishments were available.

One of the greatest values of the information contained in the land inventory data bank is illustrated in this table. That is, the availability of detailed information regarding the individual land use. In a normal land use analysis, the amount of square footage for each commercial use would not be obtained during the land use study. It has been found that this immense volume of data is extremely helpful to the planner and one of the more outstanding advantages of the information from the data bank is its use in commercial and urban renewal studies.

Table 4, "Comparison of Existing Land Use and Zoning", was a result of the comparison of the land use and zoning analysis listings and illustrates one of the other advantages of the land inventory data bank, that being the rapid computation of the amount of land used for a particular function compared to the amount of land zoned for that function. Although this information would be available from the existing land use inventory and the available zoning map, the amount of time required to make this type of comparison would almost be prohibitive, as far as a detailed analysis as illustrated in this table.

Table 5, "Value of Land Per Acre According to Use",

Table 4. -- Comparison of existing land use and zoning, renewal study area

Land use category	Amount land used (sq.ft.)	Amount land zoned (sq.ft.)
Residential		
Single-family	3,062,400	695,300
Two-family	1,089,600	4,062,300
Multi-family	562,200	454,000
Total	4,714,200	5,211,600
Commerical		
Office	40,100	121,400
All other commercial	342,200	381,800
Total	382,300	503,200
Industrial		
Manufacturing	232,900	771,000
Wholesale & warehousing	82,200	218,000
Total	315,100	989,000
Public & semi-public	627,400	
Mixed	172,100	
Vacant	720,400	
Not zoned		4,121,200
Total	10,915,000	10,915,000

Table 5. -- Value of land per acre according to use

Land use category	Area (acres)	Total land value	Value per acre
Residential			
Single-family	70.3	$735,800	$10,466
Two-family	25.0	291,300	11,652
Multi-family	12.9	178,700	13,852
Total	108.2	1,205,800	11,144 avg.
Commercial			
Retail	1.8	36,200	19,555
Personal	1.1	27,500	25,000
Automotive	2.7	87,400	32,370
Eating & drinking	.6	17,600	29,333
Office (real estate & ins.)	1.6	38,900	24,312
Professional serv.	.9	26,600	29,555
Business service	.1	1,900	19,000
Total	8.8	236,100	26,829 avg.
Industrial			
Manufacturing	1.8	60,800	33,777
Wholesaling	5.5	16,700	3,036
Total	7.3	77,500	10,616 avg.
Public & semi public			
Public schools	2.9	22,600	7,793
Churches	3.9	60,600	15,435
Public hosp., sanatorium, & private nurse homes	7.7	902,800	117,240
Total	14.5	985,600	67,972 avg.
Mixed			
Residential & other	3.9	76,600	19,641
Parking	3.3	124,700	37,787
Vacant	13.1	159,800	12,198
Total	159.0	$2,866,100	$18,025 avg.

was also complied by the data processing machines. In this table the total land area and total land value for each use category was determined from the land use listing. This information is valuable in an urban renewal study as it indicates the approximate cost of the land of each of the land use categories.

This information could be obtained by searching through the tax assessor's cards and listing the value of each piece of property under question. However, it is obvious that once this information is in the punch cards and easily extracted from a data bank, the availability of this information is valuable for an urban renewal study. If the appraised value of an individual parcel of land or a block of land is desired, it is possible to extract the desired information from the listings.

Table 6,"Number of Buildings, Population and Value of Structure According to Condition Grouping", illustrates a most important feature of the land inventory data bank analysis for the urban renewal study. This information permits a rapid computation of the value of structures and is extremely helpful in analyzing the total property value within the urban renewal project. This information will aid in determining the approximate cost of acquiring individual structures or all the structures within a condition category. (e.g. dilapidated).

All of the previously mentioned tables were valuable to the urban renewal agency in determining the cost of acqi-

Table 6. -- Number of buildings, population and value of structures according to condition grouping

Condition of buildings	Number of buildings	Number of persons living in each building condition classification	Appraised value of land by condition classification	Appraised value of improvements by condition classification	Appraised value of land and improvements by condition classification
Good	147	470	$ 652,700.00	$ 3,695,600.00	$ 4,348,300.00
Fair	834	2,668	1,149,100.00	3,505,600.00	4,654,700.00
Poor	85	272	185,300.00	446,500.00	631,800.00

sition of blighted structures, the total number of blighted structures in the study area, and the number of persons who must be relocated prior to removal of the blighted structures.

The maps which were developed from the land inventory data aided in determining the location of the blighted structure, the comparison of existing zoning to existing land use and the actual land use.

Conclusion

This study served 2 purposes, the first, providing the Little Rock Housing Authority with the data which it required and secondly, testing the feasibility of using this information for an urban renewal study. For Metroplan's information a cost-time analysis was incorporated in the overall study. The urban renewal area contained 66 blocks with approximately 10 parcels per block or 660 parcels within the study area. The cost of processing the punch cards which were in numerical order, by census tract through the sorting machine and printing the desired listings as described was $28.00.

The time required to extract the punch cards of the renewal area parcels from the data bank and time spent separating the cards for the audit, land use, zoning and building condition listings was approximately 45 minutes.

The results of this study indicated that a study in which information is desired from 400 or more parcels, electronic data processing is extremely helpful and a great asset to the planner in rapidly obtaining information to aid in solving the research problems for urban renewal studies.

Recommendations

In all studies of this type, there are bound to be short comings or problems which soon become evident. One of these is the grading system used by the county tax assessor. The "good", "fair", and "poor" structure condition analysis made by the staff of the tax assessor's department is not satisfactory for the detailed information which must be obtained for renewal studies. Therefore, when information of a very current and detailed nature is desired, it is advisable to supplement the tax assessor's building condition information with a windshield survey.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Analysis of Information Used From the Land Inventory Data Bank, its Reliability and Usefulness

In the short time that the land inventory data bank and electronic data processing have been used by Metroplan, the results have been very encouraging. In most cases the information has been found to be reliable and extremely helpful to the planner in the solution of planning problems. The only question of reliability of the information acquired from the tax assessor's cards is the building condition. As previously stated, the information satisfies the requirements of the tax assessor; however, the use of only 3 categories for building condition is not sufficient for planning purposes. In numerous studies and in particular for urban renewal studies, the information is not recent enough and also does not provide sufficient detail about the structure condition. In a few cases it has been established that the tax assessor has not resurveyed property for a period of 5 years. Although these situations are not commonplace, they still must be taken into consideration in the analysis of a land inventory data bank.

All of the information has been found to be useful to

the planner and since most planning studies are done on a rush basis, it has been determined that the expense and staff time required to develop the land inventory data bank has been extremely worth while. Undoubtedly as a more refined data collection system is developed and the additional information required for other planning studies put on the second punch card, studies of a more technical and refined nature will be possible.

At the present time, Metroplan does not have access to or require a graphic map making machine which is used to convert information from cards or tape directly to graphic aids and maps. However, it is quite possible as this community continues to grow to 500,000 or 750,000 persons that more refined equipment will be acquired and located in this area. This added service will be most helpful to the planner for rapid mapping of data.

Advantages of a Land Inventory Data Bank

Volume of usuable information

In Metroplan's data bank there are data on 26 items of information in the first punch card, and 14 additional items will be punched on a second card by April 1964. Considering that Metroplan has information on more than 100,000 parcels there are 2,600,000 items of information in the first deck and 1,400,000 items will soon be added to the second, a total of 4,000,000 items.

Ease of retrieval of information

All items of information are available from 3 sources:

a. basic data tabulation sheet

b. punch card

c. audit listing

The availability of information and speed at which it may be acquired from these 3 sources aids the planner in the preparation of analysis for planning problems.

If data are desired regarding a few parcels of land this information may be read from the basic tabulation sheets. Each sheet contains information on the parcels of only 1 block. These sheets are maintained in Metroplan's office.

If larger amounts of data are desired, these data may be obtained from the audit listing of all parcels in numerical order for each census tract.

If a large volume of information is required and the information is the result of electronic data processing, then the punch cards of the respective parcels would be processed. Since the sorting and other electronic data processing functions are extremely rapid, the time required would be minor.

Machine processing of data

One of the most important advantages of having data on punch cards is that the information is in a form as to be machine processed with great speed and accuracy. The numerous electronic data processing functions; sorting, extracting, multiplication, division etc., and speed at which these functions may be accomplished helps justify the high initial cost of setting up a data bank.

Format of the final product of electronic data processing

The end product of a retrieval procedure is such that it may be either the totals of the required information and/or a listing of all parcels which were processed for the result. The availability of a printed listing provides the planner with the visual picture of all the parcels of the study This listing is very helpful as a means of illustrating the ability of electronic data processing to interested persons and as a future reference.

Data in usable form for other agencies

By using the street address as a means of location for each parcel, in addition to census tract, block and parcel, other businesses may use the information contained in the data bank. Inquiries have been received from utility companies, urban renewal agencies, private planning consultants, and real estate firms regarding the data bank.

Had the parcel data been recorded using a grid system for location of parcels the value and ease of utilization of the parcel information by other agencies would have been reduced.

Ease of updating and maintaining the data bank

The updating of the data bank is a relatively simple process after updating information is received. Changes to the basic tabulation sheet are made by red lining the old parcel information and writing the new information on the back of the sheet, changes are made to the audit listing in a similar manner. Changes to the punch card are made by punching a new card with the new information. The old card is kept as a part of a historical file.

Preparation of maps

An important part of the data bank are the parcel maps. As the continuous updating of parcel information is accomplished parcel maps are also changed to indicate land owner-

ship changes and subdivision platting. As a result of plotting parcel locations for the data bank, accurate maps at 1 inch to 200 feet are drawn and are available for reproduction.

Disadvantages of a Land Inventory Data Bank

Cost of acquiring data

It has been reasonably estimated that Metroplan has an investment of approximately $150,000, in its land inventory data bank.

The largest single item of this cost is labor. Other costs include the use of vehicles, drafting, supplies, equipment, duplication of forms, punching of the 102,000 punch cards and production of the analysis listings.

Cost of data bank maintenance

Two Metroplan staff members have been assigned the full time task of data bank maintenance and updating. It has been estimated that there will be 2,000 changes to the data bank each month. These 2,000 changes will require revisions to the basic data tabulation sheets, punching new punch cards and correcting the audit listings.

The monthly salary of these two persons is $570.00 or an annual cost of $6,840. Office space, equipment and utilities, are in addition to this figure.

Limited requests for the data bank information

Since the data banks inception it has been used for 3 major studies of the Pulaski County Metropolitan Area. They are; "Office and Commercial Study", " Industrial Growth Plan", and a "Residential Land Use Plan". For these 3 studies the data bank supplied the desired information and electronic data processing was used to sort and add the available data.

Three minor studies of greater depth and analysis have been made, 2 of which have been described in this thesis. These 6 studies are the only use the data bank has received since its operation. Other studies using the data bank will be forthcoming but the depth and detail of these studies is not known.

Cost of Acquiring and Transferring Data for the Land Inventory Data Bank

For the cost analysis a 5,000 residential parcel sample was used. The first data bank items are obtained from the tax assessor's cards and transferred to the basic data tabulation sheet.

The items of information were obtained from the tax assessor's cards at an average rate of 25 cards (parcels) per hour at an hourly salary rate of $1.52 per person per hour. The second step, that of parceling, or locating and assigning the individual parcels on maps, averages 24 parcels per hour by an individual who is paid $1.73 per hour. The next step

is the association of detailed information such as the zoning category for the individual parcel of land. This data was placed on the basic tabulation sheets as the rate of 600 parcels per hour by an individual paid $1.73 per hour. Finally, after all items of information were listed on the basic tabulation sheet, the sheets were edited. Editing was accomplished at the rate of 50 parcels per hour by a person earning an hourly rate of $1.73 per hour.

The total cost for acquiring data on 5,000 residential parcels, assigning the parcel to the proper location on a map, adding such additional data as zoning and editing all the data is illustrated by Table 7.

Table 7. -- Cost of acquiring and transferring data for the land inventory data bank

Item	Number of cards per hour	Total number of hours for 5,000 cards	Rate per hour	Total cost
Acquiring data from assessor's cards	20	250	$1.52	$380.00
Parcelling	20	250	1.73	432.50
Assigning zoning category land use and industrial classification code	60	83	1.73	143.59
Editing	25	200	1.73	346.00
Total hours	125	783		1,302.09

Comparison of the Cost of Manual Computation vs. Electronic Data Computation of Statistical Information

This section illustrates a comparison of the cost of acquiring information from the basic data tabulation sheets and summarizing the 12 articles of information desired using office machines as compared to the cost of taking the same information from basic data tabulation sheets, transferring this information to punch cards, and processing these punch cards for the desired totals.

This cost comparison is made on the basis that in both cases all of the information has been gathered, itemized, edited and placed on basic data tabulation sheets.

For the comparison of the cost of acquiring totals, from the basic data tabulation sheets, a sample of 15 blocks containing 400 parcels was used. Within this 15 block area was a mixture of residential, commercial, public and industrial uses. The totals desired of all the parcels of land by land use codes are as follows:

1. Total number of parcels in the study area by each land use code
2. Total of front lot widths of all parcels in same land use category
3. Area of all parcels in same land use category
4. Appraised value of all land in same land use category
5. Appraised value of all improvements in same land

use category

6. Number of main buildings in the same land use category
7. Number of accessory buildings in the same land use category
8. Number of dwelling units in the same land use category
9. Building coverage in square feet of all buildings in same land use category
10. Floor area coverage in square feet of all buildings in same land use category
11. Number of establishments
12. Number of parking spaces

The process used to acquire these totals for each land use category of the parcels of land within this study area was as follows. First, data on the parcels of land coded single-family residential, code 0100, were copied from the basic data tabulation sheet and listed on a multi-column accounting sheet. After all of the information on the 0100 category uses had been copied from the basic data tabulation sheets and listed, each column was added on an adding machine and totals obtained. Next, all parcels having the 0200, two-family residential category, were listed on the multi-column accounting sheet and the operator used an adding machine and added the totals for each of the 12 items as desired. The same steps were carried through for the remainder of the residential, commercial, industrial, public buildings, and

vacant categories.

Hand copying information on 400 parcels by land use category from the basic data tabulation sheet to the accounting analysis sheet and adding the columns took approximately 6 hours. The office girl was paid at an hourly rate of $1.75, thus the cost of this study on 400 parcels of land was $10.50.

A comparison of the cost using electronic data processing equipment included the following steps. First, punch cards were punched and verified for the 400 parcels of land at a rate of 250 cards per hour. Then the punch cards were separated by the card sorter at a rate of 1,000 per minute, by land use category in numerical order. After sorting all of the cards by land use category the cards were placed in the accounting machine. The accounting machine added the desired totals from the columns of information punched into the punch card and printed all of the information within the punch card on an audit listing. For the 400 parcels used in this study, it took the accounting machine 4 minutes to print the information from the 400 cards and give printed totals for the 12 items of information desired by land use code.

Total cost and time to transfer and verify all items of information from the basic data tabulation sheet to punch cards, sort the cards by land use code, and total volumes of desired information and print results for the 400 card test was as follows:

Table 8. -- Time required and cost of electronically processing data of 400 parcels of land

Procedure	Time required (minutes)	Cost
Key punch and verify	100	$18.00
Sort	4	.72
Total and print	4	1.50
Total time	108	$20.00

The cost indicated above illustrates that using electronic data processing was faster but slightly more expensive than hand methods for a 400 parcel study. However, the corresponding step of verification in the manual test would require a second series of additions for the adding machine. The cost of this second addition would bring the cost of manual computation to about the same as electronic data processing.

Although an analysis of the cost comparison for hand vs. electronic data processing methods, indicate that electronic data processing was just slightly more expensive than manual methods, it should be realized that 2 additional features may be performed during the electronic data processing. One of these features is the calculation of the area for each parcel if not given on the basic data tabulation sheet; the absence of which would require another step which must be done by either the girl operating the adding machine or another individual in the basic data collection function.

A second advantage of using the electronic data processing was the fact that at the same time the accounting machine is totaling the desired information a printed listing may be made thus providing a permanent record of the operation.

Another factor which should be stated is that after a punch card was punched for each parcel of land the card becomes a permanent vehicle of information and may be used for other studies.

Therefore, a conclusion may be drawn that in all cases where a study contains 400 parcels or more, and totals of 12 items are desired, it is more efficient in both time and money to use electronic data processing.

Recommendations for other Communities Proposing to Use Electronic Data Processing and a Land Inventory Data Bank For Planning Purposes

It is suggested that before a community undertakes the complexities of establishing a data bank, thorough investigation be made of all known planning data banks. This one step will save many hours of decision making. It is doubtful that any 2 communities would desire the same type of information or have similar sources of information, however, another communities data bank may aid decision making.

A thorough study should be made of the desired information; how it will be acquired, its accuracy and how it will be used. Data collection for the sake of having data is very time consuming, expensive and reduces the value of the data

bank.

Discussion should be held to describe and educate other public agencies of the proposed data bank, its value and use. Meetings of this nature are helpful in gaining support of other agencies and determining if additional items may be added to the data bank to increase its usefulness and value.

Information collection methods and the updating system should be well established and tested prior to starting the actual collection function. It is advisable that a manual be written providing a step by step explanation of all processes, problems and their solutions. Establishing a data bank is very involved, complex procedure and hundreds of decisions will be required. If possible each new major problem should be identified and its solution included in the procedure manual.

During the parceling, or location of a parcel on a map, it is suggested that the land use of the parcel be written on the map in the parcel area. This one step will provide a complete land use map of every parcel in the communities study area.

Format of doucments

The format of the information sheet or source document, the punch card and the printed report sheets should all be similar. Also the data punched into the punch card should be printed on the top of the card to aid in card identification. The location of data in a similar position on the 3

above mentioned items speeds the collection, staff familiarization, and the processing of desired data.

Processing of data

During the establishment of the data bank it would be advisable to investigate the cost of card punching and obtaining bids for this and other data processing functions. Consultation during the initial stages of setting up the data bank with the organization hired to preform the electronic data processing will be beneficial to both parties.

Public relations

A well organized program of public relations and education will be helpful in the collection of the desired data. As most of the data must be collected from or with the aid of other agencies a good working relationship is desirable. Also if space use information is desired for each commercial and industrial establishment, announcements that survey teams are acquiring this data will aid the survey teams.

APPENDIX

Glossary

Card Column

One of the 80 vertical divisions of a data punch card, normally accommodating 1 letter, digit, or special character. Each column contains 12 punching positions.

Coding

Assignments of letters, digits or both to identify or classify data.

Collating

Interfilling of 2 sets of cards in sequence.

Comparing

Examination of fields (usually in 2 cards) for equality of data punched.

Control Panel

The removable device which contains external wiring to cause data to be processed in the desired fashion.

Data Punch Card

A punch card measures 7 $\frac{3}{8}$ inches by 3 ¼ inches is 0.007 inches thick. The card is divided into 80 vertical columns, each column having 12 punching positions. Each card column can accommodate a digit, letter or special characters. The punch card becomes a permanent record of the information punched into it.

Detail Printing

The printing of 1 line of data from each card passing through the accounting machine.

Duplication

The automatic punching of data from 1 card into the next, normally performed on a card punch machine.

Field

A column or columns reserved for the punching of data of a specific nature.

Gang punching

Duplicating data from the first card in a group to the cards behind, usually preformed in a reproducer.

Grouping

The arrangement together of data of the same classification.

Group Printing

Machine summarizing of a group or groups of cards with 1 line printed for each group's total and identifying data.

Interpreting

Printing on a card data which is punched in it.

Listing

Same as detailed printing.

Merging

Interfilling in sequence 2 sets of cards.

Punching Position

On of the 12 divisions of a card column into which a hole may be punched.

Punching Station

On a card punch, place where holes are punched into a card.

Reading Station

On a card punch, the place where the holes punched into the card may be read.

Reproducing

Punching data from 1 set of cards into another set of cards.

Selecting Data

Extraction of a desired item or items of data from a large group of data. Sorters and collectors are used in selecting data.

Sequencing

Arranging data into a predetermined order.

Source Document

The original paper on which are recorded the data to be punched (basic data tabulation sheet).

Summary Punching

The automatic process of punching 1 card from data summarized from a group of cards.

Tabulating

The group printing.

Verification

Checking for accuracy what is punched in a card with data of the source document.

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