Urban Planning in Worcester

Past, Present and Future

An Interactive Qualifying Project

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by

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Abstract

The purpose of this project was to make recommendations to the City of Worcester on improvements to the current planning process. This report describes the methods that were used to aid in the analysis of current planning practices, the synthesis of available information, the identification of data sources and the organization of this information in a sustainable manner. Using this information, a relational database and GIS-based decision support system was created.

Executive summary

The purpose of this project was to develop recommendations to the city of Worcester regarding possible improvements to the current planning process. The first task was to synthesize information from past planning reports. To do this, a superset of all possible data types that could be contained or desired in a plan was created. This was submitted with the recommendation to have it reviewed to evaluate appropriate implementation. Based on these data types, a *Decision Support System* was created. This system consists of a graphical mapping tool – called Geographic Information System (GIS) – and a database. The GIS contains numerous existing map layers (such as buildings, parcels, and streets) as well as an added layer that shows planning areas of individual plans. The database contains a building-level table (describing each individual building and its attributes) and a plan-level table (which describes past development plans). This tool was first used to show its ability to store past planning data. In order to do this, numerous planning reports were first copied and chronologically filed into three-ring binders. This was also done to show by example that plans in the city are rather scattered and are much more valuable when they are centrally located and organized. Planning reports were also scanned in order to create electronic versions of in PDF file format. The next objective was to demonstrate the use of the *Decision Support System*. This was accomplished by the performance of examples of building-level analysis, plan-level analysis and synergy analysis which could be used by the city in the future. The building-level analysis was done by comparing the existing circumstances of an area and applying a plan to this area to see the change of – for an example – building floor usage. The plan-level analysis was based on the building-level data; it is an aggregation of it in a

specific area. The synergy analysis compared two plans and showed an example of a mutually beneficial aspect of each. The result of all these analyses was the finding that the fine-grained approach to planning (with the building-level approach as an example) is immensely powerful in that it could be used to gain knowledge about an area instantaneously – simply by the recombinant use of each individual component. This knowledge is one of the most important parts of planning and provides a solid basis on which to make informed, strategic decisions.

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1. Introduction

The development of old industrial cities has not been of uniform character since the turn of the 19th century (Simmons 2001). The advent of industrialism saw the phenomenal rise of these cities; during the post-industrial era each one had its own period of decline and readjustment to new conditions and norms. Where many metropolises grew from industrial centers to commercial hubs, most could afford to manage their development due to their critical mass. In the absence of this critical mass, however, development efforts were not restricted or structured in the way the metropolises could afford. Therein lay the danger of losing track of the bigger picture of city development, and allowing local development, in whatever form it may come, to gain control. Worcester is an example of such loosely controlled urban development, where numerous sites have been built up by private developers without conforming to a distinct city-wide strategy.

Worcester, the second largest city in New England, has struggled since the beginning of the post-industrial era. While most of the neighboring communities grew significantly, Worcester's population reached its high around 1950, and has since shrunk and only leveled off in the last two decades. There have been many neighborhood planning initiatives to rejuvenate the city (RKG, City Manager's Office of Planning & Community Development); most of these focused on one specific area of the city, disregarding the fact that each parcel is part of an interconnected whole. The difficulty of implementing a city-wide strategy is evident here. Where many like to remember the last few decades – even up until the late 1980s (InCity Times, Feb. 21-Mar. 6, 2003 p. 7) -

where Worcester had a communal atmosphere, they are confronted with the reality of today's rather quiet Main Street and Worcester Center Boulevard. When growth was hard to come by, city planners focused on building affordable housing. Though this is a worthy cause, it has been put out of proportion; Worcester has proportionally about four times more affordable housing units than its surrounding towns. This resulted in an increase in low-income residents and a drastic decrease in ownership rates (RKG 2002). This is just one indicator of the lack of a balanced cityscape in the City of Worcester, a trend that must be counteracted.

In the past few years, the most significant urban development project, titled "The Golden Triangle", included the restoration of Union Station, the building of Medical City and the Convention Center, and the revamping of the Worcester Common Outlets. The synergistic effect of the proximity of these complexes is what was hoped to make this triangle 'golden' – a new, bustling city center was envisioned. Today, the Common Outlets' property value has decreased by 37% compared to the previous year due to "the growing number of retail vacancies" in the mall (Telegram & Gazette [T&G], Feb. 13, 2003, B3). Union Station has been beautifully restored but remains mostly empty (InCity Times, Feb. 21-Mar. 6, 2003, p. 7). The Worcester Regional Airport is currently struggling for business as USAir, the last commercial airline to still operate out of the airport, has pulled out as of February 23rd (T&G, Feb. 2003). Dianne Williamson, a local newspaper columnist, mentioned that Worcester now has "an airport with no planes, a mall with no stores and a train depot with no trains" (T&G, Jan. 23, 2003). The city government is not just sitting back and watching Worcester fall apart, however. There are various proposed plans to restore much of Worcester, such as the Blackstone Canal or

the Piedmont district. Other existing steps toward brightening Worcester's future include a build out analysis, the creation of the city planner position and a new partnership with WPI with the goal of bettering Worcester in mind.

The problem with these numerous plans is the lack of a well-defined overall strategy for the city. Incoherent planning and building has left much of the city space unused and the new buildings that were built do not fit into a strategy that regards the city as a whole. City planning has a need for a sustainable practice framework that enables it to analyze future planning decisions on an informed basis.

To begin to fill this vacancy, our project attempted to compile all data from past and current city planning initiatives. Once collected, this data was organized, analyzed and synthesized into a database format. This will form the basis of a decision support system that aids in the conception of a new sustainable development framework. Not only will this make it easier to assess the big picture and envision the consequences in surrounding neighborhoods when developing new plans, but it will also aid in the steps of planning by having an established method to do this. The dearth of a unifying strategic plan for Worcester represents an opportunity to revitalize the city; this project will be a first step in the effort to secure the Future of Worcester.

2. Background

When looking at the future of Worcester and how to improve the city, there are several main subjects of importance. The subjects of urban planning and sustainable urban development are of great importance. A background about Worcester and its recent history in this field is also a necessary ingredient for this project. The structure and functionality of the city government, the various private sector participants in local planning and the actual project reports that have been done on different parts of the city are the main points that will be stressed. Many development projects have been carried out in Worcester in the past. Some of these projects were a success and others were not. However, all of them produced reports which are useful sources of data and maps of various neighborhoods around the city of Worcester that could be incredibly useful to future projects.

2.1 The City of Worcester

2.1.1 Historical Background of Worcester

The history of Worcester was characterized by its industrial nature. In the 19th century, wire manufactured in Worcester by Washburn and Moen was used to fence in the Western United States (Gordon Library: WPI's Founding Fathers: Ichabod Washburn, 2003). The Norton Company was the largest manufacturer in Worcester, with over 5000 employees (see Figure 1). Because of its strategic location in central Massachusetts, Worcester had a competitive advantage in the industrial age. Worcester's

importance can be seen by the transportation arteries that ran through the city from several directions: the railroad ran east to west, connecting Worcester to Boston on the east and the rest of the country to the west; the Blackstone Canal connected Worcester to Providence by water (this being one of the reasons that Worcester was designated as a Port city); and several highways that run east to west and north to south, connecting Worcester to New London in Connecticut, among other places.

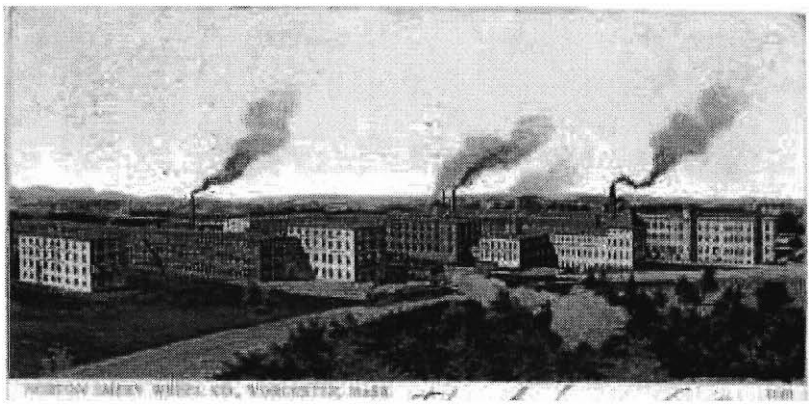

Figure 1: Norton Company, Turn of the 20th Century
http://www.worcestermass.com/places/nortons.shtml

Worcester's phenomenal growth during the beginning of the 20th century was mostly the cause of the great industrial success of the city. Immigration from various parts of Europe (Southwick, p. 57) provided the industrial sector with an ample supply of manpower. This influx of people and industrial prowess caused the city to flourish (Figure 2).

Figure 2: Main Street, Junction of Main and Southbridge Street
http://www.worcestermass.com/places/mainstreet.shtml

Worcester was largely controlled by a handful of families, such as the Morgans, the Higginses and the Stoddards, who owned the large firms – factories, banks and newspapers – effectively molding the city's economic and political landscape (The Boston Globe, July 3, 1989). These power brokers distrusted outsiders and did everything in their power to keep Worcester an "insular city they could oversee and treat as their private domain." (The Boston Globe). This type of leadership served Worcester well for several decades, yet examples like the following exhibit how, the longer the more, this out-dated power model was harmful to Worcester's future: When General Motors proposed to build a plant in Worcester in the 1940's, the ruling families fiercely opposed the idea, fearing the arrival of thousands of union workers. "This type of insularity earned Worcester a reputation as a city with a small-town mentality (The Boston Globe).

Winds of Change – recent, current and proposed developments

The last few decades have seen the waning of the power of the ruling families (The Boston Globe); "a new business and political establishment has emerged firmly committed to establishing Worcester as an urban powerhouse" (The Boston Globe). The building of the Centrum Centre – an arena (see Figure 3) – in the fall of 1982 helped "put [Worcester] on the map," as Ron Scott, executive director of the Opportunities Industrialization Center, is quoted as saying in the Boston Globe.

Figure 3: The Centrum Centre[1]

This success spurred a flurry of investment over the next two decades – nearly half a billion dollars of undertaken or proposed downtown development between 1984 and 1988, and over a billion dollars thereafter in a combination of projects called the "golden triangle" which includes Medical City – a medical center – the renovation of Union Station (Figure 4), the Centrum, the Worcester Common Outlets (a mall) and a discount store (The Boston Globe, February 27, 1999).

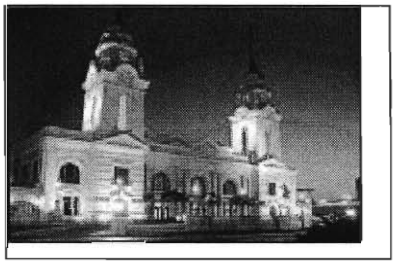

Figure 4. Union Station.[1]

The euphoria was great; the mayor at the time, Jordan Levy, was quoted as saying: "If you come back in 10 years you will not be able to recognize downtown Worcester" (The Boston Globe, July 3, 1989). However,

[1] http://www.worcestermass.org/Business/index.htm

the success of the "golden triangle" did not have "much spin-off effect on Main Street," admit John Nelson, a senior corporate executive and Worcester power broker in The Boston Globe. This characterizes a decades-old problem: "the continued deterioration of the Main Street business district" (The Boston Globe).

The City of Worcester has not been idle, however. Numerous proposals for neighborhood revitalizations have been done in the past few decades. A notable recent one is the Northern Gateway project, which plans to "to revitalize the Quinsigamond Village Neighborhood as the Northern Gateway to the Blackstone Valley by stimulating neighborhood economic revitalization, historic preservation, and environmental enhancement" (worcestermass.org-Business opportunities) (see Figure 5,6).

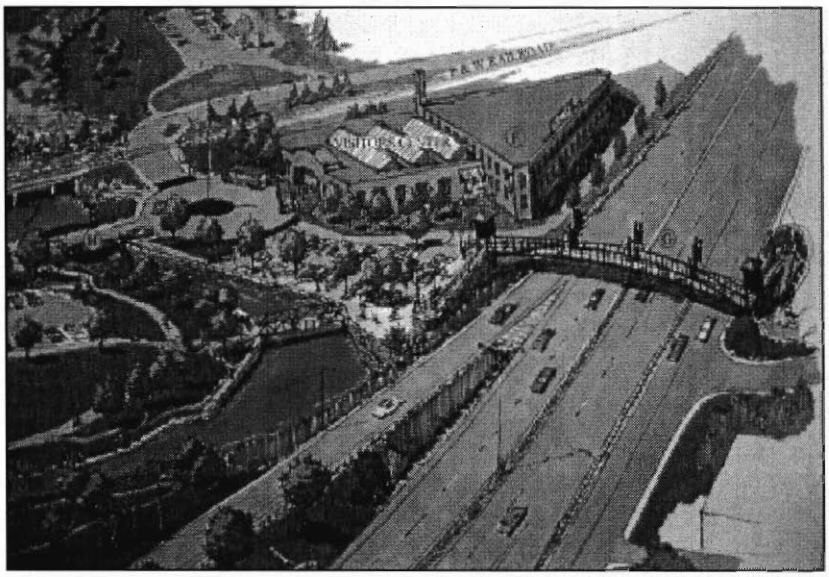

Figure 5: Northern Gateway Visitors Center[2]

[2] http://www.worcestermass.org/Business/index.htm

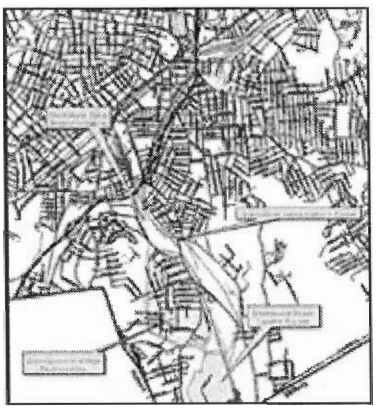

Figure 6: Quinsigamond Village Revitalization

Another project, which is currently in its completion phase, is the Route 146 Improvement Project, which provides "significant opportunities for environmental enhancement, recreation, historic preservation, and economic development as well as providing an impressive southern gateway into the city" (worcstermass.org-Business Opportunities) (see Figure 7).

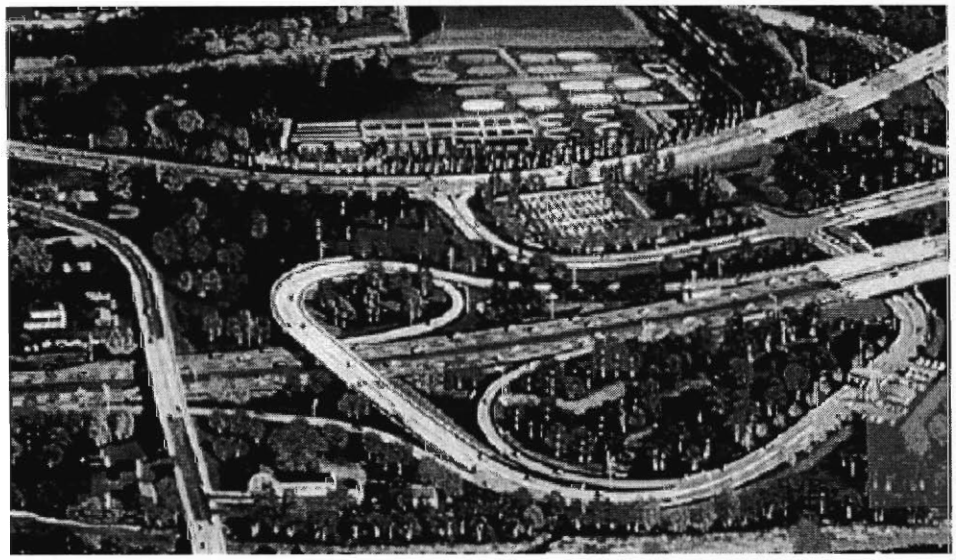

Figure 7: Route 146 Improvement Project[3]

Some other, current significant efforts are detailed in the following section.

[3] http://www.worcestermass.org/Business/index.htm

2.1.2 Community Development Studies

The sources that have been drawn upon in order to extract data types for the Access database and gain insight into the current planning practices of Worcester include:

- The Housing Market Study of Worcester, carried out by RKG Associates of New Hampshire. This study is an analysis of the housing situation of Worcester; it contains much data about the condition of the housing stock, demographic information about the population inhabiting it, and how the city's planning efforts have affected it. The study makes some controversial recommendations about how the city should change its approach to housing development. (RKG Associates, 2002)
- The Strategic Plan of 2001-2006, Benchmarking Worcester's Future; A Strategic Plan for the Third Millennium, by the City Manager, which, using the strategic planning management method, "will provide policy and decision makers with a succession of citizen initiated priorities that will ultimately lead to improved decision-making about the allocation of municipal resources" (Hoover, 2001, Executive Summary).
- Neighborhood Revitalization Strategy Areas, all-in-all ten different areas the city has designated for renewal. They include Chestnut Street, Main Street South, Washington Square, the Blackstone Canal, Gateway Park, the Wyman Gordon area, Pullman Park, the Court House, Franklin Street, and ComGas.
- The Blackstone Canal Feasibility Study conducts engineering, urban design and economic analysis on the Green Island section of Worcester in order to develop a revitalization plan (Rizzo Associates, 2002).

- Urban River Visions, a conceptual plan by the Executive Office of Environmental Affairs which details a vision of a rejuvenation of the Blackstone river area, without going into specific details.

See Appendix A for a complete list of plans.

2.1.3 City Government of Worcester

The City of Worcester is headed by the mayor, who is part of an 11 member City Council consisting of 5 District Councilors and 6 At-Large Councilors. Worcester also has a City Manager. The city manager is responsible for the day-to-day running of the city and reports to the mayor and his council, who operate more on the city policy and legislative levels. The city government also has numerous commissions and boards that decide on a plethora of issues such as the airport, the civic center, the various parks, housing, etc. These boards and commissions all report to the city manager. The most relevant of these to this project include the Community Development Advisory Committee, the Industrial Development Financing Authority, the Planning Board, the Worcester Housing Authority and the Worcester Redevelopment Authority (City of Worcester, 2003).

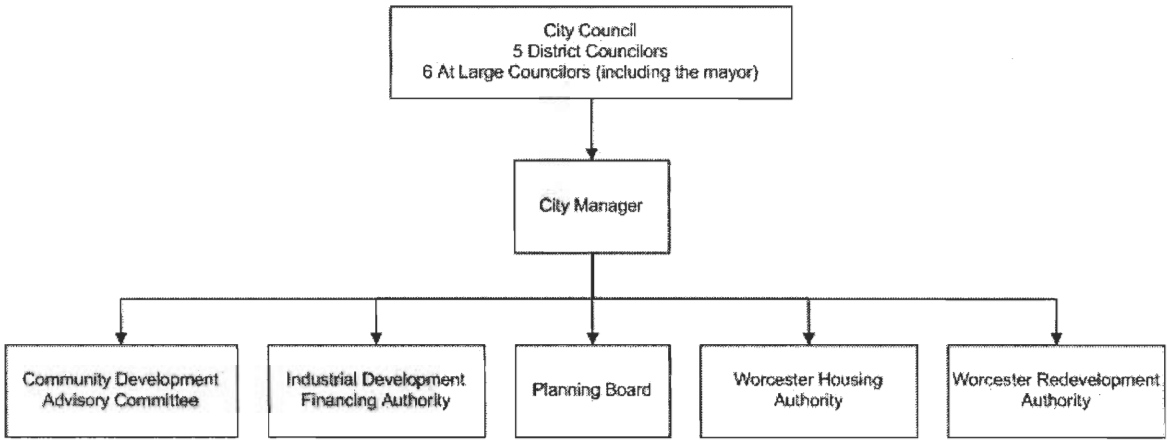

Figure 8: Flow Chart of related Worcester city government offices

The Community Development Advisory Committee screens all applicants for funding under the Community Development Block Grant program. This program is operated by the Department of Housing and Urban Development. They also cooperate with the Office of Planning and Community Development in setting funding priorities. In addition, the Community Development Advisory Committee makes recommendations to the city manager regarding agencies and programs to be funded annually (City of Worcester, 2003).

The Industrial Development Financing Authority assists business development within the city of Worcester. This is accomplished by issuing tax-exempt revenue bonds on behalf of companies to finance the purchase of land, equipment and facilities. Manufacturers and certain non-profit entities may qualify for up to $10 million in financing. The Authority coordinates, approves and processes the necessary documents to complete this effective low cost financing program (City of Worcester, 2003).

The Planning Board decides about zoning issues and regulations and is also responsible for enforcing subdivision control laws as well as site plan review. (City of Worcester, 2003).

The Worcester Housing Authority commissioners serve as the governing officers of a public corporate entity, one which functions as a developer and landlord of local low-income housing programs. Their role is similar to that of the members of the board of directors of a private corporation. Some of their principal responsibilities are providing leadership and advocating for public housing, setting policies governing the operations of the public housing authority and charting the direction of current and future programs, ensuring that the public housing authority operates within the law and according to EOCD and HUD regulations, obtaining and managing monies to support the authority and adopting operating budgets (City of Worcester, 2003).

One of the responsibilities of the Worcester Redevelopment Authority is identifying and implementing urban renewal area plans and corresponding amendments in Worcester. Following state approval of a plan designed to assist in the elimination of slums and blight, the Worcester Redevelopment Authority is also responsible for urban renewal planning, land acquisition, business relocation, demolition of obsolete structures, site testing and preparation, and public improvements (City of Worcester, 2003).

The City Council also has several committees staffed by council members. Some significant ones include the Community Development, Public Service & Transportation, Housing & Neighborhood Revitalization, Strategic Planning, Land Use and Traffic & Parking. The City Manager's office has offices beneath him, the most pertinent of which is the Executive Office of Neighborhood services, with four divisions: public services,

housing, grants and comprehensive planning. These "focus exclusively on the development of enhanced physical and human infrastructure systems in Worcester's diverse neighborhood areas" (City of Worcester, 2003).

2.2 Urban Planning

City planning requires the understanding of several areas. The main areas that must be explored include transportation, housing, economic development, the environment, and also legal, social and political issues.

In any city planning, transportation is a big issue. One must look at the way that traffic patterns around the entire city are interrelated. "In truth, there is probably no fully satisfactory way to divide a transportation system into projects without encountering important interdependencies, especially in determining net benefits over a long period of time (Meyer, 1971)." When a plan is being developed, changes in traffic may be looked at in the direct vicinity of the planning area, but surrounding areas must also be looked at. In addition, if multiple concurrent plans are being implemented, the net effects of all of the projects on traffic patterns must be examined.

Housing is another facet of urban planning. The two major controls a city has in privately funded housing are infrastructure and land-use controls (Levy, 1997). Infrastructure controls consist of the control of roads, public water and sewers; the way the city can use these controls is by either paying for infrastructure itself (burdening the tax payer) or by charging the developer (Fontane, 2003). Its most effective use is as a disincentive. Land-use controls are used to designate the size of lots and the maximum quantity of units allowed per acre, which, in turn, controls what types of housing can be

built and the price of the housing. When it comes to low income and moderate income housing, the city has more control. In addition to having infrastructure and land-use controls, the city can encourage developers to use federal and state subsidies for low and moderate income housing. The city can even go so far as to offer bonuses to developers who build a certain amount of low and middle income housing.

Economic development is another factor that must be taken into consideration when planning a city. Two important benefits of successful economic development are an enlarged tax base and a low unemployment rate. A larger tax base will enable a city to provide more services without raising taxes, which generally improves the state of a city. This encourages immigration into the city, which in turn enriches the labor market and the economy (Levy, 1997). One way to jumpstart this effect is for the city to make itself visible through promotion and advertisement. Another way is to subsidize development of local land.

A third way is to make sites and buildings available to developers and potential property owners.

The environment must also be taken into consideration when developing a city. There are five major areas that planning can influence the environment. First, the city must control how much development occurs to limit excessive building on any one type of activity (usually done through zoning). The city must also control the type of development that occurs to maintain a balanced cityscape. These two aspects, as well as the specific location of any development, can be used to maintain the balance with the environment. The allocation of public capital that is invested into development – and the conditions that can be tied to this investment – is another way the environmental impact

in the private sector can be influenced (Fontane 2003). Finally, operation of any developed space can be tightly controlled during its entire lifespan (Levy, 1997).

In addition to looking at these four main areas of planning, there is a series of steps that must be followed when developing a plan. First, the purpose of the plan must be clearly identified. Once a purpose is established, a series of goals for the plan must be set with specific time frames. The next step is to define specific objectives for each of the goals, again with time frames. Once the purpose, goals and objectives are decided upon, information must be collected and analyzed. The analysis of this information, based upon the established purpose, will form the backbone of the plan. Finally, the plan must be adopted and implemented (Butler, 1977, p. 207-208).

3. Research Methods

The goal of this project was to gather all relevant planning data pertaining to Worcester and synthesize and analyze it such that it can be used to help in the creation of a future strategy for the City of Worcester.

The main objectives in order to complete this ultimate goal were:

1.) Review current planning processes in Worcester,

2.) synthesize planning proposals and reports,

3.) organize planning data in a maintainable manner,

4.) recommend mechanisms for sustainable planning practices.

The following sections discuss the details of the methods that we used to satisfy the ultimate goal described above.

Section 3.1 defines the domain and exact geographical area used in project. Section 3.2 deals with the methods used to gather data relevant to the current planning practices of the city of Worcester and discover any inefficiencies in these practices. In Section 3.3, we describe the methods we used to figure out what types of data are contained in the various neighborhood plans. This section also illustrates the methods we have applied to identify possible sources of information. Section 3.4 deals with how we organized the planning information in a maintainable manner. Section 3.5 describes how we made recommendations for sustainable planning practices in Worcester. Section 3.6 lists the deliverables that this project has produced.

3.1 Study Area

This project was carried out in the city of Worcester, located in central Massachusetts (see Figure #10). It focused on several development projects in specific neighborhoods and looked at the ramifications of these projects on the city as a whole. The neighborhoods that currently have proposed redevelopment plans are Gateway Park, Wyman Gordon, Pullman Park (see Figures #11, #12), Chestnut Street, Main Street South, Washington Square (see Figure #12), the Court House, Franklin Street and ComGas (See Figure #13) (Executive Office of Environmental Affairs, 2002).

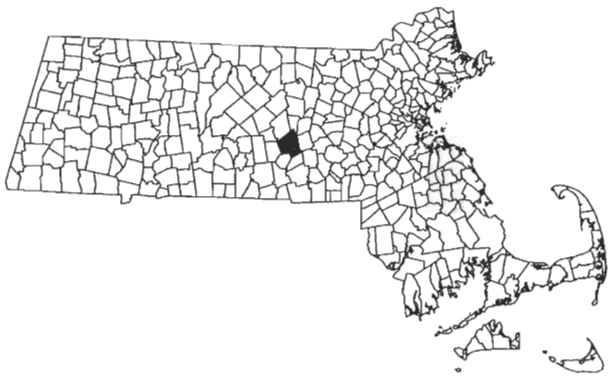

Figure 9: Worcester, located in central Massachusetts

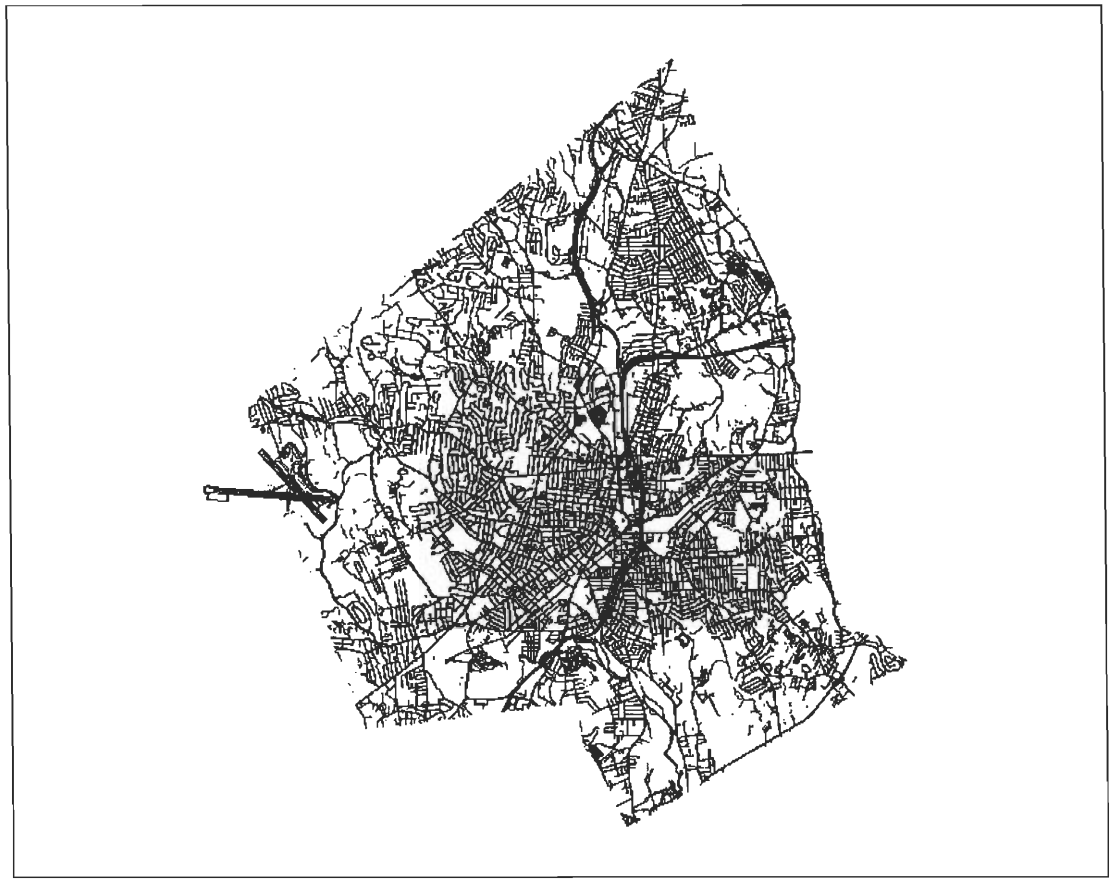

Figure 10: A GIS Map of Worcester showing streets, ponds and rivers

3.2 Review of Worcester's planning practices

As with any city, there is always room for improvements in planning practices. The first objective of this project was to identify some of the current problems in the Worcester planning process in order to discover where improvements can be made.

The main method of gaining insight into the way the City of Worcester goes about planning was through formal and informal interviews. We interviewed Worcester's Director of Planning Joel Fontane, Daniel Benoit and others involved in Worcester planning. Some of the topics that were discussed include the lifecycle of a development plan, evaluation of plans and perceived shortcomings in the current planning process.

Content analysis was also used to sift through various sources of information including housing market studies, strategic plans and reports for the city as a whole or neighborhoods in particular, market profiles, the state-wide build out analysis, and conceptual plans. For the most part, these sources of information are development plans related to Worcester and various studies conducted on the city of Worcester.

3.3 Synthesize information from Planning Proposals and Reports

The second objective that was completed to reach our ultimate goal was to synthesize all of the development plans. The types of data that are used in each of the plans were scanned and a superset of all of these types of data was created. The information sources for this objective are those identified in the previous objective, but different types of information were extracted from them for this objective. Instead of looking for planning practices, factual and numerical data were extracted.

3.3.1 Identify Sources of Information

A large part of this objective was to identify the complete spectrum of planning information that is available to the city of Worcester. This process was launched by questioning the project advisors – particularly Professors Carrera and Krueger – and the project sponsor, Mr. Daniel Benoit. From then on, a tree-like approach was used: each new contact was usually the source of information about another contact. Thus the contact network branched out. These contacts could be sources of development plans as well as experts on the subject of planning. The internet, another source of information, was usually limited to being a source of electronic plans, basic research and background information about institutions.

Internal sources of information included multiple organs of the city government. This includes the City Manager's office and its related offices. These offices include: the

City Planner's office; the Executive Office of Neighborhood services, which is where the Neighborhood Strategy Area reports, among other things, are kept; the Code Enforcement office, which takes care of building permits, housing inspection as well as infrastructure inspection, among other things; and the Public Works office, which is responsible for the water supply, the sewage system, and street and traffic systems. City Hall offices have also been identified as sources of information. Two examples are the Economic Development Office, which aids in the financial and technical assistance of new businesses, and the Assessing office, which establishes the market based evaluation of real estate parcels and private estates.

External sources of information are all those sources not within the city, state or federal government systems. They include private firms and developers, non-governmental organizations (such as the Central Massachusetts Regional Planning Commission) and research bureaus (for example the Worcester Regional Research Bureau). These information exchanges were generally done through informal interviews or formal requests for information.

3.3.2 Taxonomy of Planning Information

When looking through the various sources of information, we looked for a wide variety of data. This included information relating to GIS layers for the city such as roads, highways, railways, foot-paths, bike-paths, buildings/building types (e.g. fire stations, police stations, hospitals, industrial centers, commercial hubs, malls & shopping centers, residential areas, closed off areas, communes), utilities (e.g. gas, electric, water, other), zoning (e.g. residential, commercial, industrial, institutional, specialty), municipal boundaries, developed/undeveloped/developable land, waterways (e.g. lakes, ponds,

marshes, rivers, watershed area, floodplain), topography, large infrastructure (e.g. ports, airports, railroad stations, power plants), historical landmarks and statues, parks and recreational centers. Background data pertaining to geographic sites was also extracted including general data (e.g. square footage, water usage, etc.), economic (e.g. current estimated value of land/building, tax base), communal (e.g. crime level, communal desirability, waste disposal), transportation (e.g. road/sidewalk/bike path access, distance to next bus/railroad station, access for large vehicles, parking facilities), environmental (e.g. air pollution, noise pollution, vibration) and housing.

This list of data types was adjusted and prioritized according to the input of various contacts. The people questioned were asked about which data types were of relevance to their part of the planning process. In this way the data collection was confined to a limited set. Whereas the more detailed case study involved the use of a comprehensive list of data types, most of the development plans were synthesized based on this limited and representative set of data.

3.4 Organize Planning Information in a Maintainable Manner

One of the inefficiencies in the current planning processes of Worcester that we became aware of is the lack of data reuse. The same data will often be recollected in multiple development projects. If these data were all in a centralized source that was available to city planners, this problem would be eliminated. Thus one part of this objective entailed the acquisition, physical duplication and digitization of all of the most pertinent planning reports.

Once the reports were acquired from various sources including the City Planner's Office, the Main South Community Development Center, the Worcester Redevelopment Authority, Mr. Dan Benoit, a local architect and our sponsor, and the Central Massachusetts Regional Planning Commission, they were photocopied. The photocopies of the reports were hole-punched and filed chronologically into three-ring binders. The newest reports were at the front and the oldest at the back of the binders. We used this method with the idea that the most recent reports were usually likely to be the most relevant. In addition to photocopying the reports, we also converted them to electronic format. In order to do this, we utilized the HP 9100C Digital Sender located in WPI's George C. Gordon Library. This machine scans in documents, converts them to Adobe Acrobat PDF format and emails the file to a specified recipient.

In addition to this duplication process, we also kept a running list or "bibliography" of all of the collected reports. In addition to the names of the reports, we listed a variety of other characteristics in this index. The type and depth of each report was recorded along with what topics were covered in each report, the date that the report

was published and the author(s) of the report. Some of the reports dealt with specific planning areas. For these reports, we also listed a geographic code that corresponds to a region on the "Planning Areas" GIS layer that we created.

To define a scope for our analysis, we took several factors into account. First, we looked at the date of the reports creation. We decided to make a cut off at five years. We looked at every relevant report from 1998 on and judged whether or not each report was relevant to our project. Before 1998, we only looked at a selected few reports. To decide which reports from before 1998 to look at, we briefly looked through each of the reports and decided if they were relevant to the project, if they were relevant to Worcester's development in general and if the data was out of date or not.

3.4.1 Building-level approach

As the name implies, this database is built up from a very fine-grain level – the building level – and builds up in a hierarchical structure. The power of this approach comes from its simplicity: as data is gathered at the finest level, it can easily be aggregated to give a good picture of the sum of its parts. From the building level, the data is used to calculate the corresponding data for the next unit of analysis – the parcel. At the parcel level, additional information was available from the City's Planner's office, such as land value. Using this as a basis, the same data can be generated for census tracts and block, or for precincts and wards. As a final step, these can then all be aggregated together to give a good overview of the whole city.

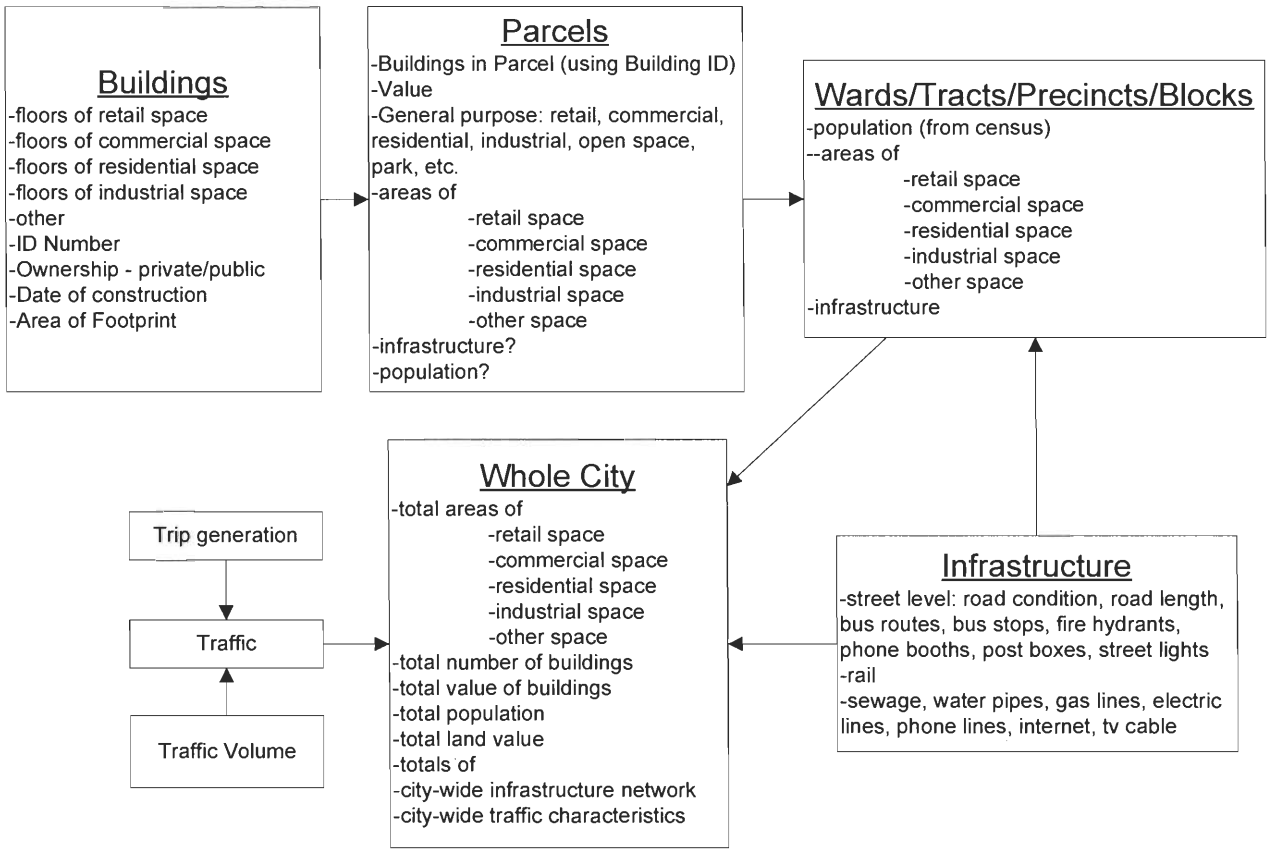

Figure 11: Organizational chart of the Buildings-level database

Buildings-level database

The buildings-level database is the most fine-grain database that is both useful and realistic. Several types of data were gathered at the building level (see Figure #15), the most important of which are the number of floors of retail, residential, commercial, and industrial space.

The Parcel-level database

This database is essentially created from the aggregation of the data in the buildings-level database. This entails running a search, or query, which pieces all the corresponding building information together. Additional information that is only available at the parcel level can then be added, such as land value.

The Local database

The building-level approach can be applied at almost any level using the simple concept of addition. The most commonly used ways of grouping parcels is through precincts and wards, which are groupings made by local authorities for tax purposes, or through census tracts and census blocks. Here again, different information is available at these different levels. For example, in addition of course to the aggregated building data, census tracts will have demographic data on the population within that tract.

The Traffic database

The traffic database describes the characteristics of traffic flow through the city. This data was available from traffic data that has been collected over the years at specific sites, such as the location of major construction projects. This is the one database that cannot simply be aggregated due to the nature of traffic. In contrast, when a new building is built, new retail space (for example) is added to the total retail space of the

city. This has no direct effect on the amount of cars on the road. It may, however, influence the way those cars behave.

The Infrastructure database

This database includes all types of infrastructures present and describes its condition. On the street level, this includes: road condition, road length, bus routes, bus stops, fire hydrants, phone booths, post boxes, and street lights, rail connections, sewage, water pipes, gas mains, electric power lines, and telecommunication lines. This can be implemented at the local or the city-wide level.

The City-wide database

The city-wide database contains the complete assembly of all data types. Starting from the basic building information, it includes land value, land use, total number of buildings, total value of buildings, population characteristics, infrastructure and traffic data.

3.4.2 The Plan-level approach

The plan-level database attempts to compile much of the data that can still be used for analysis to the current environment. It classifies plans using the indicators that follow.

Classification types

The types of plans that we came up with for the list are master plans, strategic plans, neighborhood plans, historic preservation plans, land use plans, building plans, charrettes, and other reports. A master plan describes the overall vision and long term goals of an area. Master plans are usually fairly conceptual and do not include much quantitative data. Strategic plans describe a way to transform an area. Neighborhood plans are similar to strategic plans, but deal with the revitalization of one specific neighborhood. Historic preservation plans deal with renovating historic landmarks. Land use plans deal with such issues as zoning and wetland areas. Building plans are projects that deal with the construction of one specific building. Charrettes are public forums similar to town meetings. There are usually no official reports related to charrettes, but oftentimes they will leave a variety of newspaper articles, notes and other various records in their wake. In the process of sifting through all of these reports, we came across a few that did not fit into any of these categories, such as the "Building Vibrant Communities" report. We decided to list them under the "other reports" category.

The categories we developed for plan depth are concept plans, feasibility studies, detailed development plans, market studies and impact reports. Concept plans are usually the first step in the planning process. They are basically just ideas or visions that somebody has come up with. Feasibility studies are the step in the planning process that usually follows the concept study. These studies contain lots of data and help decide whether or not a planning project is worth doing. They indicate if a project is cost

effective or not and look at how the project may change things in surrounding areas. Detailed development studies discuss how a planning project will be implemented. This is the final step in the planning process for a development project. Market studies look at statistics related to a specific market, such as a housing market study. Impact reports can be done before or after a planning project is implemented. They discuss the project's effect on the surrounding environment.

For the "Topics Covered" section of the list of reports, we decided on a list of twelve possible topics. They are parking, traffic, transportation, housing, water (including water supply and use), sewage (which includes solid and/or hazardous waste and wastewater), historical preservation, area description (such as site plans, existing conditions, aerial views, parcel descriptions and building conditions), economic development (including entertainment and retail), land use (including open space and zoning), pedestrian activity and comfort (which encompasses such things as aesthetics and streetscapes) and environment.

3.4.3 Data Analysis

Plan-level analysis

Using the plan-level database, this analysis attempts to point out the costs and beneficial points of a plan. The positive points of a plan include jobs created, housing, retail and commercial space built, and open space and parks created. The costs of a plan on the community can be felt through the traffic impact, the change in parking needs, the

increased need for schools, and the change in infrastructure usage (such as sewage and water).

Building-level analysis

Based on the building-level database described above, this analysis uses the base-level data gathered and compares it to a plan and the plan's projections. The data on the plan-level is compared to the aggregated data coming from the building-level approach. This is done for the "current plans" (see Scope) and conclusions are drawn thereof. The complete array of plans is looked at and the effect of the comprehensive implementation of these plans is compared to the ability of the catchment basin to support that level of development.

Synergy Analysis

This analysis shows how two plans can have a beneficial or a negative effect on each other depending on their objectives. This will make use of the two different approaches – plan-level (aggregate) and building-level (fine-grain) – and compare how the different approaches attempt to answer the same question of land use.

3.5 Recommend Mechanisms for Sustainable Planning Practices

The final objective for this project was to make recommendations to the city about the types of sustainable planning practices they could use in the future. We have designed a decision support system using an Access database and GIS map layers. We then demonstrated the use of this decision support system tool by applying it to a selected neighborhood development area. Based on this demonstration and the analysis of current planning practices, we have produced recommendations about sustainable planning practices that will stimulate urban development.

3.6 Deliverables

The deliverables for this project include the final report with appendices, a CD with the Access database and GIS layers (in MapInfo format), an example of the use of the decision support system, copies of plans filed chronologically into three ring binders, electronic versions of plans, images, and a final presentation

4. Results and Discussion

4.1 Data Sources

The following sources of data were identified as potentially useful to include in the Decision Support System. What follows here is a brief description of each; the degree of their integration into the Decision Support System is described in subsequent chapters.

The Assessor's Office data: Received from the City Planner of Worcester, this data is used for tax purposes. The main categories are Income Data Lines, Calculated Areas, Value Correlation, Quality/Age/Condition, and Information, Income Calculations, and Apartment Data Detail.

Development Plans: As the mainstay of this project, the numerous different development plans are the main data sources for the database-part of the Decision Support System.

Existing GIS Layers: City of Worcester: These layers include ponds, stream, railroads, streets, street centerlines (which is where street names are stored), parcels buildings.

Existing GIS Layers: CMRPC: These layers include more detailed data such as contours (which display altitude), land usage, a few recent development plans, railroads, and several types of zoning.

US Census: A very detailed data source, the US Census provides information on various levels: state, county, county subdivision, subbario, tract, block group, and even block level – a block representing a group of parcels.

4.1 Building-level Database

4.1.1 Contents

We constructed the Building-level database to include as many different factors as possible. Beginning with an assortment of data types that are available in the Assessor's database (see Appendix A1), the database was expanded by using the recommendations of the Executive Office of Environmental Affairs (EOEA). It must be mentioned that the included data from the Assessor's office is not the complete array of documented data that is available in that database. This is another opportunity that can be explored in future endeavors and was not pursued here.

Besides the general information like Object ID, MBL (a unique identification code that the city uses), Street identification number, Street Number, Buildings identification number, the building footprint or area, the categories included here are General Information, Photographs, Income Data Lines, Calculated Areas, Value Correlation, Quality/Age/Condition, and Information, Income Calculations, and Apartment Data Detail.

The General Information category contains the building name as well as the number of floors of residential, retail, commercial, industrial or other floor use. The photographs section was laid out to be able to store up to six images of a building: front

view, rear view, left view, right view, angled view and auxiliary view. Front view is defined primarily as the view of a building's main entrance. If this is not clear then the view of a building from the most important adjacent street is used. The left, right and rear views are defined accordingly once the front view is determined. Angled view is defined as a view at an angle that is as close to isometric view as possible and should contain the whole building. Auxiliary view is defined as any additional view that is deemed appropriate.

The following categories were extracted from the Assessor's database and make up the main data categories of the Buildings-level database.

Income Data Lines: describes the income sources of the unit using a predefined code.

Calculated Areas: includes gross building area, the total rent area, the rent area ratio (which is the ratio of the previous two) and the number of units.

Value Correlation: includes building market value information

Quality/Age/Condition: a description of the internal and external quality of the building, the year built and its condition.

Apartment Data Detail: if a building contains apartments, this section describes these in detail, such as number and type of apartments.

When using the Assessor's database, it must be kept in mind that this data was collected for tax purposes only. Its suitability must be questioned and ensured before integration. For example, once a building is empty or abandoned, there is a tendency to remove that record from the database so no tax bill is sent. Things like this are very harmful to data when used for planning and must be watched out for.

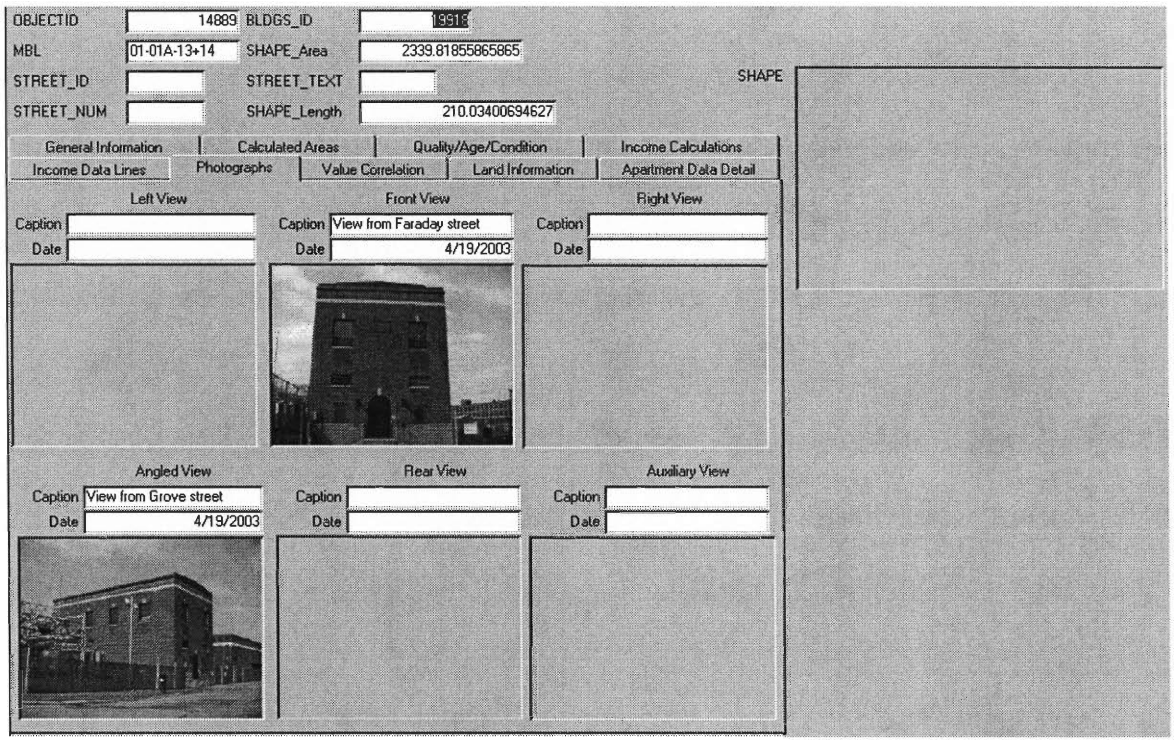

Figure 12: Screenshot of the Building-level database. This is a view of the photographs tab

4.1.2 Demonstration: Gateway Park

The main use of this database is the ability to aggregate various characteristics of the smallest unit of analysis – the building floor. Starting from this point, any specified area can be selected and its individual components added to result in a complete array of data describing that area. This type of analysis was done for the area of Gateway Park. This development area is defined differently by different people. Below are the two different definitions encountered (see figures below)

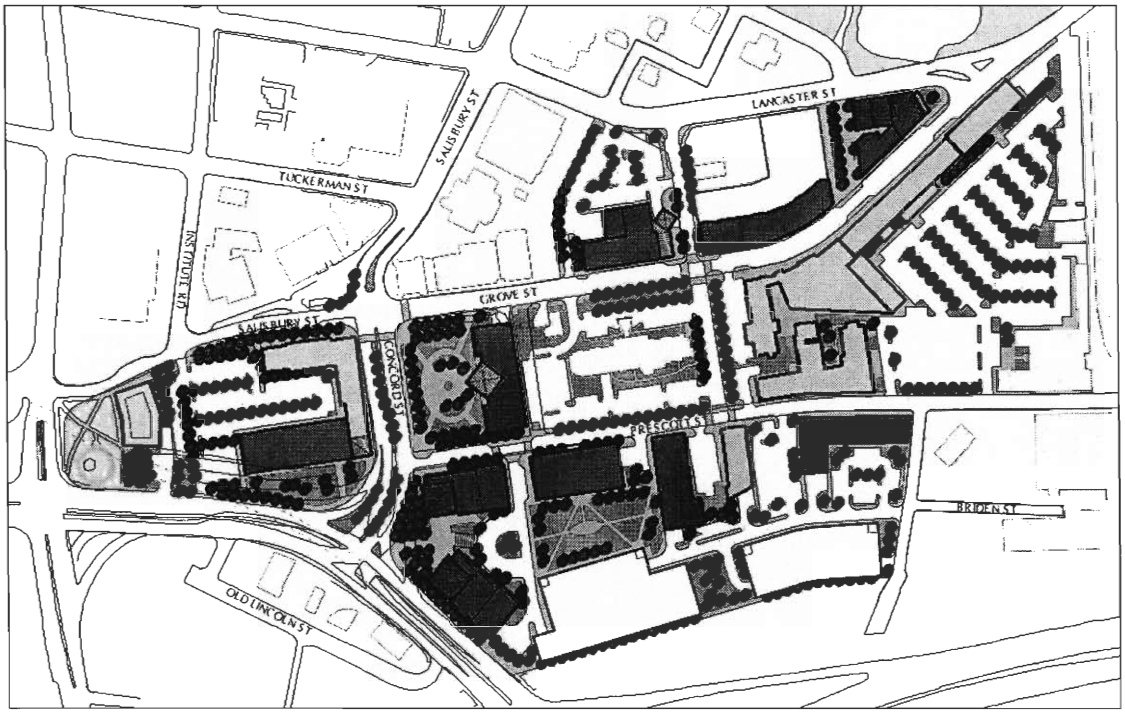

Figure 13: Gateway Park Master Plan area

All the buildings in the CMRPC area (and thereby all buildings in the Master Plan area) were surveyed in the field to evaluate the number of floors of each building, and the uses of those floors. This information was then entered into the buildings-level database. What was found during this process was that the GIS map we were using with the most current versions of the buildings on it did not correspond exactly with reality. Thus the buildings layer of the GIS maps had to be updated first (see figure #).

Figure 14: Updated GIS map

Once this was done, the illustrative plan of the Gateway Park Master Plan was compared to the map of existing buildings. Seen in Figure #, a clear picture emerges as to which buildings will be demolished and where new ones will be erected. The black areas show buildings to be demolished.

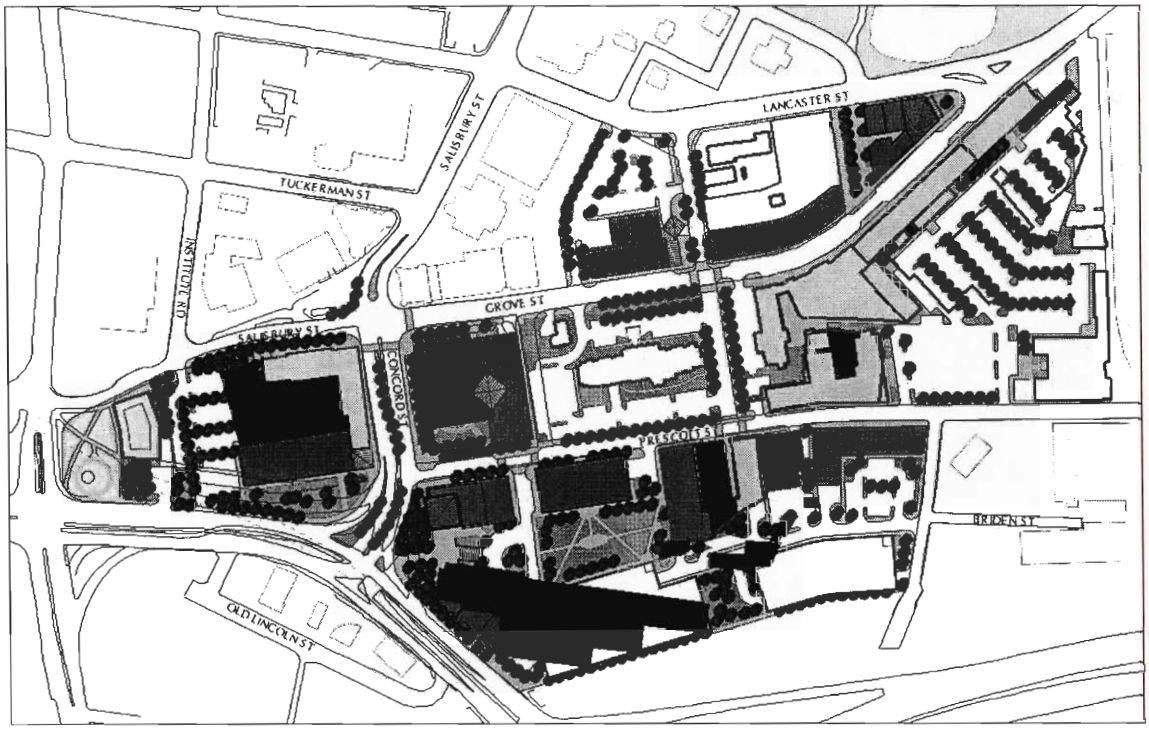

Figure 15: Update map with proposed plan

Using this map, a new layer was created to show the location of the new buildings (see Figure 16).

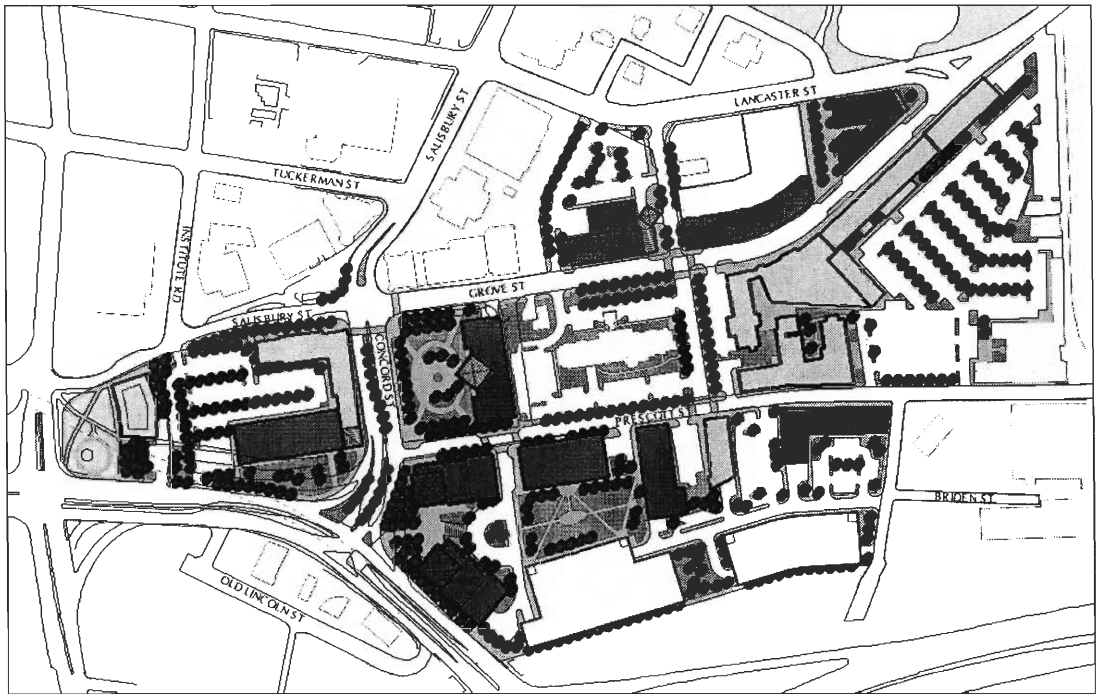

Figure 16: Proposed new buildings (in red)

This now yields a clear picture as to the change that the plan will bring to the area.

The total amount of floor space in the new plan area was now calculated using the collected data and the buildings-level database. Each category (residential, retail, commercial, industrial, and other) was summed up by multiplying the building footprint area by the amount of floors of that use for each building. This yielded the totals, listed in Figure 17:

Total floor usage in Gateway Park before plan implementation		
	Square Feet	Acres
Residential	298,155	6.84
Retail	289,668	6.65
Commercial	353,021	8.10
Industrial	367,126	8.42
Other	443,339	10.17

Figure 17: Total floor usage in Gateway Park before plan implementation

The change that the plan brings in terms of floor space can be seen clearly (see Figure 2)

Total floor usage in Gateway Park after plan implementation		
	Square Feet	Acres
Residential	146,500	3.15
Retail	54,184	1.16
Commercial	1,093,213	23.50
Industrial	10,241	0.22
Other	288,600	6.21

Figure 18: Total floor usage in Gateway Park after plan implementation

This change is depicted graphically in the following figure.

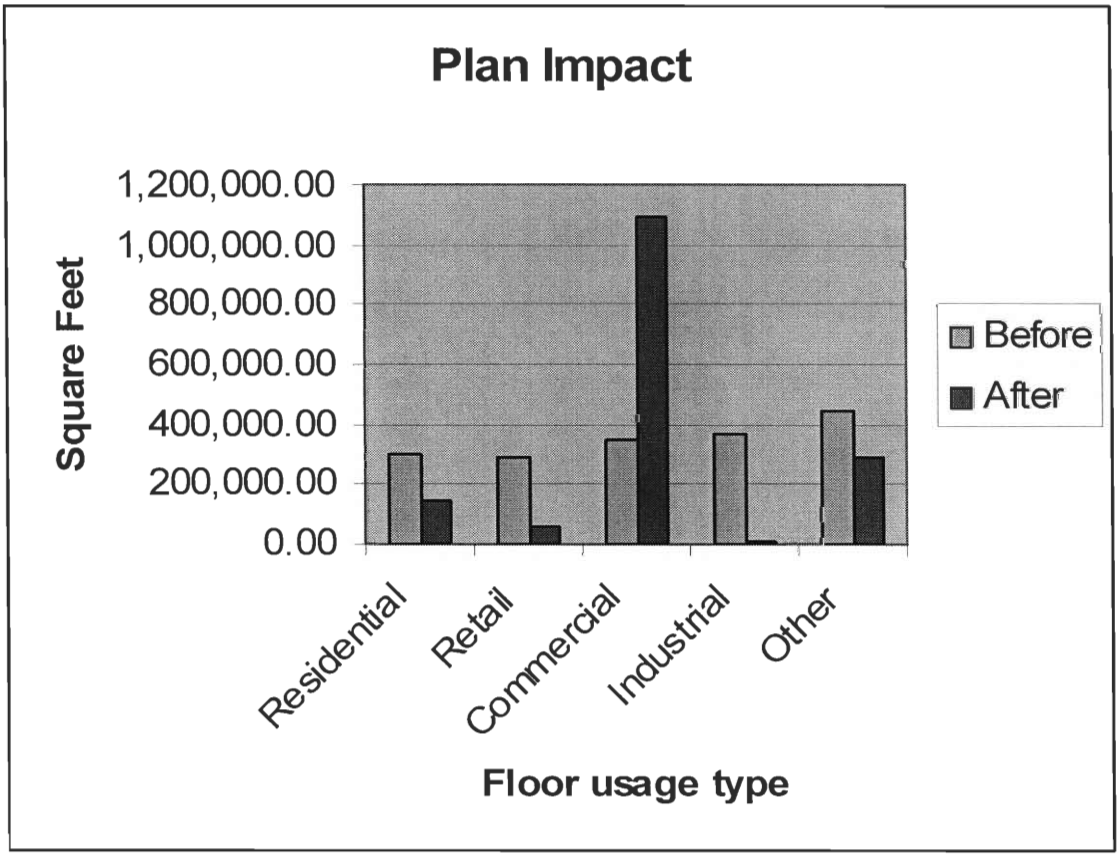

Figure 19: The impact of plan implementation, shown graphically

The Central Massachusetts Regional Planning Commission (CMRPC) completed a study of the Gateway Park project as part of their build out analysis of the city. Among other things, this study determines the amount of new housing units and the amount of non-residential buildable floor space that results from implementation of the plan.

New Development and Associated Impacts

Developable Land (sq.ft.)	133,075,800
Developable Land (acres)	3,055
New Residential Units	10,993
Non-Residential Buildable Floor Area (sq. ft.)	20,758,268

Table 3: Summary Buildout Statistics, excerpt

A comparison with the CMRPC analysis shows that a more detailed classification of floor usage is useful and not very difficult, rather than simply using non-residential buildable floor area. More importantly, it shows that the building-level approach yields a far more exact result of a 'before and after' analysis of plan implementation.

4.1.3 Lessons learned from Demonstration

The first point of surprise was the fact that the GIS maps currently in use are missing some buildings (or demolitions) of significant size. Since any type of analysis must be based off an accurate view of present circumstances, this is an obvious point that can be improved.

Secondly, the current GIS maps tend to depict two or more adjacent buildings as one building. Thus, if a plan calls for the demolition of one of these buildings, the old, remaining building as well as the new building has to be added to the GIS. Additionally, the building footprint of the remaining building has to be reacquired or recalculated. The major reason why this individual building depiction is important with this type of

analysis is because each building needs a separate record in the database, such that its number of floors and the usage of these floors can be documented individually. This enhances the accuracy of this method significantly.

One shortcoming of this method is in cases where the building footprint does not correspond exactly with actual area of usage in that building. For example, a building could be 4 floors up from the ground on its whole footprint, and have 8 more floors on just a fraction of that footprint. This shortcoming does not greatly influence the resulting data on a city-wide level, but on a plan-level it may be the cause of some inaccuracy. A method to account for cases such as these could be added to eliminate this inaccuracy.

4.2 Plan-level Database

4.2.1 Contents

Sources of data types: assessor's office, EOEA recommendations, from plans

Summary views

This database attempts to give a good picture of the contents of a plan. In contrast to the complete digitization of many of the plans (as PDF files), this database lists some important characteristics of each plan to enable quick comparisons. This database appears in several different format for different purposes: general viewing (usually on a computer screen), and two detail levels for printing purposes.

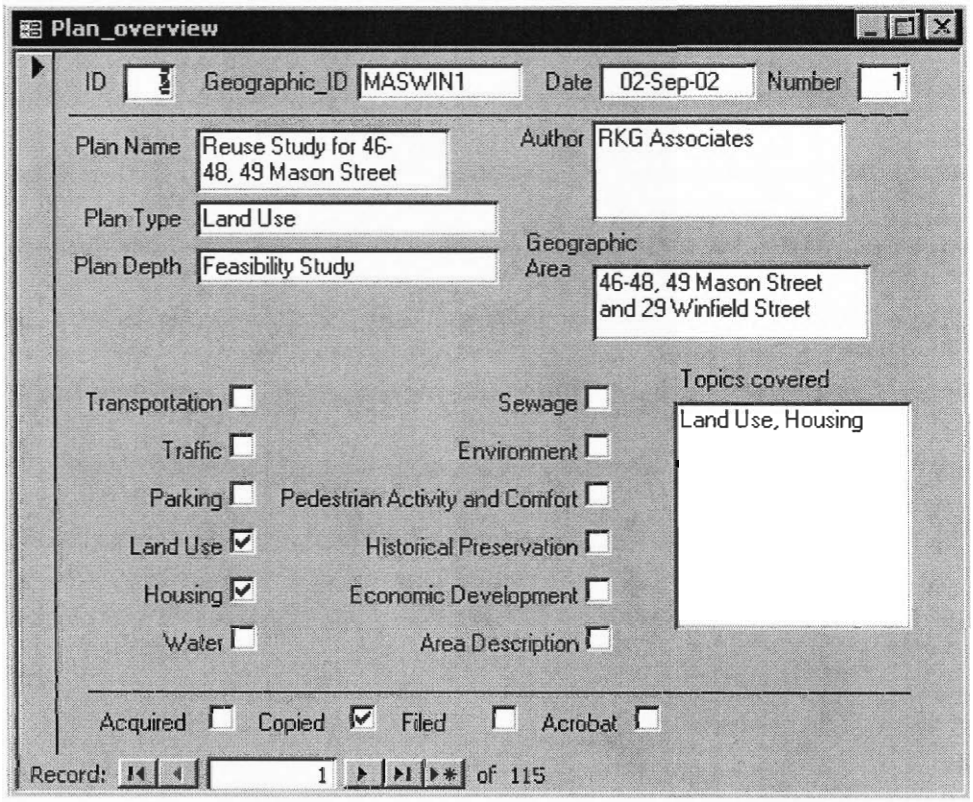

Figure 20: Screen shot of the plan-level database

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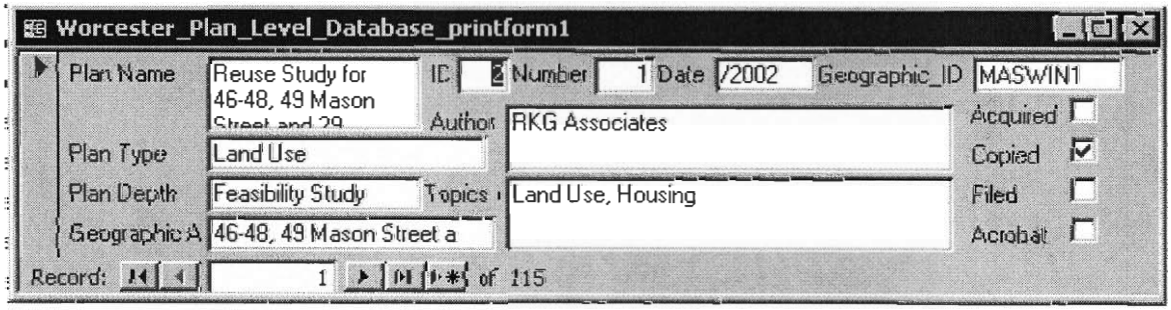

Figure 21: Screen shot of the plan-level database

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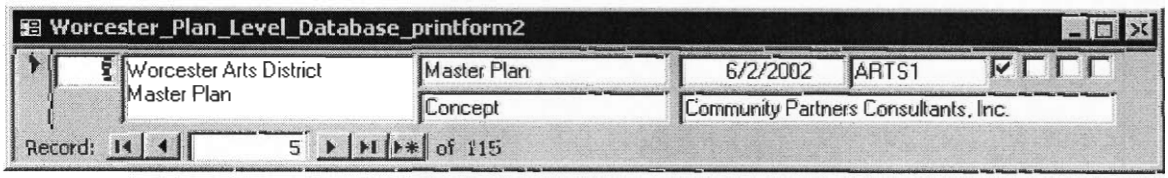

Figure 22: Screen shot of the plan-level database

Detailed views

Using this summary-style database as a backbone, the detailed plan-level database goes further; it has the ability to describe detailed content such as apartment descriptions and land and building value.

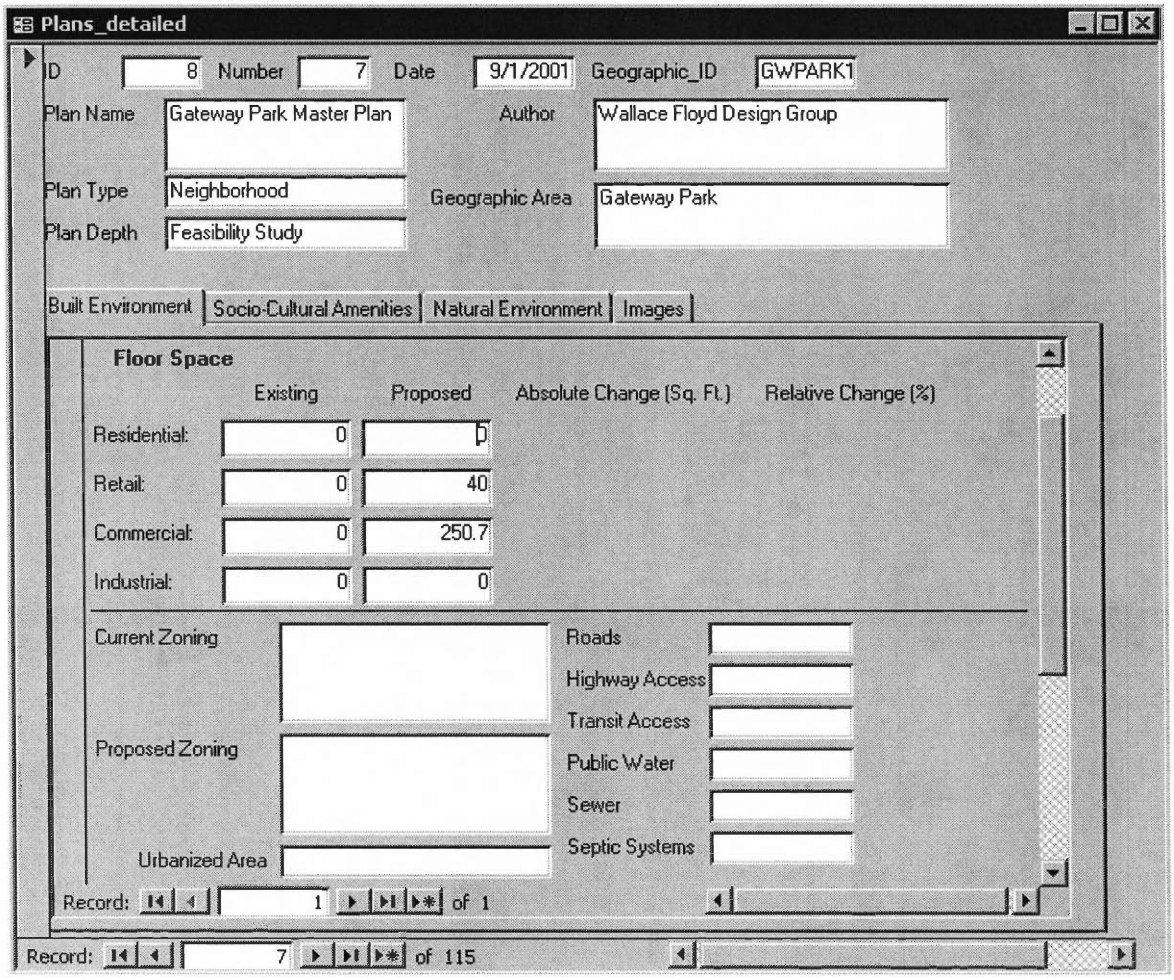

Figure 23: Screen shot of the plan level database

4.2.2 Demonstration

City-wide addition of plans, projections, compared to present levels, ability of catchment basin to support this

Side-by-side comparison

This database enables the user to compare plans side-by-side based on the same structure. The structure of the database was made as comprehensive as possible to include various different variables and data types. This can again be added to as needed; the present database provides a good basis. Since this structure is based on the contents of several different plans, the use of this kind of comparison quickly reveals the strengths and weaknesses of different plans.

-example of missing data

-provides good basis of judgment for recommendations of what components a plan should have, and in what format it should be

Combined effects

This database can also be used to see the combined effects of different plans. The simple addition of a data type – the area of proposed commercial space, for example – can have an eye-opening effect. When compared to an assessment of the region and its

catchment basin, this result reveals the neighborhood-bias in planning and exposes the need for a city-wide analysis in addition to the neighborhood one.

Along with the city-wide analysis, a 'greater-neighborhood' analysis can also be done by selecting the plans within a desired radius and combining the results of those plans to see their aggregate effect. As an example, when pedestrian activity is analyzed in a certain area, a radius of 5, 10 and 15 minute walking times can be drawn and the plans in those areas looked at to see their effect and their location.

4.2.3 Possible future uses and modifications

It must be stated here that the data categories included are merely suggestions to the city as to what possibilities exist. For professional application, a thorough analysis must be done to determine all necessary, appropriate and universally applicable data types.

A future use that has not been explored is the analysis of a plan's success using this database. After setting up a set of criteria to be able to judge successful implementation, this data can be used as the basis for this judgment.

4.3 Synergy Analysis

For the synergy analysis, we compared the Franklin Science Park plan with the South Worcester Industrial Park plan. The Franklin Science Park plan called for the demolition of several industrial buildings which were in poor condition to make room for future biomedical companies. To do this, a number of companies that were currently located on the site would need to relocate. The South Worcester Industrial Park plan created 218,500 square feet of new industrial space spread over 4 buildings (see figure #20) in order to revitalize an area of approximately 68 acres in the Main South neighborhood of Worcester.

South Worcester Industrial Park	
Building	**Area (sq. ft.)**
Building 1	82500
Building 2	64000
Building 3	37000
Building 4	35000
Total	**218500**

Figure 24: Proposed industrial space in the South Worcester Industrial Park

The first step in this analysis was to figure out approximately how much space each company in the Franklin Science Park area currently occupies. The plan included a list of each building scheduled for demolition, the area of each building and the tenants in each building. To find an approximate area that each company was occupying (see figure #22), we divided the area of each building by the number of spaces it contained (including vacancies). For example, if there was a 30,000 square foot building which was housing 2

Franklin Science Park	
Company	**Area (sq. ft.)**
Flexographics	14659
Visi	14659
Burton	14659
Come Play	91977
Enrich Foods	16000
Fresh Foods	14350
DNS Printer	14350
Consolidated	8180
Total	**188834**

Figure 25: Companies in the Franklin Science Park area in need of relocation

companies and a vacancy, we would assume that each of the two companies inhabited a 10,000 square foot area.

The next step was to figure out how many of these companies would be able to relocate to the new buildings in the South Worcester Industrial Park. When doing this, we tried to keep any companies that occupied the same building in the Franklin Science Park area in the same building in the new South Worcester Industrial Park area. We were able to find space in the four new buildings proposed by the South Worcester Industrial Park plan for all of the industrial companies that needed to relocate from the Franklin Science Park plan. Our results are shown in figure #23 - figure #26.

Building 1 (82500 sq. ft.)	
Company	**Area (sq. ft.)**
Come Play	56977
Total	**56977**

Figure 26: Possible tenants of Building 1 in the South Worcester Industrial Park

Building 2 (64000 sq. ft.)	
Company	**Area (sq. ft.)**
Flexographics	14659
Visi	14659
Burton	14659
Enrich Foods	16000
Total	**59977**

Figure 27: Possible tenants of Building 2 in the South Worcester Industrial Park

Building 3 (37000 sq. ft.)	
Company	**Area (sq. ft.)**
Fresh Foods	14350
DNS Printer	14350
Consolidated	8180
Total	**36880**

Figure 28: Possible tenants of Building 3 in the South Worcester Industrial Park

Building 4 (35000 sq. ft.)	
Company	**Area (sq. ft.)**
Come Play	35000
Total	**35000**

Figure 29: Possible tenants of Building 4 in the South Worcester Industrial Park

5. Conclusions and Recommendations

5.1 Synopsis of City Information System

5.1.1 Data Completeness

Geographic Information System (GIS)

The city's current GIS maps that were acquired from Technical Services are somewhat outdated. Several buildings that were drawn on the map were found to be empty lots on inspection. Conversely, empty parcels turned out the have new buildings on them. Thus follows a simple recommendation:

Recommendation: Update current GIS maps.

The Central Massachusetts Regional Planning Commission (CMRPC) has a number of GIS maps which are more current than the city's maps. The proximity of these organizations in geographic as well as intellectual terms could be the basis for a mutually beneficial relationship.

Recommendation: Begin cooperation with CMRPC about sharing GIS information.

Numerical and factual information

The current method of data capture and retention is rather sporadic. Using the Assessor's database as a basis, data is gathered from the areas of interest and then entered into a word processor, where it is neither structured nor searchable. A reliable, searchable database system is necessary.

Recommendation: Adopt the use of the building-level database

The Assessor's database does have much useful information that does not have to be collected twice. Using the precautions discussed in the results & discussion section, this data should be reused.

Recommendation: Include accurate assessor's data in building-level database

The US Census contains a multitude of demographic as well as housing information that goes down to the block level of a city. This freely available data can be easily integrated into the multi-layered database – such as the block, block-group or tract levels.

Recommendations: Integrate US Census data into multi-layer database.

The Home Mortgage Disclosure Act (HMDA) discloses public loan and demographic data which is potentially useful for planning purposes.

Recommendations: Verify usability of HMDA data and include it multi-layer database.

5.1.2 Data Management

One of the biggest problems we ran into while carrying out this project was tracking down the plans. To eliminate this problem, we recommend that copies of every plan are stored in one centralized location that is easily accessible; possible locations might include the City Planner's office or the Worcester room at the Worcester Public Library. Another measure that could be taken to provide easy access to plans would be to convert them to electronic format (possibly Adobe PDF format) and put them online. This would allow anybody to access plans at any time of the day or day of the week.

While doing this project, we noticed that most plans contained conclusions based on data, but the actual data itself is not usually included in the plan. This data could prove to be incredibly valuable. There are often numerous plans that deal with the same area and most likely some of the same data. To avoid this continual data recollection, we recommend that the data be contained in an easily accessible database. We have developed a series of databases that could possibly be used and expanded upon. We also suggest that as much data as possible be building specific as opposed to being specific to the plan area. This way, not only can data for an entire plan area be easily generated, but if a plan area deals with part of an area covered by a different plan, the data can still be reused. If the

data is on the plan area level, reuse would only be possible if two plans dealt with the exact same area.

Another suggestion that we have in terms of data management is that the "Plan Areas" GIS layer that we have created be updated when appropriate. This GIS layer makes it very easy to see which plans overlap or are in the general vicinity of each other. Plans that deal with areas that are close to each other or possibly overlapping, will most likely have an effect on each other. If the location of plan areas in relation to each other is easy to see, then it will also be easy to realize what effects the plans will have on each other and take these into account. This will lead to a more sustainable planning practice.

5.2 Planning

5.2.1 Planning Guidelines

While reading through plans over the course of this project, we noticed that there was no standard set of information that every plan of each type includes. We feel that it would be beneficial to the planning process in Worcester if a set of guidelines for all plans was created. These guidelines would consist of a minimum set of data that plans of each type (e.g. concept plans, feasibility studies, etc.) should include. Having this standard set of data that all plans would adhere to would be advantageous for the sheer fact that it would be much less likely for any needed data to be omitted from a plan report.

5.2.2 Building-level, Plan-level and Multi-level Database

Value of the Building-level analysis

The strength of the building-level analysis lies in the fact that is it the smallest practical unit of analysis. As previously described, this simple data can be aggregated to yield an accurate picture of larger areas. The following recommendations are made due to this simplicity and power:

Recommendation: All data-collection should be done at the building level, rather than taking a representative sample and then interpolating and extrapolating.

Recommendation: All data-collection that is done and aggregated into plans should be submitted with the plan, in accordance to the recommendations made under the planning guidelines section.

Value of the Plan-level analysis

This analysis is particularly useful at present because numerous old plans exist. This wealth of information is currently more or less unexplored; thus their 'rediscovery' is an accelerated and very economical data-collection method.

Recommendation: Complete the plan-level database to the desired depth of content and as far back as 1964 to ensure a complete spectrum of previous work, and keep it updated as new plans are completed.

Value of the Multi-layered database

The merger of the building-level and the plan-level database is embodied in the multi-level database. This database allows for the inclusion of data at all levels – from the city population all the way down to the single building. Using this approach, information at a variety of levels can be integrated and used. Once a building-level database has been realized, a multi-layered database easily implemented using the building-level as a basis.

Recommendation: Implement multi-layered database to be able to include multiple levels of data types.

5.2.3 Synergy Analysis

The synergy analysis we performed is an example of a useful tool which could be utilized in future planning endeavors within the city of Worcester. Plans often call for a change in the amount of residential, commercial, retail and industrial space, whether this change is an addition or reduction of space. The synergy analysis of which we implemented an example is a good way to see exactly how multiple plans can interact. This was just a basic example involving only two plans and one category of space (industrial), but in the future, this analysis could be carried out with multiple plans and

multiple types of space. It could also be explored in more detail in the future. We only looked at floor space for the most part, but if the data was available, the exact needs of relocated occupants could be taken into account. These needs may include such things as railway access, access to waterways, loading docks and nearby highway off-ramps.

5.2.4 Traffic Analysis

We noticed that in the traffic portion of some plans (such as the Blackstone Canal feasibility study) the effects of other concurrent plans on traffic patterns were taken into account. Unfortunately, this was not the case with all plans. We recommend that the effects of other simultaneous plans be analyzed for every plan. This would drastically reduce the chance of improved roadways quickly becoming insufficient. Some topics that could be looked at in relation to this include traffic volumes and turning counts.

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Appendices

A1 Excerpt of Assessor's Database

Appendix not included
in original submission

IQP/MQP SCANNING PROJECT