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Massachusetts Enters the Global Age a Service Export Initiative

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**MASSACHUSETTS ENTERS THE GLOBAL AGE
A SERVICE EXPORT INITIATIVE**

WESTERN MASSACHUSETTS

Fall 1991

Evaluation Committee

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The Center for Economic Development wishes to thank
Ms. Maureen Moriarty for this Masters Project.

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FORWARD

The role of the University in local, regional and statewide economic development efforts has become increasingly widespread and has had far-reaching effects on these efforts. From Research and Development, to consulting services, to internship programs, the search for new ways to help those in business become efficient, effective and competitive continues. This service-export initiative is yet another step in this on-going process.

By providing valuable resources inherent within the University setting - computer skills, expertise in a variety of subjects, foreign language capabilities, motivated students and faculty - the ability to assist the community of which it is a member has become an important function of the University of Massachusetts. In a time when the search for new markets has become crucial in order to survive in this competitive global economy, organizations such as the Center for Economic Development have provided essential service to government and business and the community as a whole in its effort to adapt to an ever-changing economic environment.

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Introduction

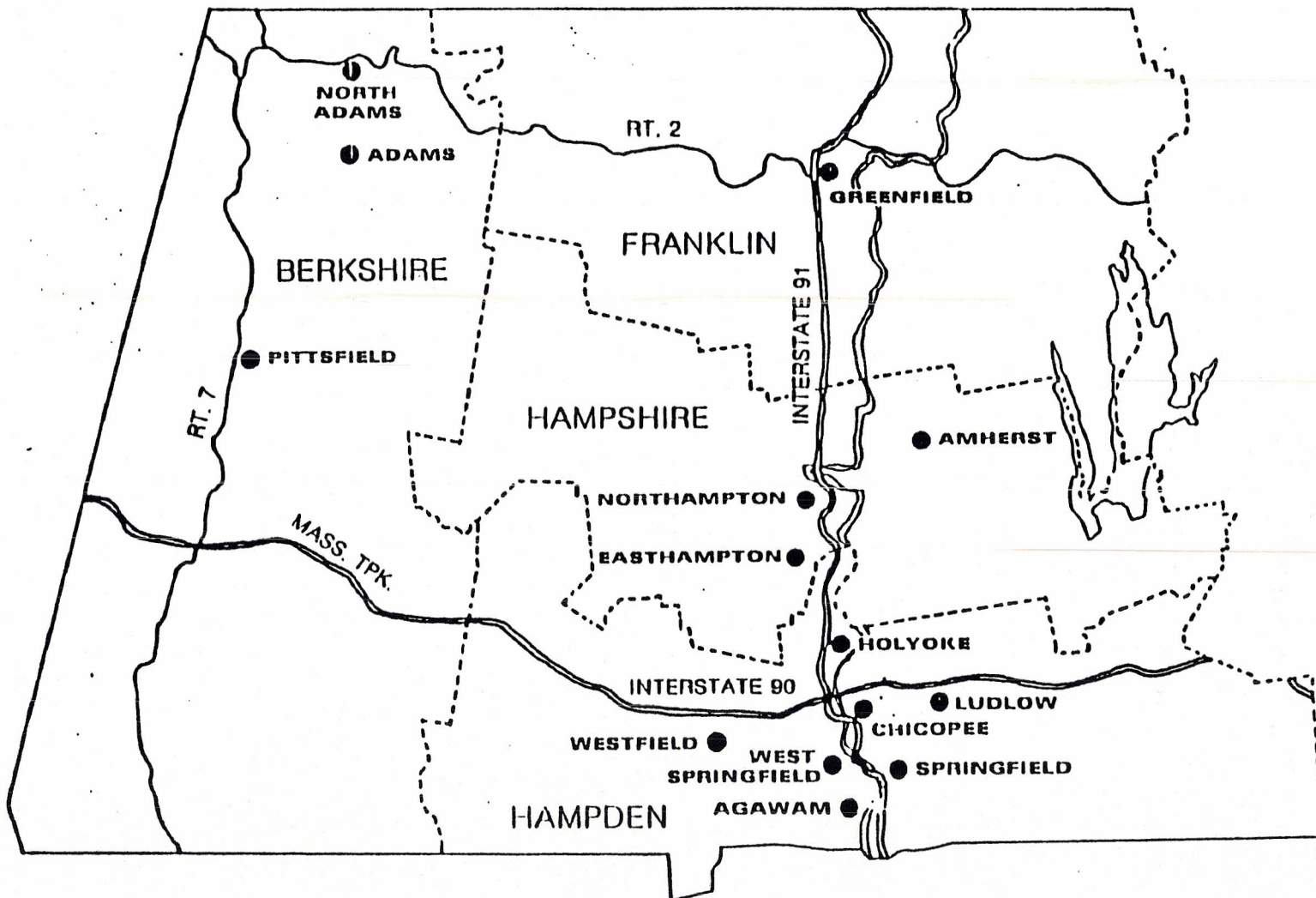
Globalization and the Integrated World Economy

In this rapidly changing world, the interdependence among countries is the result of a global revolution in transport and communication, increases in the transfer of technology, removal of trade restrictions and financial barriers and, in general, an increase in the movements of people worldwide.¹ These forces have created an integrated world economy characterized by global sourcing for production, a limitless range of choices for investment and worldwide markets for products and, more recently, services.² At the same time, this environment of increased trade will mean increased competition for markets. The challenge for American manufacturing firms is to use the best and most current business and production practices, while professionals must seize opportunities and innovate in a variety of service activities.³

Within this broader context of worldwide economic interdependence, an overall shift of demand has occurred from goods to services. In the United States, as well as within the European Community, approximate 60% of the workforce is employed in the service sector.⁴ More and more, manufacturing companies use a variety of services to finance its inventory and advertise its product. Or they may have to purchase services such as Research and Development, software programming, legal advice, engineering, design, dataprocessing, market research, advertising, distribution and management consultancy.⁵ In addition areas such as health care, home health services insurance and finance among others have gained more attention than ever before in being critical factors in the economy. These services, too, have begun to cross national borders, as international trade in such sectors have been capturing a great proportion of international trade accounts. In 1989 services comprised 34% of all U.S. exports.⁶

This feasibility study is the first step of a long term initiative which will seek to harness the vast service-oriented resources within Western Massachusetts and assist them in expanding along global lines.

WESTERN MASSACHUSETTS



Rationale for a Service Export Initiative

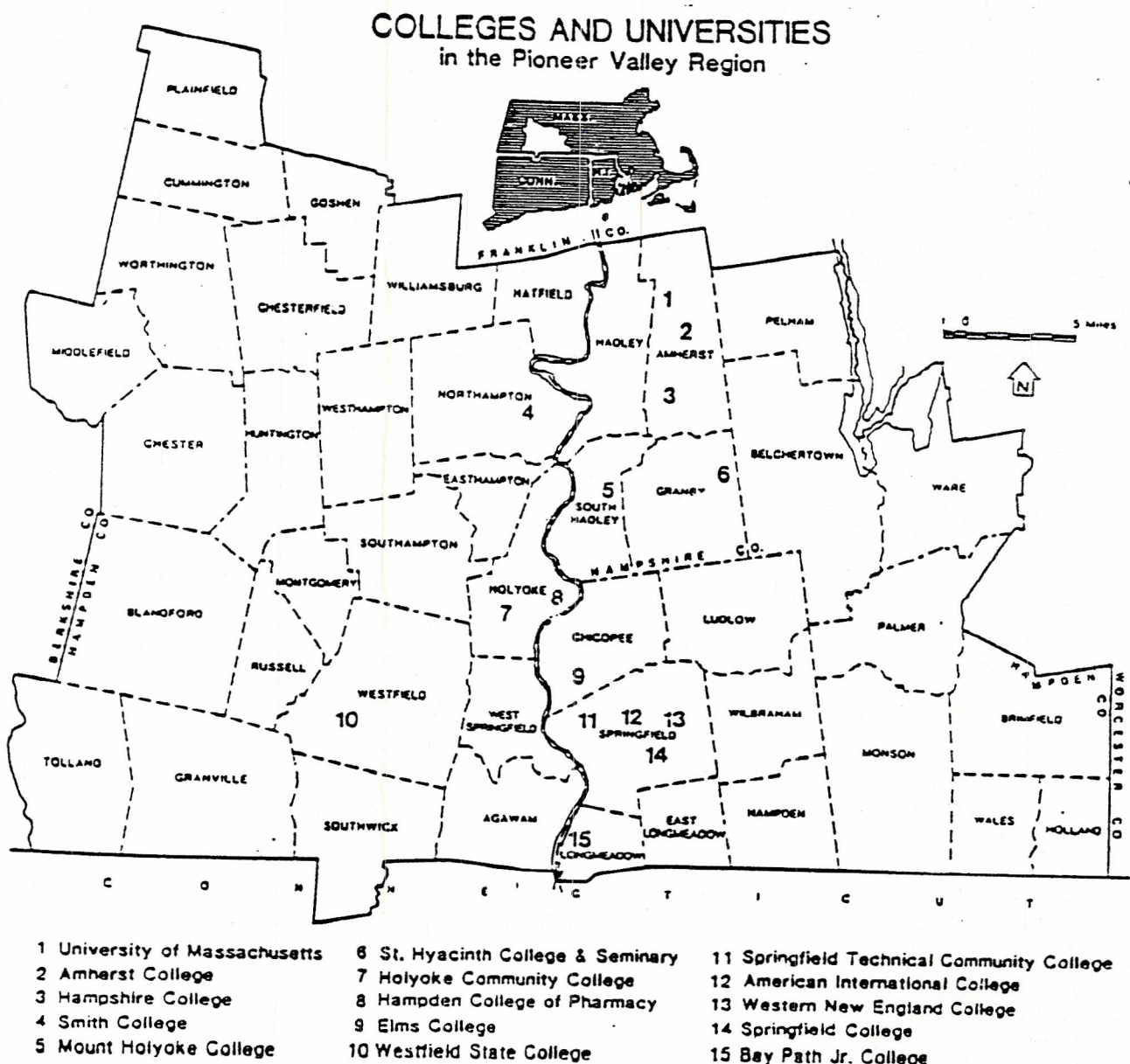
This proposed unique and innovative program is designed to assist service firms within Western Massachusetts meet the challenges of competing in a global economy. Manufacturing and, more recently, service firms all over the world are seeking out new markets and leveraging this expansion through new technologies and innovation, increased penetration of markets in which they are currently doing business or by increases in market areas. For U.S. firms, it is crucial to begin to start exporting now before the area in which they had once comfortably done business becomes saturated by companies with the foresight to seize the opportunity. But for many, particularly service firms new to exporting, a question frequently asked is, "Why should businesses in a foreign country choose my services over a similar domestic company?"

Western Massachusetts possesses a wealth of assets and advantages which make service firms in the region viable candidates for exporting activities, as well as to become key players in assisting foreign businesses which have begun to come to this country. Some of these assets include:

1. High levels of computer literacy.
2. Advanced communication systems.
3. Proximity to European and Canadian market.
4. A young, educated workforce. (see Figure 1)
5. Access to the resources of prestigious colleges within Western Massachusetts.
6. A lower cost of living in comparison to larger metropolitan areas in the Northeast.
7. Access to a variety of information data bases
8. A high quality of life.
9. Knowledge of the U.S. market.
10. Knowledge of U.S. culture and U.S. business practices.

In light of these strengths, it is no surprise that the service industry within Hampden, Hampshire and Franklin Counties is the largest sector in terms of employment size. This sector is comprised of a diverse set of industries ranging from business services, to health, social and educational services. Growth in services as a whole within the three counties (and in all of Massachusetts) has been notable. Franklin County posted an 8.5% increase in service jobs, while Hampden and Berkshire Counties experienced a 6% and 3% increase in jobs respectively.⁷ Below is a summary of some major service industries by employments statewide.

Figure 1



Prepared by the Pioneer Valley Planning Commission 1984

Table 1

Massachusetts Employment by Major Industry

	1990	1991	Growth
Business Services	159,199	160,790	plus 1.0%
Misc. Business Services	30,007	31,842	plus 6.1%
Legal Services	25,939	26,868	plus 3.6%
Engineering and Management	94,610	100,672	plus 6.4%
Research & Testing	24,321	25,145	plus 3.4%
Management and Public Relations	23,436	25,985	plus 10.9%

Source: Department of Employment and Training April 1990

By the year 2000 it is estimated that 95% of all net new jobs within Massachusetts will be found in the service-providing sectors, while goods-producing sectors will provide fewer than 4 out of every 100 net new jobs.⁸ Table 2 is the Massachusetts Department of Employment and Training projections for job growth into the next century. Interestingly, all of these "hot jobs" are service occupations which can be found along a broad spectrum of skill requirements.

Table 2

Occupations
Generating 50% of the Job Growth
1987 - 2000

Occupations	New Jobs
Salespersons, Retail Trade	27,750
General Managers & Top Executives	21,780
Electrical and Electronic Engineers	19,330
Registered Nurses	17,080
Waiters and Waitresses	15,230
Cashiers	13,190
Guards and Watch Guards	12,180
Computer Programmers	12,000
Secretaries	11,510
Accountants and Auditors	11,350
Computer Systems Analysts	10,830
Janitors & Cleaners	10,570
Nurses Aides, Orderlies and Attendants	9,230
General Office Clerks	8,760
Carpenters	7,830
Elect. & Electronic Technicians & Technologists	6,860
Clerical Supervisors	6,410
Home Health Aides	6,040
Dining Room & Counter Attendants	5,410
Lawyers	5,070
Financial Managers	4,980
Licensed Practical Nurses	4,670
Receptionists & Information Clerks	4,530

Source: Massachusetts Department of Employment and Training, Employment 2000. Massachusetts Employment Projections by Occupation, July 1989.

Table 3 illustrates those occupations with a projected numerical increase in jobs numbering 1,000 or more. Again, all of these are service jobs and range from social service to more high-technology industries such as operations and systems analysts.

Table 3
Occupations with Highest Percentage Growth Rates,
1987 - 2000*

<u>Occupation</u>	<u>New Jobs</u>	<u>Growth Rate</u>
Paralegals	3,440	86%
Computer Service Technicians	3,580	79
Home Health Aides	6,040	72
Computer Systems Analysts	10,830	69
Computer Programmers	12,000	65
Electrical & Electronic Engineers	19,330	60
Medical Assistants	1,580	57
Physical Therapists	1,230	56
Operations & Systems Researchers & Analysts	1,230	51
Securities & Financial Sales Workers	2,730	45
Social Welfare Service Aides	2,910	44
Electrical & Electronic Technicians & Technologists	6,860	44
Travel Agents	1,540	44
Radiological Technicians	2,720	42
Guards & Watch Guards	12,180	40
Lawyers	5,070	40

Source: Massachusetts Department of Employment and Training, Employment 2000, Massachusetts Employment Projections by Occupation, July 1989.

Even in the Western Massachusetts region, while manufacturing once dominated the regional economy, services today account for more than 31.6% of the total employment, according to the Pioneer Valley Planning Commission. Tables 4 and 5 illustrate this dramatic shift and indicate those services which have shown the most growth between 1985 and 1989, of which retail and health services have been particularly notable.

Table 4
Changes in Manufacturing and Service Employment in the Pioneer Valley

	1980 - 1985	1985 - 1989
Manufacturing	-9,318 -12.6%	-2,568 -4.0%
Services	13,720 8.7%	23,089 13.4%

Table 5
Changes in Service Employment in the Pioneer Valley

	Absolute Change 1980-'85	Percent Change 1980-'85	Absolute Change 1985-'89	Percentage Change 1985-'89
TCPU	418	-4.8%	1,460	17.7%
Wholesale Trade	446	4.8%	1,763	18.2%
Retail Trade	3,464	8.8%	4,446	10.4%
FIRE	1,204	9.7%	1,619	12.0%
Services	5,567	13.0%	8,618	17.5%
Business Services	873	15.2%	-81	-1.2%
Health Services	2,494	15.0%	2,694	14.0%
Educational Services	322	6.2%	590	12.0%

Source: Regional Data Center, Pioneer Valley Planning Commission, 1991.

This brief overview of the service sector is meant to illustrate the great potential and promise which various service industries hold for economic growth on a domestic, as well as worldwide level.

Western Massachusetts Enters the Global Age - A Service Export Initiative for Western Massachusetts

Growth opportunities are certain in light of the existing strength of the service sector, yet for many service firms in the Western Massachusetts, neither the resources nor knowledge is available within their own company to expand efforts beyond local or regional markets to the international arena. The notions of international commerce is a relatively new one, even for manufacturers. Service exportation is an even newer phenomena. Yet the benefits of expanding to this level of business goes beyond matters of worldwide competitiveness. Strong export markets inevitably translate into strong domestic markets. If a service firm does well in meeting the challenges of a global market, that strength will carry through in his own home territory. This is crucial for both job retention and job creation on a local level here in Western Massachusetts. Ultimately this program seeks to move from a service sector dependent on the local economy, to one which has world-wide possibilities and a vast network of contacts and places to bring their skills.

The first module of this service export initiative will entail the creation of a pilot program in which Western Massachusetts service firms will target United Kingdom firms wishing to enter the American market, including the attraction of tourism from the U.K. as well.

Within a broader context this module initiates a long-term effort which will seek to gain a foothold in the European Community and expand further into the global economy. These latter modules will engage other University of Massachusetts resources, including those departments involved in languages, computers, business and management.

Module 1 - A Service Export Program for the United Kingdom

Goal: To develop a mechanism to export services from Western Massachusetts to the United Kingdom.

This goal can be achieved through 3 objectives:

- 1) To design an integrated export approach for service industries taking into account the goals of current United Kingdom export programs.
- 2) To locate service industries who are interested in test marketing their service within the United Kingdom.
- 3) To actively work to attract British firms that are eager to export to the U.S. and may require the assistance of Western Massachusetts business services.

This first module will be completed in three phases:

- 1) **Research and Feasibility** - Research U.K. industries with potential to benefit from Western Massachusetts service firms.
- 2) **Preparation** - Select appropriate Massachusetts service companies with strong export potential.
- 3) **Implementation** - Implement plan and evaluate.

This report is the Phase 1 Research and Feasibility study for the U.K. Pilot Program.

During this Phase 1 Research and Feasibility study 3 objectives will be met:

- 1) To map the steps required to establish communications between Western Massachusetts and the United Kingdom. (e.g. agencies responsible for exports to North America, Governmental bodies funding export promotion programs.)
- 2) To determine potential niches within the American market which may be filled by U.K. products or suppliers.

- 3) To create an inventory of U.K. firms which may benefit from the assistance of area business service assistance based on information gathered by meeting objective 1 and 2.

In order to meet these objectives the following steps have been taken in order to complete this feasibility study:

- 1) Research mechanism to establish trade relations.
- 2) Research United Kingdom firms with relevant products to offer the United States which can benefit from the assistance of Western Massachusetts service in order to bring their product to market.
- 3) Research market need in the U.S. for potential British export product.
- 4) Use the information gathered in Tasks 1 - 3 to design criteria to be used to select target exports from the U.K., as well as steps required to locate service companies from Western Massachusetts to assist U.K. target industry.

Tasks 1 through 4 will be outlined throughout this feasibility study to more clearly highlight how communications were established with Britain, how target markets were selected, as well as what services might be required to assist them in the exporting process. In this area of Massachusetts, no effort has yet been undertaken to create a consortium of business services designed to provide "one-stop shopping" for foreign investment. While foreign investment will continue to infiltrate the American economy, such a consortium would well-serve domestic entrepreneurs and small to medium sized business, as well, who might wish to invest in the Western Massachusetts area.

This first study will also serve as a preliminary model for future modules of this initiative. Appendix A contains a directory of export assistance organizations on Federal and State levels, as well as private sector organizations. These contacts have been gathered in conjunction with this study for the purpose of making future efforts in this initiative more efficient.

Task 1

Research Mechanisms to Establish Trade Relations with the United Kingdom

Key Tasks:

- 1. Researched general trends in the U.K. economy**
- 2. Submitted proposal to the British Consulate**
- 3. Met with representatives from British Department of Trade and Industry in London, England**

The British Economy

The United Kingdom consists of England, Scotland, Wales and Northern Ireland and has a total land mass of 94,250 square miles. Britain has an open, broadbased, free market economy with no control on currency movements. As in most other mature economies, there has been a major shift from manufacturing to service sector activity. Between 1970 and 1990, the rate of growth in gross output in the service sector has been more than four times as fast as that in manufacturing.⁹ Although much of Britain's future growth will be in the service sector, Government has emphasized that manufacturing needs to be competitive internationally so that it can hold its home market against imports from abroad. In addition, it is striving to increase its exports to markets all over the world.

The Organization for Economic Cooperation and Development has prepared figures that compare the performance of the British economy with that of the other leading industrial countries in the Group of Seven (G 7 countries include Britain, West Germany, France, Italy, Canada, United States and Japan) in three time periods: 1961-1973, 1973-1979 and 1979-1988. The figures show that in all three periods, the growth of the British economy as a whole was slower than that of the other countries and that the growth in manufacturing was particularly weak. In addition, exports from the U.K have declined from 16.5% of total exports from the G7 countries in 1960 to 7.6% in 1986.¹⁰ Finally, between 1970 and 1989, the volume of imports of manufacturers has risen three times as fast as the volume of exports of manufacturers within the U.K.

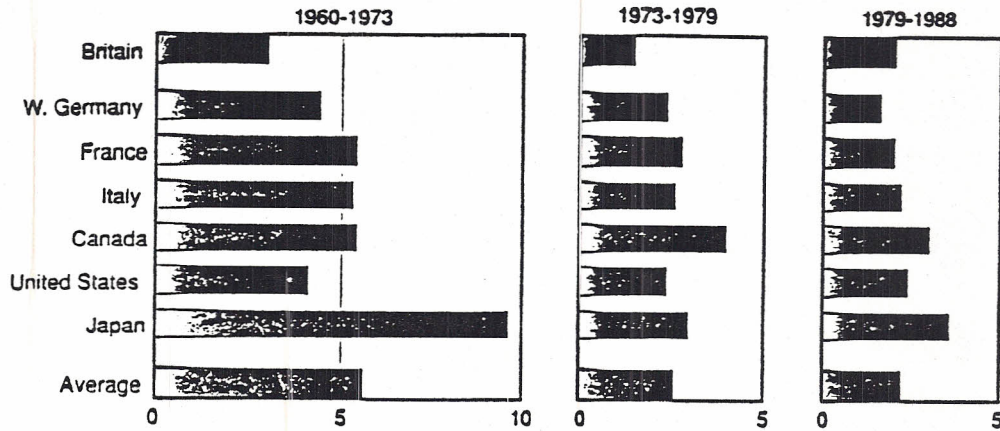
Figure 2

International Economic Growth Rates

Average percentage growth per year of "Group of Seven" Countries.

International Economic Growth Rates
gross domestic product

average percentage growth per year
of 'Group of Seven' countries



Source: OECD

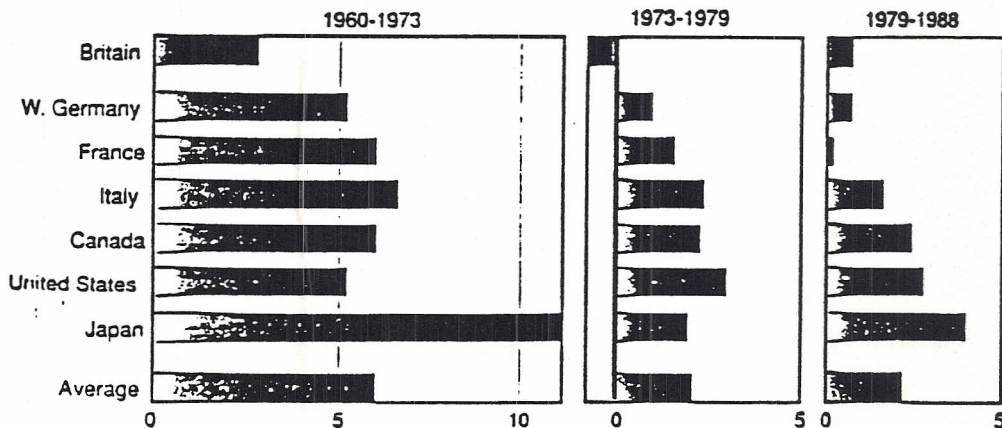
Figure 3

International Manufacturing Growth Rates

Average percentage growth per year of "Group of Seven" Countries

International Manufacturing Growth Rates

average percentage growth per year
of 'Group of Seven' countries



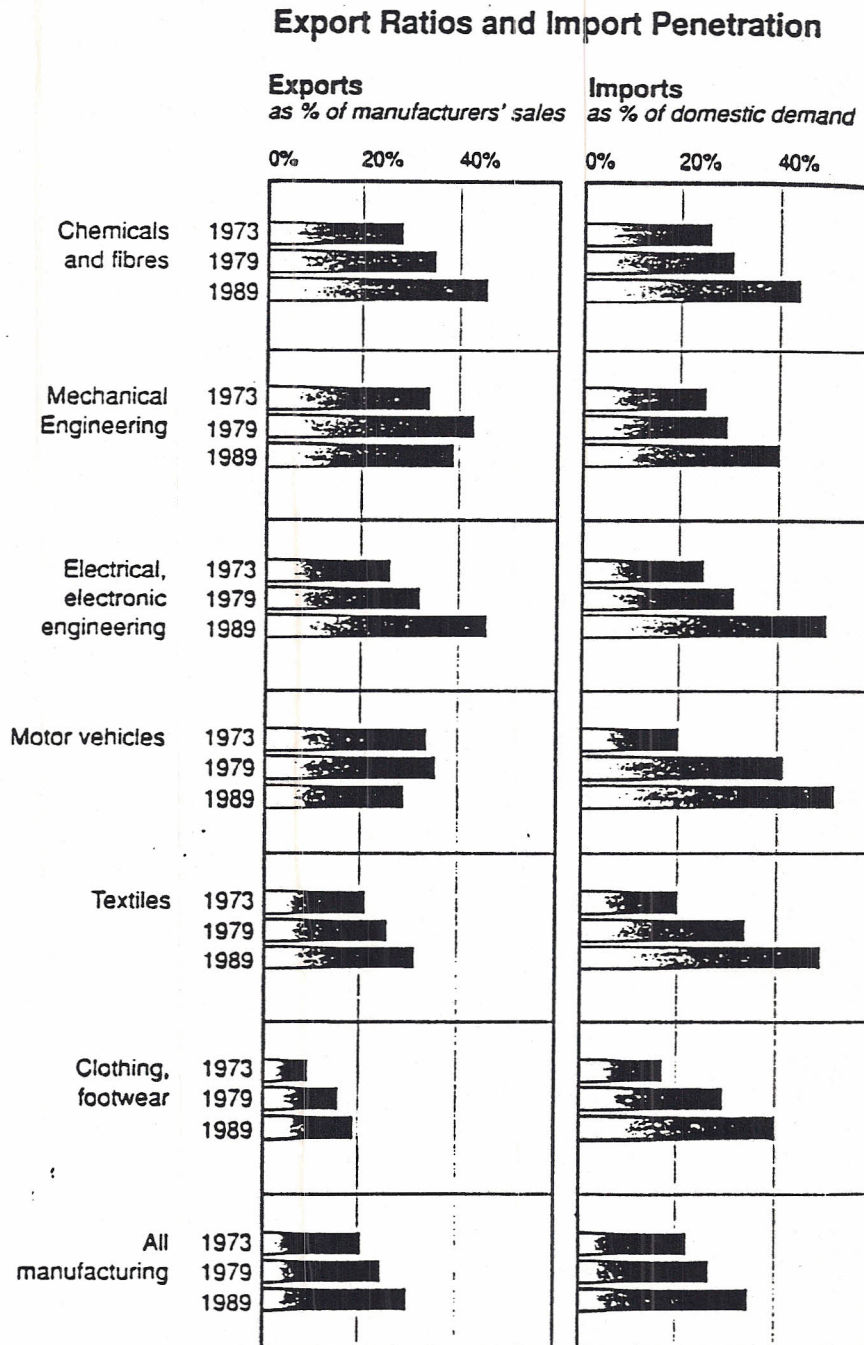
Source: OECD

Source: Britain in 2010, published by the Policy Studies Institute, 1991.

Figure 4

Export Ratios and Import Penetration within Britain

Note: One measure of competitiveness is the difference between import penetration (the percentage of the home market taken by imports) and export ratios (the proportion of sales to export markets). In 1979-1989 import penetration increases twice as fast as export ratios.



Source: Britain in 2010, published by the Policy Studies Institute, 1991.

According to the Policy Studies Institute report, " Britain in 2010," "... the evidence is starkly clear that British manufacturing industry is still not improving its performance internationally."¹¹ Therefore, in the way that Western Massachusetts service industries are offered opportunities for growth in the international marketplace, Britain must increase foreign exports to reverse a long, downward trend, making this initiative beneficial to both U.K. and Western Massachusetts.

Submission of Proposal to the British Consulate

The British Consulate in Boston, Massachusetts is a clearinghouse for all enquiries regarding British trade and industry, as well as assisting U.K. firms wishing to invest in the New England region of the United States. Because of the sheer number of trade-related enquiries, the Consulate is unable to provide detailed consultancy services. For a nominal fee, it will provide U.K manufacturers with market reports, outlining potential demand for a certain product. The Consulate will also direct firms to U.K trade organizations which provide export assistance services.

Meetings with Consulate officials regarding this initiative were encouraging and not seen as an infringement upon Consulate duties. Recognition that such efforts are " mutually beneficial to both countries," allowed further access to the British government and arrangements were made by Consulate official, Karen Rogers, to meet with the Department of Trade and Industry in London, England.

The Department of Trade and Industry and the British Overseas Trade Board

The British Overseas Trade Board (BOTB), a division of the Department of Trade and Industry was established in 1972. Comprised of experts in the areas of industry and commerce, the task of the BOTB is to guide Britains export promotion program. The Board has seventeen Area Advisory Groups (AAG's) which provide advise on the world's main trading areas. The Board's main aims are three-fold:

1. To help improve cost-effectively the export performance of U.K. industry and commerce.

2. To guide the Government export promotion efforts, including the provision of export services.
3. To provide advice on policy issues affecting international trade and exports.¹²

By providing information, advice and practical assistance, the Board aims to ensure that U.K. firms, particularly small and medium sized enterprises, are aware of export opportunities.

The North America Advisory Group (NAAG) is one of the seventeen Area Advisory groups responsible for increasing exporting efforts to North America. The goal of the NAAG is to increase the U.K. market share of world exports by 2%.¹³ It has designated eighteen target sectors, specific manufactured products within the United Kingdom, which will be priority exports to North America. The Exports to North America Branch (ENAB) of the North America Advisory Group is the body which is responsible to work to achieve the objectives set forth by the NAAG.

Initiatives undertaken by ENAB include regular workshops for British business managers which provide practical advice on doing business "the American way". It provides marketing information through its "export library," and sponsors trade promotion campaigns through trade missions on a yearly basis.

This project proposal was presented to David Babb of ENAB, which is located within the Department of Trade and Industry Building in London. An introduction to this service export program was made to ENAB by the British Consulate. ENAB spends 5.9% of its 151.1 million dollar budget on direct assistance to U.K. firms.¹⁴ As in the preliminary meeting with the Consulate, care was taken not to present this initiative as "competition" with comparable services available within regular ENAB programs and workshops.

ENAB acknowledges that its primary weakness, in promoting various target sectors, lies in assisting British manufacturers of consumer goods as opposed to industrial products. This is due, in part, to the fact that consumer goods, as they are produced in the United Kingdom, are rarely ready for the United States market. Typically, they must be packaged and marketed specifically for the American consumer-- a task ENAB acknowledges can be done with more expertise by American firms.¹⁵ Apart from specific products and industry, Mr. Babb pointed to the tremendous growth of tourism worldwide - as an economic development tool and as a method to

foster cooperation between countries. The popularity and success of "sister cities" has promoted exchange and tourism. In addition, packaged tours of foreign countries has become an important feature of travel and tourism companies "product lines." Analysis of tourism potential in Western Massachusetts should be examined as well.

After some discussion of this initiative, ENAB provided its list of 18 target sectors for export to the United States.¹⁶ It includes:

1. Clothing
2. Environmental Products and Services
3. Aerospace
4. Furniture and Home Furnishings
5. Agriculture, Fisheries and Food Processing
6. Cosmetics and Toiletries
7. Energy
8. Giftware
9. Instrumentation
10. Sports and Leisure Goods
11. Textiles
12. Toys
13. Specialty Chemicals
14. Lawn Equipment
15. Security Equipment
16. Defence Equipment
17. Airport Equipment
18. Automotive Components

On the advisement of ENAB, efforts on this service export initiative should remain focused on consumer goods. In particular, Sport and Leisure Goods, would be an optimal choice because of current market demand for institutional products (i.e. team sportswear) , soft goods (e.g. leisure

wear, clothing) and a rapidly growing demand for fitness products (e.g. exercise bicycles, weights) in America.

Task 2

Selection of Potential U.K. Exports

Key Tasks:

- 1. Contact industry experts in the British sporting goods market**
- 2. Investigate British organization representing interests of sporting goods manufacturers.**
- 3. Contact British manufacturers of selected sports/leisure activities.**

Contact Industry Experts in British Market

From shoes to clothing, from sports equipment to exercise equipment, the sporting goods industry consists of a vast array of industries within an industry. Based on early discussions with store managers, sneakers and footwear of any kind were eliminated as potential U.S. imports. Currently footwear manufacture is dominated by a few name brand companies- companies which spend millions of dollars on advertising and marketing. No small or even medium sized firm could ever compete with efforts such as those.

The same is true of the "soft goods" manufacturers or those companies which produce clothing, hats or outer-wear. From skiing to tennis, to soccer and backpacking, sportswear is also dominated by name brands. Rossignol, Le Coq Sportif, Umbro and Patagonia- all names the well-dressed sportsman and woman look for.¹⁷ According to Alex Romer, Director of International Trade for Spalding U.K, strong British exports for the American market include " those sports which are popular in Britain and are finding their way into the U.S. Some of these include billiards and snooker, rugby and golf, which always has a niche in America."

However, a variety of British products atypical of those sporting goods which might be popular in Britain, might also find demand within the U.S. market. The only way to determine those firms interested in export to America would be to contact the U.K. sporting goods trade association and contact a variety of its members.

The British Sporting Goods and Allied Industries Federation

The British Sports and Allied Industry Federation, founded in 1926, represents the interests of the sports goods and equipment industry in the United Kingdom. The Federation, which is the largest sports trade association in Europe, includes within its membership many of the most significant companies across a range of products ranging from clothing and equipment to market research and sports promotion. However, its membership also includes smaller manufacturers, who benefit from the programs and sponsorship of the BSAIF.

The Federation is controlled by a Board of Directors elected by member companies. The strength of this organization is exemplified by the fact that the Federation holds a seat on the Board of the World Federation of the Sporting Goods Industry. This particular organization works to protect the international sport environment. The BSAIF works for its member companies to achieve 5 main goals:

1. To provide a strong, united voice for the industry in its dealings with the European Economic Community.
2. To ensure that all sections of the industry in the U.K are represented in the work of the World Federation.
3. To promote the interests of its members at home and in export markets.
4. To sponsor and organize exhibitions in the U.K on behalf of members and to organize joint ventures in overseas exhibitions.
5. To provide cost- effective financial and legal services for members.¹⁸

In the area of export promotion, the BSAIF will give member companies general market information, advice on how to find agents and distributors, technical advice on meeting product standards and information on import and export tariffs and quota levels. However, as is the case with many organizations this of this size, at 400 members, the Federation can do little in helping the small to medium sized manufacturer with detailed financial, technical and legal assistance.

To promote representation of a particular sector or sport , the BSAIF is divided into 15 specialized Associations and Groups which include:

1. The Angling Trade Association
2. Association of Play Industries
3. Billiard and Snooker Trade Association
4. Association of Spectator Equipment Suppliers
5. British Golf Industry Association
6. Diving Trade Association
7. Field Sports Group
8. Golf facilities Trade Association
9. Sports hall and Fitness Equipment Association
10. Sportswear Group
11. Synthetic Sports Surfaces Association
12. Tennis Court Constructors
13. Rackets Group
14. Darts Group
15. Bowls Group

The purpose of each of these organizations is to "arrange meetings to allow for the discussion and exchange of information, enabling members to work together for the solution of common problems... All Associations and Groups provide additional specialized services and opportunities apart from the more generalized services provided by the BSAIF."¹⁹ In order to discern the exact nature of these services, the BSAIF was contacted for more specific information on each of the 15 specialty groups. Of the 15, only one, the Sports Hall and Fitness Equipment Association, offered any kind of formal export services. Most of the groups meet one to five times a year, with an emphasis on providing new information regarding technical standards, innovations and access to trade shows.

From the British Consulate, to the Department of Trade and Industry, to the organization representing the interests of the sporting goods industry, there is a notable lack of export assistance for small and medium sized firms in the areas of marketing, advertising, financial and legal, unless these services are purchased by individual firms.²⁰

To corroborate these findings and to determine for certain whether or not there may be a need for Western Massachusetts services capable of assisting these manufacturers, a letter outlining this initiative was sent to 30 British firms in a variety of sports such as rugby, volleyball, golf, fishing, orienteering, squash and hockey and tennis. Below is a sample of a letter sent to U.K. firms abroad.

Ron Hill Sports
Unit 4 Redfern Industry Est
Hyde
Cheshire
SK14 1RD
England Telefax 061 366 5020

Dear Director of Marketing,

I am currently a graduate student working with a team of faculty from the Department of Regional Planning and the School of Business and Management at the University of Massachusetts at Amherst. Our project aims at leveraging local service resources to attract U.K. investment here in the United States. Since January of this year we have been investigating the feasibility of establishing a consortium of individuals from the Western Massachusetts marketing, financial, advertising and legal professions to help British firms who do not currently export to the American market to begin doing so. After discussions with Karen Rogers from the British Consulate in Boston, as well as a visit to England to discuss our ideas with the Exports to North America Board of the Department of Trade and Industry, we were advised to explore the possibility of attracting British-based sporting goods

I would be most grateful if you could send me information on your company and products. Please indicate whether you are currently exporting to America and, if not, would you be interested in a proposal to see about how it could be done. Specifically, the goal of this effort is to identify small and medium-sized U.K. manufacturers wishing to tap into a new market and match them with companies who can assist them in bringing their product to American consumers.

I thank you very much for your time and greatly look forward to hearing from you.

Sincerely,

Maureen Moriarty, Research Assistant

Meir Gross, Program Director

The goal of this sample mailing was to assess potential demand for assistance to British firms to expand into the American market. Ten percent of the sporting goods firms contacted responded. Responses can be found in Appendix B. These results were encouraging, however, a determination of specific niches within the American sporting goods market would open the door for more specific and aggressive marketing of this effort.

Task 3

Research Market Need in the United States for Potential U.K. Export- The Sporting Goods Industry in Western Massachusetts and the United States

Key tasks:

- 1. Research general trends in the U.S sporting goods market**
- 2. Interview area sporting goods owners and managers to understand issues and problems in current industry practices**
- 3. Research trends in sporting goods in the Northeast**

The United States sporting goods industry is a 44.1 billion dollar industry and growing.²¹ According to the National Sporting Goods Manufacturers Association 1990 "Recreation Report," sales in sports apparel rose 5.3%, sports equipment rose 5.8% and exercise equipment sales increased by 15%.²²

Most of the big sporting goods companies: Spalding, Coleman, Baden, Nike, Reebok and others may refer to themselves as American, German or British manufacturers, but they rarely manufacture their product in their home country. In fact, most goods are produced in Third World or Pacific Rim countries and are distributed from the home country headquarters.²³ It is not uncommon for competing brands to be manufactured on the same assembly lines, in the same factory, in effect making them the same product.²⁴

From factory, sporting goods are shipped to distribution headquarters, where orders for products are filled. Sporting goods retailers rarely deal with distributors directly and purchase through representatives. "Reps" may work for one sporting goods company or they may represent several product lines. They visit sporting goods stores at certain intervals throughout the year to take "futures orders" for items which will be delivered six to eight months later. Based on these orders, distributors will have their manufacturing facilities produce only enough of the product to fill the futures orders it receives.

From the distributors perspective, this practice cuts down on excess inventory which may or may not sell-- a risk too great to take in this present economy. Such practices present problems

for the retailer who is forced to plan his inventory months in advance. Changes in preference, innovations or increases in demand may require "fill-in" orders. Retailers, however, are rarely able to obtain inventory above and beyond what was originally ordered.

This is further exacerbated by the fact that New England states, in contrast to the rest of the country, are the last to begin their sports seasons due to the rather severe weather conditions. Since sporting goods products are delivered to New England last, the result is often unfilled and late orders. For smaller sporting goods retail establishments in the Northeast, many rely on institutional (i.e. team) sales, often comprising 70% of all sales.²⁵ Prompt delivery and flexibility in ordering practices are crucial to the success of these stores.

An informal survey of five Western Massachusetts sporting goods stores was taken in order to uncover ongoing problems in current shipping, ordering and inventory practices.

Current Weaknesses in the Northeast Sporting Goods Market

1. Suppliers fail to deliver orders on time, nor do they carry fill-in stock to handle last-minute changes in demand.
2. Sporting goods stores must put money up front six to eight months in advance in order to secure brand name items.
3. Retailers must go through tedious procedures to return unsatisfactory goods.
4. Protectionism- Many representatives remain loyal to one store and don't allow saturation of a geographical area with popular products.
5. Manufacturers reward high-volume buying with lower prices per unit. As a result, wholesale sporting goods stores can out price smaller, independent stores who cannot compete with pricing disparities.
6. Some manufacturers impose purchase quotas, quotas which are difficult for small retail stores to meet.

7. Late deliveries.
8. Failed deliveries.
9. Too many product lines by name brands that are of poor quality.
10. Infringement by mail order and discount catalogs on traditional sporting goods stores.

The common denominator among this list of complaints is *service*. According to Len Nolan, President of the Sporting Goods Agents Association, "the only people benefitting from the current soft market in the Northeast are distributors. Retailers are willing to pay 15% more just for quick delivery."²⁶ Flexibility, service and dependability, though eagerly sought after, are precious commodities in the Northeast sporting goods industry.

Trends Within the Sporting Goods Industry: Niche Markets for U.K. Products?

In a 1991 Leisure Trends/Gallup Poll, 27% of the respondents said they would like to try something new in their leisure time: exercise.²⁷ Despite tough economic times, the sporting goods industry will continue to grow and four major players in retail will emerge throughout the 1990's:

1. **Megastores:** Offering lowest price and the largest selection of name brand items. Walmart and Herman's Sporting Goods are examples of megastores.
2. **Specialty Stores:** Offering a wide variety of brands and products in a particular sport. Runners shops and golf specialty stores are common examples.
3. **Traditionalists:** Providing a variety of goods and a moderate level of service.
4. **Discounters:** Regular discount department stores with an expanded selection of sporting goods. Nevada Bob's and Fran Johnson's Golf World are popular discounters.²⁸

Megastores and discounters will continue to purchase name brands in high volume, allowing them to out price specialty and traditional stores. For these latter two, one of the most important survival strategies in keeping up with sales will be to identify and exploit niche markets.²⁹

According to Sporting Goods Business Magazine: " stores will have to be different and carry different merchandise in order to survive. Goods and services will have to be different in order to stand apart from the big stores".³⁰ Following these trends, smaller retailers are limiting the number of brands in stock. Yet how can they survive if they don't carry the big labels?

Consumer Preferences

In a recent study conducted by sporting goods consultants Leo Shapiro and Associates on consumer brand loyalty:

1. 47% of respondents said they would switch the brand of sporting goods if their favorite brand was unavailable.
2. 53% of respondents said they would skip purchasing an item if one of comparable quality was available.
3. Only 7% of all respondents expressed a preference for a specific label in sporting goods.

In contrast to the 1980's, consumers will buy based on their expectations of price, quality, style and service.³¹

The following charts, all compiled by the National Sporting Goods Association, show U.S. sales in sporting goods over a 10 year period and sports participation in 1990. In Table 6, clothing has shown the most dramatic increase in sales, more than doubling between 1987 and 1990. Footwear sales, though also increasing, is dominated by Nike and is followed by only a small, elite handful of top name brands, leaving little room for young companies wishing to break

into this highly competitive market. For this reason, British shoe companies will be excluded as potential importers in this project.

Equipment, as well, continues slow, though not marked growth. In the Northeast, school budget cuts have resulted in some declines in institutional sporting goods sales, though demand still remains relatively steady.

Table 7 indicates those sports which have been participated in more than once, with walking, swimming and biking in the top three. What is not indicated within this listing is the strength of basketball in the Northeast. Participation in this region between 1988 and 1990 has grown 15.3% within the Boston/Lawrence/ Salem SMA, registering the sixth highest number of participants in the country, according to American Sport's Data Company's study "National Market Participation Research." What the NSGA study also omits is the strength of the six to seventeen year old age group which is very active, participating in organized sports 38 to 54 days per year.

Table 8 illustrates the winter market niche in the Northeast, with hockey sticks, cross country skis, downhill ski and ski wear as big sellers in the region.

TABLE 6
SALES OF SPORTING GOODS
(in millions)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Clothing	3,201	3,014	3,266	3,432	3,796	4,213	4,645	10,736	11,557	11,382
Footwear	1,785	1,900	2,189	2,381	2,989	3,128	3,524	3,772	5,763	6,437
Equipment	6,762	7,114	7,925	8,317	9,069	9,414	9,900	10,705	11,504	12,073
SUB TOTAL	11,748	12,028	13,380	14,130	15,854	16,755	18,069	25,213	28,824	29,892
Recreational Transport***	6,977	6,656	9,771	12,271	12,718	13,846	15,873	16,880	16,360	14,248
TOTAL	18,725	18,684	23,151	26,401	28,572	30,601	33,942	42,093	45,781	44,140

*Because of added product categories, data is not comparable with earlier years.

**Some of the 1989 increase may reflect improved pairage reporting due to a slight questionnaire change.

***Bicycles, pleasure boats, RVs & snowmobiles; projections provided by other associations.

SOURCE:

National Sporting Goods Associations
1699 Wall Street
Mt. Prospect, Illinois 60056
(708)439-4000 FAX: (708)439-0111

Table 7
Participated more than once (in millions)
Seven Years of age and older

1. Exercise Walking	25. Table Tennis
2. Swimming	26. Skiing (Alpine)
3. Bicycle Riding	27. Soccer
4. Fishing	28. Backpacking
5. Camping	29. Water Skiing
6. Bowling	30. Badminton
7. Exercising with Equipment	31. Canoeing
8. Boating	32. Croquet
9. Billiards	33. Raquetball
10. Basketball	34. Skateboarding
11. Running	35. Ice skating
12. Aerobic Exercising	36. Archery
13. Volleyball	37. Skiing (Nordic)
14. Golf	38. Sailing
15. Hiking	39. Rock Climbing
16. Softball	40. Roller Skating
17. Hunting	41. Bocce
18. Tennis	42. Scuba Diving
19. Rollerskating	43. Ice Hockey
20. Dart Throwing	44. Snowboarding
21. Baseball	45. Surfboarding
22. Football	46. Boardsailing
23. Calisthenics	47. Squash
24. Target Shooting	

Source: National Sporting Goods Association
Mt. Prospect, Illinois

Table 8**Northeast Share of the U.S. Market**

The following tables present some products listed in order of percent of U.S. sales in that region.

The percentage of households in that region are shown also. Products whose percent of sales is greater than the percent of households have above average sales per capita in that region.

New England

Percent of U.S. Households	5.4%
Hockey Sticks	23.3%
Cross Country Skis	19.9%
Downhill Skis	18.7%
Volleyballs	13.1%
Skiwear	13.1%
Barbells/Weights	12.3%
Golf Bags	11.6%
Weight Benches	10.0%
Rowing Machines	9.6%
Home Gymnasium	9.1%

Middle Atlantic

(New York, New Jersey)

Percent of U.S. Households	15.6%
Downhill Skis	34.5%
Hockey sticks	34.1%
Tennis Clothing	25.1%
Home Gymnasium	24.8%
Ski Wear	24.2%
Nordic Ski	24.1%
Exercisers	
Bowling Shoes	23.9%
Sneakers	22.6%
Weight Benches	22.0%
Raquetball Raquets	21.2%

Based on the information provided by industry experts and results of National Sporting Goods Association surveys, the following British manufacturers in these sports may have a niche within the American market.

- 1) Hockey
- 2) Volleyball
- 3) Skiing
- 4) Golf
- 5) Tennis
- 6) Fishing
- 7) Billiards/Snooker
- 8) Rugby
- 9) Basketball
- 10) Badminton

Task 4
Design Criteria to Select Potential U.K. Export
and
Western Massachusetts Service Firms

The ability of a foreign firm to successfully enter into a new market depends greatly on its ability to fill a niche within that market, while maintaining a high level of service to the customer despite issues of distance. Using information gathered in TASKS 1 through 3 based on U.K. target exports, American trends in the sporting goods market, industry weaknesses and consumer preferences, U.K. firms with the following characteristics are suitable targets for export to America, particularly the Northeast:

1) British manufacturers who produce products in the following sports:

- Hockey
- Volleyball
- Skiing
- Golf
- Tennis
- Fishing
- Billiards/Snooker
- Rugby
- Basketball
- Badminton

2) Smaller to medium-sized firms which have the capability to:

- a) Deliver orders on time.
- b) Guarantee service for unsatisfactory or damaged goods
- c) Allow less than the current time frame of seasonal orders (6-8 months). Three to four months in advance for orders.
- d) No imposition of purchase quotes.

- e) High quality, specialty items.

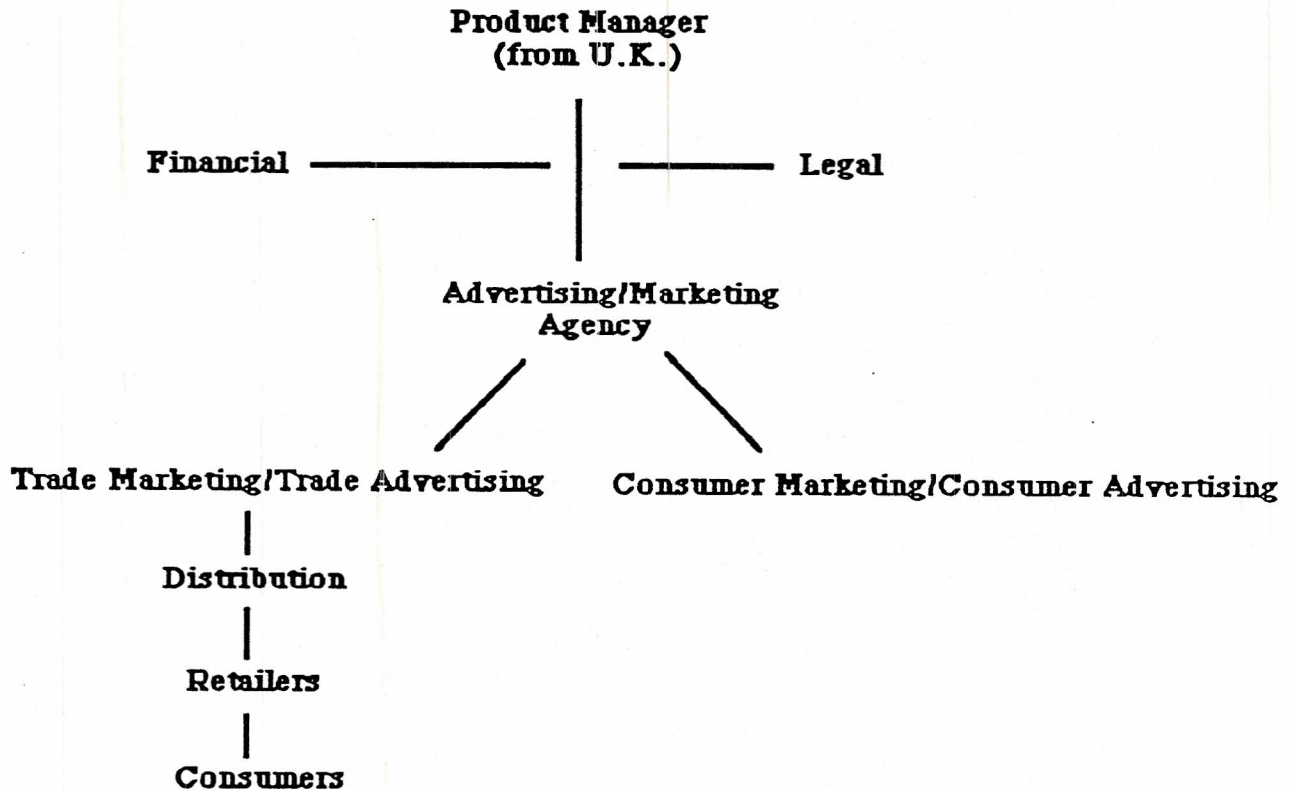
Because the 90's will see more and more volume discount stores, most small firms will be unable to compete with big names. For this reason, specialty stores and perhaps traditional sporting goods stores will be looking for competitively priced products from companies which can provide service and quality.

Criteria to Select Western Massachusetts Service Firms

In order to discern what services from Western Massachusetts would be required to assist British firms being their product to market, one of the regions most prestigious firms involved in international marketing and advertising was consulted. Northgate Advertising is an award-winning firm with ties to the University of Massachusetts. From discussions of this service export initiative, the following suggestions were put forth:

- 1) A consortium of business services is an excellent idea, not only for international trade, but for domestic investment efforts as well.
- 2) A "service-group" attempting to compete overseas in the sporting goods industry must be comprised of the following:
 - a) Lawyer with expertise in finance and trade.
 - b) Advertisers with marketing capabilities. Expertise in the area of consumer as well as trade and industrial goods.
 - c) Import/export companies (for advice on tariffs, product standards, customs, etc.).
 - d) Distributor. (Within the sporting goods industry).
 - e) Representative. (An independent sporting goods representative with a strong client base. Ties to specialty stores as well.)
 - f) Financial consultant.

The following diagram show what the process of bringing products to market might look like, according to Northgate Advertising:



Once the British manufacturer decides to utilize the assistance of Western Massachusetts, the product will reach the American consumer through 2 distinct marketing and advertising campaigns. First, through trade advertising which, in effect, sells the benefits and attributes of brand X to those who will actually sell the product. Second, through consumer advertising, which is directed at those who will buy the product.

The point of this brief overview is to illustrate that no one knows either the American sporting goods industry of the American consumer better than an American firm. finally, the process of import and export to and from the United States, as well as legal and financial advice is best given from an American and, more specifically, a Western Massachusetts service firm.

Conclusion/Steps to Come

As a result of this first effort in a service export feasibility study, the following has been accomplished:

- 1) Success in establishing communication with governmental and trade organizations within the United Kingdom.
- 2) Identification of British sporting goods manufacturers eager to export to the United States.
- 3) Solid data base of organizations, contacts and resources involved in international trade here and abroad.
- 4) Encouragement by local service firms to pursue the creation of a service consortium.
- 5) Completion of two other feasibility studies in the areas of tourism development and pollution control services/consultancy in Western Massachusetts, using this sporting goods study as model.

The success and interest in this initiative during Phase I has been notable and a Phase II strategy is currently underway. Steps to be taken in this Phase include:

- 1) Outreach from the University of Massachusetts for Phase II funding.
- 2) Detailed investigation of service firms within Western Massachusetts in the areas outlined in Task 4. (This will also occur based on the results of the tourism and pollution control studies.)
- 3) Creation of a detailed business plan by the University of Massachusetts team and selected service firms.
- 4) Dialogue with area banks and businesses for investment funding.
- 5) Implementation of Phase II, whose activities include attendance of trade fairs and missions overseas.

¹U.K. Policy Studies Institute, Britain in 2010, ([London, England]: Policy Studies Institute, Carfax Publishing, 1991), 34.

²*Ibid.*, 34.

³*Ibid.*, 147.

⁴United States Department of Commerce, EC 92: A Challenge for United States Service Sectors, by Linda Powers, Report on Business in America, United States Department of Commerce (Washington, DC: United States Department of Commerce, 1990), 20.

⁵Geiza Feketekutz, "International Trade in Services" in The United States Service Industry handbook, ed. Wray O. Candiles (Connecticut: Praeger Publishing), 57.

⁶Price Waterhouse, Ltd., "Doing Business in the United States", (Connecticut: Price Waterhouse), 7.

⁷Alden S. Raine, "The Role of MassPort in Export Efforts", presented as part of a symposium International Export at the Worcester Chamber of Commerce, Worcester, MA, 4 December 1991.

⁸Paul Simpson, Analysis of Employment Trends in the Hampshire County Service Delivery Area, (Boston, MA: Field Research Services, Department of Employment and Training, 1990), 72.

⁹Richard Starks, ed., Invest in the U.K.: A Handbook for Foreign Companies, (London: London House Publishing, 1990), 12.

¹⁰U.K. Policy Studies Institute, Britain in 2010, 253.

¹¹Small Business Administration, An International Trade Source Book for the Small company, (Boston, Massachusetts: The Small Business Administration Foundation of America, 1989), 61.

¹²U.K. British Overseas Trade Board, Forward Plan. 1991, published by the U.K. Department of Trade and Industry, 7.

¹³*Ibid.*, 7.

¹⁴David Babb, Manager of Exports to North America Branch of the Department of Trade and Industry, Interview by Maureen Moriarty, 9 July 1991, Department of Trade and Industry, London, England.

¹⁵Kenneth D. Weiss, How to Conquer the U.S. Market, (Guilford, England: Biddles Publishing, 1990), 47.

¹⁶Interview with David Babb, Department of Trade and Industry, 9 July 1991.

¹⁷James Bower, Inflated Products Manager, International Division of Spaulding Sports Worldwide, Interview by Maureen Moriarty, 13 September 1991, Spalding Sports, Chicopee, Massachusetts.

¹⁸The British Sports and Allied Industries Federation, Membership Brochure, 1991, 38.

¹⁹*Ibid.*, 39.

²⁰T. W. Sharkey, J. S. Lin, K. I. Kim, "Export Development and Perceived Export Barriers," Management International Review, 29 (February 1989): 77.

²¹Jeffery Zucchi, Inflated Sports, prepared by Jeffery Zucchi, Product Manager, Inflated Products for Spalding Sports Worldwide, Chicopee, Massachusetts, 1991.

²²*Ibid.*, 21.

²³Jeffery Zucchi, Product Manger, Inflated Sports: Interview by Maureen Moriarty, September 1991, Spalding Sports, Chicopee, Massachusetts.

²⁴Dennis Childs, Manager, Childs Sporting Goods, Interview by Maureen Moriarty, 6 June 1991, Northampton, Massachusetts.

²⁵Robert McLaughlin, "Marketing in the United Kingdom," Sporting Goods Industry Magazine, 27 August 1990, 4.

²⁶"Sporting News", Sporting Goods Dealer, Volume 185, June 1991, 17.

²⁷Robert E. Carr, "Doing Business 1990's Style," Sporting Goods Industry Magazine, Vol. 161, January 1991, 19.

²⁸"Sporting News," Sporting Goods Dealer, Volume 185, June 1991, 17.

²⁹Craig T. Kelley, "Inventories Eyed in Wary Northeast", Sporing Goods Business, Volume 23, May 1990, 21.

³⁰"Sporting Goods Shoppers Are Less Likely to Insist on Specific Brands," Discount News Magazine, Volume 27, 24 October 1989, 71.

³¹British Overseas Trade Board, Forward Plan, 15.

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Robert E. Carr. "Executive Cite Ways to Survive Quotas." Sporting Goods Business Magazine, Vol. 17, June 1985.

David Kirkpatrick. "Environmentalism." Fortune Magazine, Vol. 8, 26 March 1990.

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APPENDIX A

Index of Trade Related Resources

- 1) Massachusetts Office of International Trade and Investment
100 Cambridge Street, Suite 902
Boston, MA
Telephone (617)367-1830
Fax (617)227-3488
- 2) Massport Trade Development Unit
World Trade Center
Suite 321
Boston, MA
Telephone (617)439-5560
- 3) Europe Now (Marketing Information)
U.S. Department of Commerce, Room 3036
14th Constitution Avenue, N.W.
Washington, DC 20230
Telephone (202)377-5279
Service Industries: (202)377-3575
Consumer Goods: (202)377-2762
Chemicals & Basic Industries: (202)377-3575
- 4) Export Development Offices (Temporary Office Space Overseas)
International Trade Administration
14th Constitution Avenue, N.W.
Room H2116
Washington, DC 20230
Telephone (202)377-2525
- 5) U.S. Council for International Business (Doing Business Overseas)
1212 Avenue of the America's
New York, New York 10036
Telephone (212)354-4480
- 6) Capital Formation Service (Finance)
Boston College
96 College Road - Rahner House
Chestnut Hill, MA 02167
Telephone (617)552-4091
- 7) International Trade Program
University of Massachusetts, Amherst
School of Management, Room 205
Amherst, MA 01003
- 8) Small Business Administration (Counseling, Market Research Workshops)
Regional International Trade Office
155 Federal Street, 9th Floor
Boston, MA 02110
Telephone (617)451-2047

- | | | |
|-----|---|--|
| 9) | Smaller Business Association of New England
69 Hickory Drive
Waltham, MA 02154
Telephone (617)890-9070 | (Export Assistance for
Beginners) |
| 10) | Small Business Service Bureau
554 Main Street
P.O. Box 1441
Worcester, Ma 01601
Telephone (508)756-3513 | (Export-related Programs) |
| 11) | Department of Commerce
Commercial Information Management System
Telephone (202)377-4561 | |
| 12) | U.S. Industrial Outlook
Telephone (202)783-3238 | (Forecasts on U.S. Industries) |
| 13) | Overseas Private Investment
Telephone (202)457-7128 | (Country Information Kits) |
| 14) | Overseas Business Reports
Telephone (202)377-5494 | (Evaluation of International
Markets) |
| 15) | Foreign Economic Trends | (In Depth Reviews of Business
Conditions and Prospects) |

Detailed Market Research

- | | | |
|----|--|--|
| 1) | Country Consumer Market Research
U.S. Bureau of Census
Telephone (301)763-2870 | |
| 2) | FINDEX: The Directory of Market
Research Reports and Surveys
Telephone (800)227-3052 | |
| 3) | American Export Register
(212)290-7343 | (U.S. Companies Exporting) |
| 4) | Inside Washington: The International
Business Executive's Guide to
Government Resources
(800)288-2582 | (Comprehensive Guide of
Government Sponsored
Support Services) |
| 5) | The International Trade Reporter Service
Bureau of national Affairs
(202)452-4200 | |

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From:

Czinkota, Michael R., and Illkka A. Ronkainen. International Marketing. Philadelphia, PA. Dryden Press, 1990.

APPENDIX B

Janino

14 November 1991

UNIVERSITY OF MASSACHUSETTS
AT AMHERST
Hills North
MA 1003

Dear Ms Moriarty

Thankyou for your letter, I am very interested in your project and I enclose our latest Brochure.

Janinos manufacture all their own garments in Hampshire, and we sell to various retail outlets, including department stores and sports shops.

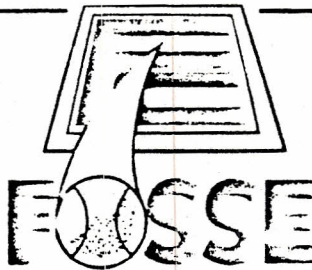
We are very keen to expand our exports and would be interested to know more about your project.

Yours sincerely

Jan Combes
Jan Combes
Managing Director

JANINO LTD
Unit 5, Tower Industrial Estate
Chickenhall Lane
Eastleigh, Hampshire
England. SO5 5NZ

Tel: 0703 611113
Fax: 0703 643838
Mobile: 0831 508838



Fosse Contracts Limited, 28 Cannock Street, Leicester. LE4 7HR

Telephone: (0533) 460500 Fax: (0533) 461561

Our Ref: KJB.JW

Your Ref:

Date: 27 November 1991

Maureen Moriarty,
Research Assistant
Dept of Landscape Architecture & Regional Planning
University of Massachusetts
at Amherst
Hills North
Amherst
MA 01003
U S A

Dear Miss Moriarty,

I thank you for your recent correspondence which I found quite interesting.

Our company has been established for over 20 years and we specialise in the installation of both Indoor and Outdoor Sports Facilities. A large proportion of these sports would be European orientated, such as Soccer, Hockey, Cricket etc. although Tennis and Golf would be of interest.

As far as Tennis is concerned the only surfaces which would be applicable would be artificial grass, but I do know these are also present in the U.S. and how competitive we would be I am not really sure. Incidentally we do install a floodlighting system for tennis which is actually supplied to us by the Devoe Corporation of New Jersey.

The only product that I think might be of interest to the U.S. market would be our Golf Mats, and I enclose a small leaflet and sample for your perusal. You will see from this sample that the carpet itself is actually woven manufacture, which means that it is probably one of the most hard wearing products of its type and particularly applicable to such intensive wear of golf. It is also very attractive in appearance and is installed for Driving Ranges, Golf Clubs, private individuals etc. for practice and permanent use. We sell the product throughout Europe, and as far away as Australia, but as yet have not considered the U.S. market, which I suspect could be quite considerable.

Continued./



**Specialists for Sports Surfaces
and Floodlighting Systems**



INUATION....

At this stage I will not go into a boring sales campaign, but leave you to consider whether you feel it is something which could be explored further.

I look forward to the possibility of further correspondence.

Yours sincerely,



K. J. Bell
DIRECTOR



Swilken Golf Company Ltd., Stewart Works, Tom Stewart Lane, St Andrews KY16 8XW Fife, Scotland
Telephone: 0334 72266 72241 Telex: 76243 Fax: 0334 75037

ITB/SG

Ms Maureen Moriarty
University of Massachusetts
Hills North
Amherst
MA 01003

4 November 1991

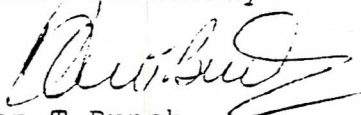
Dear Ms Moriarty

Thank you for your letter regarding possible exporting into the American market.

We have pleasure enclosing our catalogue which covers our range of products. We are very interested in exploring the possibilities of distribution of our products in the United States.

We look forward to hearing from you in due course.

Yours sincerely


Ian T Bunch
Managing Director

Enc



Our game is making golf easier.

Directors: C.S.R. Stoyan, W.S. (Chairman) I.T. Bunch (Managing) E.J. Cuthbertson, W.S. D.S.D. Robertson
Reg. Office: Stewart Works, Tom Stewart Lane, St Andrews Reg. No. 38484 Scotland

With Compliments
Hope this is of interest,

If you require any further information, do not
hesitate to contact me, Lynette Hayes.



RON HILL SPORTS LTD, WORLD HEADQUARTERS, P.O. BOX 11, HYDE, CHESHIRE, ENGLAND SK14 1RD.
Accounts, Tel: 061-366 6894, Tel: 061-366 5020. Telex: 669755 - Att. Ron Hill. Telefax: 061-366 9732. V.A.T. No. 1475

SK14 1RD.

TELEPHONE : (0)61 - 366 - 5020

FAX : (0)61 - 366 - 9732

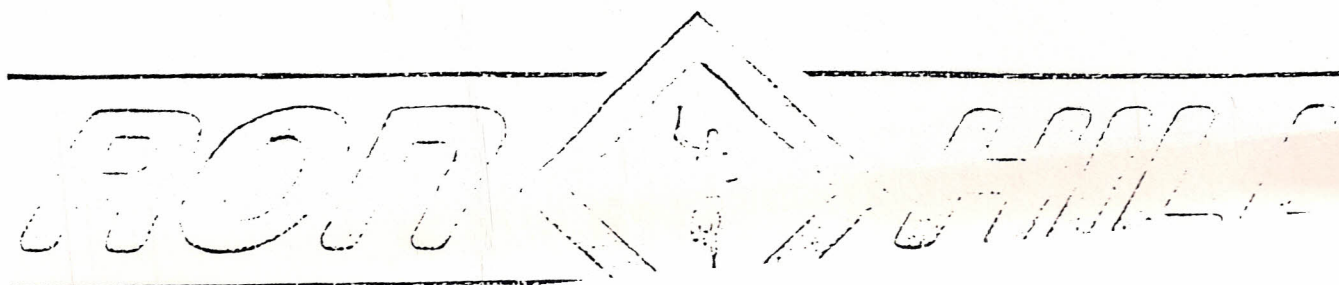
TELEX : 66975 ATTN: RON HILL

EXPORT DIRECTOR : GRAHAM RICHARDS

EXPORT ADMINISTRATION /
SALES : LYNETTE HAYES

EXPORT PRICE LIST

EFFECTIVE 1st September, 1991

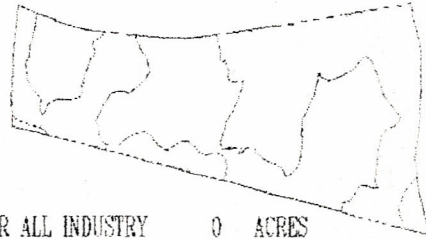


SUITABILITY 3 & PROXIMITY TO TRANSPORTATION



LOCATION OF INDUSTRIAL
AREA IN SOUTHAMPTON

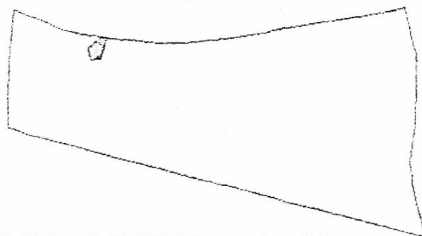
COMPOSITE SUITABILITY ASSESSMENT COMBINED NATURAL AND LOCAL FACTORS



■ SUITED FOR ALL INDUSTRY	0 ACRES
▨ SUITED FOR LIGHT INDUSTRY	118.2 ACRES
□ UNSUITED FOR INDUSTRY	104.4 ACRES

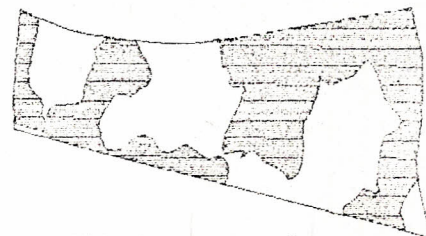
REDUCTION FROM ORIGINAL

COMPOSITE SUITABILITY OF LANDS WITHIN RAILROAD BUFFER

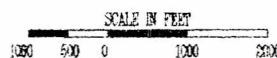


■ SUITED FOR ALL INDUSTRY	0 ACRES
▨ SUITED FOR LIGHT INDUSTRY	.9 ACRES
□ UNSUITED FOR INDUSTRY	221.1 ACRES

COMPOSITE SUITABILITY OF LANDS WITHIN ROAD BUFFER



■ SUITED FOR ALL INDUSTRY	0 ACRES
▨ SUITED FOR LIGHT INDUSTRY	118.2 ACRES
□ NOT SUITED FOR INDUSTRY	104.4 ACRES



DATA SOURCES:
LANDS: UMARS Resource Mapping Unit from
1965 color infrared photography
ROADS: 1:250,000 and 1:50,000 D.G.s
DRAINAGE: USGS 7.5' - MassGIS Project
from 1:25,000 manuscripts

CENTER FOR ECONOMIC DEVELOPMENT
LANDS ZONED AND SUITABLE FOR INDUSTRY

SOUTHAMPTON



Produced by the METLAND Research Group
Dept. of Land Arch. and Reg. Planning
University of Massachusetts, Amherst

4.3 Conclusion to Application

These preliminary numbers are strong indication of the magnitude of the original hypothesis which stated:

"The premise being that a significant portion of the land now zoned for industry is not suitable for development due to environmental, physical, and political constraints." (1. INTRODUCTION, p. 1)

Distressing, almost half of the lands in the valley zoned and available for industry are not available for industrial development, and the land remaining is to a great extent not suitable for industrial development. Of the 411 acres of industrially zoned land assessed for its industrial suitability (Phase Two), only 1.36 percent of the land was suited for *All Industry* within proximity to major roads. Only half a percent is within rail buffers. There is a definite need for more land to be made available for industry here in the Pioneer Valley.

Assuming the percentages calculated from the Phase Two results on Belchertown and Southampton hold true for the whole Pioneer Valley, only 161.4 acres are available and suitable for all industry within the Pioneer Valley. This is from an original total of 26,963 acres zoned industrial in the Pioneer Valley. Although the calculations are based on only two towns, even if the actual numbers show an 100

percent improvement, the industrial land available would still only equal 322.8 acres. The following tables show the acreage for Phase One and the two towns from Phase Two.

APPLICATION TOTALS PHASE ONE

Category	Total Land Area	Percentage Land Area (26 Towns)
Pioneer Valley (40 towns)	667,493.1	n/a
Towns w/ Industrial Zoning (26 towns)	440,026.3	100.0%
Industrially Zoned Land	26,963.0	6.1%
Available Industrial Land between 50-100 ac.	15,770.2	3.5%
over 100 ac.	1,411.8	0.0%
w/in Road Buffer	11,847.8	2.7%
w/in Rail Buffer	13,281.8	3.0%
	4,798.9	1.1%

TABLE # 4.2

APPLICATION TOTALS PHASE TWO

(Numbers in parentheses (##) are estimates out of 11,847.8 acres of available industrially zoned land in the Pioneer Valley based on averaged results from the Suitability assessment on Belchertown and Southampton, 2 of 26 towns.)

Category	Industrial Lands:		
	Suited for All	Suited Light	Not Suited
Part 2:			
Physical Suitability	(879.2)	(7,523.8)	(3,413.1)
Belchertown	28.0	145.4	14.0
Southampton	2.5	115.6	104.4
Part 3:			
Local Factors	(230.6)	(11,617.2)	(0.0)
Belchertown	7.0	180.0	0.0
Southampton	0.0	222.6	0.0
Part 4:			
Overall Suitability	(161.4)	(8,250.2)	(3,401.6)
Belchertown	5.6	168.0	13.6
Southampton	0.0	118.2	104.4
w/in Road Buffer	(161.4)	(4,750.6)	(6,935.7)
Belchertown	5.6	163.9	18.9
Southampton	0.0	118.2	104.4
w/in Rail Buffer	(66.3)	(4,375.9)	(7,385.4)
Belchertown	2.3	33.6	151.8
Southampton	0.0	.9	221.1

TABLE # 4.3

Although these numbers from Table 4.3 are estimated from only two sample towns, the numbers are still frightening. Industrially zoned land in the Pioneer Valley is mostly not suitable for industrial development. Only 4,750 acres or 17 percent of the industrially zoned land in the Pioneer Valley is suitable for *Light Industry*. Even using the more accurate numbers from Phase One shows that only 44 percent of the industrially zoned land is

available and of large enough size to be considered for industrial development. It is apparent from this assessment that the initial hypothesis is true. That a significant portion of the industrially zoned land in the Pioneer Valley is not suitable for development. The process for zoning industrial land in the Valley took place without the proper information and knowledge necessary to do the job adequately.

5. CONCLUSION

This project started with a hypothesis, a major goal, and specific objectives regarding industrial lands in the Pioneer Valley. The results of this project show that the original hypothesis from the data gathered and assessed is true. Less than 3.0 percent of the land in the Pioneer Valley is available and within close proximity to a transportation network. Only 66.3 acres in the entire Pioneer Valley, based on a limited sample of only two towns, are estimated to be available and suitable for *All Industry* that is within close proximity to the railroad network.

The major goal of this project was to provide the information necessary for towns to improve their industrial zoning. This project has been the first step towards achieving this goal. The suitability model developed will provide the information towns need to know regarding their industrial zoning. Of course this is only the preliminary data that shows the problem does exist and steps need to be taken to remedy the situation.

The objectives, mainly creating a suitability model based on the use of readily available data, and an inventory of available industrial lands, have been accomplished. The maps and charts

contained in this report show the results of this assessment. They provide a good source of information to show towns how inadequate their industrial zoning is for providing industrial lands available for industrial development.

The Industrial Suitability Model developed for this project provides the preliminary data needed to show the inadequacy of the Pioneer Valley's present industrial zoning. By simply expanding the study to include all lands within each town of the Valley, the areas most suitable for industrial development will be exposed and can then be zoned industrial. A buffer area around the industrial zone can also be created to ensure compatibility with and protection for the industrial zone. This procedure provides quality information a town planner needs to evaluate and revise current zoning to better fit the land and community. GIS information provides graphical output that is useful in the political realm for persuading changes to the town zoning as well. This type of assessment and revision needs to take place. Using this model to assess areas most suitable for industry and then zoning appropriately is putting the "horse before the cart". In the past, this type of information was not available, but it is today and it is imperative that it be used.

Zoning boundaries are only the beginning. The State of the Art Chapter provides information explaining how the zoning ordinance can be written to both encourage quality industrial development and

provide quality controls to maintain the town's best interests for the future. The new GIS technology provides a unique opportunity for towns to revise their zoning based both on the physical suitability of the land and the important and unique cultural aspects within the town. The benefits the town receives from this new technology is a stronger, more fiscally sound tax base and an improved quality of life.

The problem that becomes apparent from this study is the decision making process regarding industrial zoning. The decisions are not based on solid information or based on the physical constraints of the lands. The zoning lines are placed on the map with the assumption that the land will fit the expected use of the land. This is putting the cart in front of the horse. In more simpler terms - *poor planning*.

As less land becomes available for development the need to use land for its highest and best use becomes more critical. Planners and other officials that make these land use decisions need to take advantage of the spatial information that is available today. Proper land use decisions are dependent upon the type of information this new technology, GIS, can provide at a reasonable cost. The model developed for this project shows how useful this new technology is and how inexpensive it can be. Over two thirds of the data used for this study is available in digital form today.

This data is produced for the entire state which allows the Industrial Suitability Model to be easily run for the entire state. The benefits that can be obtained and utilized from the use of GIS information, such as better use of town's land, greatly offset the cost of such information. This is only the tip of the iceberg. Geographic Information Systems are barely out of their infancy. What word processing has done for office automation, GIS will do to even a greater extent for land information processing and land use decision-making.

The results of this study show how inappropriate it is to zone land prior to assessing its suitability. Zoning without knowledge of the land is like buying property sight unseen or buying a car without looking under the hood. This study has shown where the mistakes have been made, but this as well is the wrong way to apply this technology. The procedure developed for this project assesses land for its suitability for industrial development. Therefore this procedure should be carried out on the whole town to locate the ten percent of the town's land most suitable for industrial development. A buffer area surrounding the industrial land should then be drawn to protect the industrial area from incompatible uses. This same model can then be easily calibrated to locate lands most suitable for the remaining zones using the same data already collected.

GIS is a powerful tool that can make a positive change to our

landscape now and for the future. Assessing the land first and then zoning appropriately is progressive, pro-active planning. The availability of GIS has provided this opportunity that was not an option in the past. A town's land is one of its main resources, why waste it by planning in the past. Plan for the future using the technology available today that is the future of planning.

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(the sum of the criteria scores). Each parcel was then designated either highly suitable (12), adequately suitable (11,10), or limited suitability (less than 10).

Site suitability was determined with three types of industrial development in mind; general industry, warehouse and distribution, office and/or research. They ranked parcels based on the "preferred" type of development for each site. There is no explicit explanation of the criteria used to determine how one type of development was better suited to a site than another. They also developed action plans for each highly and adequately suited site.

Criteria not used for evaluating sites were; current zoning (It was presumed the zoning could be re-evaluated for sites determined to be highly or adequately suitable for industrial development and was therefore not mapped), condition of buildings, and conformity with a Master Plan because such a document for Chicopee could not be found.

This report more clearly defined how the rating system was applied, yet it is not clear how they calculated remaining developable land after eliminating undevelopable lands. The dividing of the industrial land into three industry types adds validity to the analysis. The report is a definite aid to industrial development in the City of Chicopee.

2.2 Geographic Information Systems and Computer Technology

This section addresses the use of GIS and computers in the landscape planning process. Several issues are discussed including the definition of GIS, an evaluation of several GIS's, and the implementation of GIS at different levels of government, and in private industry.

2.2.1 Definition of Geographic Information Systems

Geographic information systems are defined as "...a powerful set of tools for collecting storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes." (Burroughs 1986). In an age of technical revolution, this definition remains true regarding the current software available, but the tools Burroughs describes have become more complex. Geographic information systems are becoming increasingly integrated into the land use decision making process. This trend is expected to continue into the future as technological advances continue to be made in both hardware and software.

2.2.2 A Critical Evaluation of GIS

While the point of this project is not to look at geographic information systems and evaluate the usability of various systems, it is important to understand the reasons for choosing the system utilized. A procedure was developed for choosing the system that was employed on this project. This criteria evaluates the different types of systems that are available and provides a method for comparison with other systems. The software evaluated in this section does not constitute the entire inventory of GIS software available, but only attempts to look at several sections of the broad spectrum of available software. The systems studied are representative of most systems available.

The criteria for evaluation includes four basic categories:

1. The "user friendliness" of the system.
2. The data available for the system.
3. The presentation ability of the system.
4. The analytic ability of the system.

These four categories are used to look at the various aspects of a GIS. While each geographic information system must, to some extent, accommodate each principle mentioned above, different tasks present different requirements from a geographic information systems standpoint. Rating industrial suitability is a problem

that requires extensive use of the analytic ability of a system and its data availability. Therefore, the system chosen for this study needed strong analytic and data availability characteristics.

The following systems were evaluated using the criteria explained above:

IDRISI

This package was developed at Clark University primarily for the analysis and manipulation of data. IDRISI is considered a "tool box" of primitive functions that allow the user to develop the larger functions needed for more complex analyses. This allows a great deal of flexibility for the user, but hampers the systems ability to be used by novices. While IDRISI can quickly adapt to read different types of data (through conversion programs), There is no data base immediately available. This limits the usefulness of this system for the model used in this project.

ATLAS MAPGRAFIX

This package has been developed by a private company and is representative of packages available for about one to two thousand dollars. This package features the ability to present maps in a very easy to understand format, and is menu driven to increase user

friendliness. These systems have little analytic ability, and do little for the user in terms of database support. These systems are available on many computer platforms, and have an intuitive user interface. While these systems may be appealing for the purpose of rating industrial suitability it is doubtful that they either have the data base needed or the analysis ability to do such a task.

MAP (MAP ANALYSIS PACKAGE)

MAP is a direct descendant from some of the original geographic information systems that were developed. This package is remarkably analytical while remaining relatively simple to use. There is no established database for this software, but like IDRISI this software can be easily modified to read the needed data. MAP is ported to several different machines, but has a relatively coarse presentation ability. While this package can be made to use the data available and clearly has the ability to analyze, the poor presentation ability makes this package less than the ideal choice.

ESRI's ARC/INFO

To many geographic information systems users ARC/INFO represents the culmination of all that geographic information systems should be. This package combines good analysis ability with a good presentation ability to create the package that is quickly becoming the standard of the industry. While the compromise for presentation has limited the analytic ability, ARC/INFO users have developed the user friendliness and the data availability to the point where ARC/INFO is truly a useful tool for land use planning. The sacrifices are hard however. While creating a slope analysis map in MAP would be simple, it is prohibitively difficult in ARC/INFO. The vector orientation of ARC/INFO makes analysis of this type difficult due to the way the information is stored. ARC/INFO release 6.0 for the workstation environment has the new GRID package which is a raster system and was developed to resolve this problem. The data availability and the presentation ability of ARC/INFO still make it the system of choice for this project.

MacDonnell- Douglas GDS

Users of both ARC/INFO and GDS have commented on the similarity of the systems and the incredible power of GDS. This system has presentation ability comparable to ARC/INFO and analytic abilities like that of MAP. This package also features a very advanced (graphical) user interface, but fails when measured in the data availability category. GDS was only introduced recently and so lacks a sufficient database to be useful in this study.

Geographic Resources Analysis Support System (GRASS)

GRASS is a raster based GIS designed to present data on line printers. GRASS was originally developed by the Army Corps of Engineers. While this raster system is public domain it is only a toolbox from which other more powerful functions can be built. Because of the modelling capabilities of GRASS, and the fact that it runs on many hardware platforms, makes this software very appealing. GRASS functions have been defined that allow GRASS to read and interpret remotely sensed (satellite) data from both Landsat and SPOT, but these levels of data may not be appropriate for the level of study being proposed. (GAO, 1990)

Environmental Planning and Programming Language (EPPL-7)

EPPL-7 was developed by the state of Minnesota Land Management Information Center. It is the seventh version of GIS software that has been developed by this group and is available on a number of hardware platforms. EPPL-7 is a raster based system and the years and different versions make this software very well designed and extremely useful. EPPL-7 is available at very little cost (\$500 dollars for a single user site). The drawback to this software is that there is no direct link to the data that this study needs. This would require the study team to build a database from scratch, and therefore makes this software impractical for use in this study.

This section has attempted to relate the issues that the project team had to consider when contemplating which geographic information systems to choose. It was not the intent to review all the geographic information systems software available, but to show a sample of that software. While technical knowledge can supplement user friendliness problems, data availability, presentation ability and analysis ability can not be supplemented into a system without a lot of work. These issues contributed greatly to the selection of ARC/INFO for this project. ARC/INFO is a vector type GIS that has very good analytic abilities along with good presentation abilities. The strongest justification for choosing ARC/INFO is that MassGIS uses ARC/INFO for development of

their 12 layer database. ARC/INFO has also been determined to be the best GIS for this study.

2.2.3 Data Availability

The availability of digital data is perhaps the strongest factor in the choice of a GIS than any other factor (including the actual system costs). This is true because the data is the singularly most expensive part to the system. While there is not a great deal of "canned data" the availability of even some data strongly affects the choice of a system. The cost of acquiring the data if the study team were to build a database of its own would probably be prohibitively expensive.

The model of the Pioneer Valley that was constructed for this project was implemented with the intent of taking advantage of the digital geographic data available within this state. MASSGIS, part of the Executive Office of Environmental Affairs, has been constructing and maintaining a statewide data base which at present includes twelve different data layers. ESRI's ARC/INFO is being used as the standard. Since one of the objectives of the study is to create a transferable model for use statewide, it is necessary to take advantage of a system such as MASSGIS. The data layers provided by MASSGIS are integral to our study.

2.2.4 Implementation of GIS

GIS has been available since the implementation of digital computers. These programs started as simple arrays of values like the raster systems used today, and have been developed to today's technology that combines raster and vector technology. Much of the development that has occurred in GIS technology has occurred as further needs were defined. This development, like computer technology has developed and trickled down in size as machines and software have become cheaper. GIS technology started at the larger levels of government and business and has come down to the level of smaller agencies as the affordability has increased. The next sections look at the implementation of GIS for agencies starting with the federal government and working down through the state level to the regional level.

2.2.4.1 Federal Government GIS

Federal participation in GIS activities is a billion dollar business (GAO, 1990). The roots of GIS are in federal agency efforts to track land use activities. The earliest efforts in this type of programming were in the 1970's, mostly on mainframe computers. They created mostly dot and dash maps that defined the category in terms of a grid cell. While these efforts were good

for analyzing large areas, they required vast amounts of time and the technology made maps that were not very similar to conventional maps. Today 19 federal agencies use GIS of some type, on different sized computers, for vastly different reasons.

Federal agencies have built databases in GIS that include grid cell data from GRASS and other raster systems and vector database systems for programs such as ARC/INFO. These databases have become integral parts of the agencies that use them and are the cornerstone in current land use planning techniques.

The 1991 federal budgeting for GIS related activities reveals the importance that federal agencies are placing on spatial information. The Office of Management and Budget reported as of October 1988 that GIS related activities would cost nearly 165 million dollars annually (GAO, 1990). The federal budget supports this interest in GIS by funding the different types of GIS within the various federal agencies.

Yet the nature of these systems is consistent at this level. While the systems these agencies use are not identical, there is a certain amount of standardization that indicates some ability for inter-agency communication. For instance, nearly all of the federal agencies using GIS have GRASS in some form or another. GRASS provides a standard basis for communication. While the individual agency may have other GIS needs and other GIS software,

GRASS provides an excellent area for mutual use and standard database and software development.

2.2.4.2 State Level GIS - Two Case Studies

With the advent of better hardware and software, the states began getting into the GIS market for land use analysis and planning. One of the leading states in this area was Minnesota. Minnesota began developing its Environmental Planning and Programming Language (EPPL) in 1972. EPPL-1 was implemented on a mainframe and now the latest version, EPPL-7, is available at the PC level (MLMIC 1990). This is a clear example of how technology has moved from large centralized machines into small de-centralized ones. This program has been developed and is marketed for resale by the State of Minnesota Planning Agency. The actual software was reviewed earlier in this document.

EPPL-7 is the center piece of the Minnesota experience, but not the only focal point. In addition to pioneering software development, this state as a whole has done a tremendous amount in terms of data collection and development of data standards. Minnesota has formed the Natural Resource Geographic Information System Consortium. The consortium consists of subcommittees for database development which include committees devoted to Hydrology, Wildlife, Transportation, Soils, Land Use/Land Cover, Land Net and

Forestry. Each subcommittee works to develop their data layer and to insure consistency with the other subcommittees. In addition there are two technical subcommittees. One is devoted entirely to data exchange and the other to GIS standards (NR-GIS 1989).

Another accomplishment of the Minnesota State Planning Agency is its Datanet Plus software. This relatively simple and inexpensive software package is a mapping package with built-in data for use by nearly anyone. The package is largely for mapping of prepackaged data sets, but again, it illustrates Minnesota's commitment to understanding and supplying spatial information (Hanson, 1990).

The Minnesota experience is largely that of a state which has built their own tools for spatial information processing. In addition however, Minnesota is also leading the way in database standards development in an attempt to create an efficient up-to-date model of their state.

The Massachusetts experience is somewhat different than the Minnesota experience. Massachusetts has created a data base using a standard software package. The data base consists of twelve data layers, and while the work is largely a product of a single agency, the Executive Office of Environmental Affairs (EOEA), great care has been taken to assure standards and reasonable accuracy are achieved.

Like Minnesota, the data layers in Massachusetts are largely natural resource related, consisting of the following information: Land Use/Land Cover, Roads, Railroads, Aquifers, Ponds, Streams, etc. These data layers represent the interests of the host office, EOEa, but remain very helpful for use in many fields. Many public and private agencies use the data available through the Massachusetts GIS project. These agencies seem to have followed EOEa in adopting ARC/INFO as their software standard. The data provided by EOEa and MASSGIS is usable on the PC version of ARC/INFO up to the Mainframe version. This flexibility, along with the number of functions or tools available in ARC/INFO, have contributed to the decision to use ARC/INFO in this state.

MassGIS is also a consulting and cartographic services unit. The project team has used consulting as a method to supplement the cost of building the data base. This allows the state agencies and town governments in Massachusetts to perform analysis on GIS without actually purchasing the system and hiring the staff.

MassGIS also serves as a training center for GIS. Using ARC/INFO and their own database, MassGIS provides these training services teaching both technical and management issues involving GIS. These programs are available to anybody and are provide at a nominal fee.

2.2.4.3 Regional Level GIS

The major user of GIS at the regional level in the state of Massachusetts is the Cape Cod Planning Commission. The commission is a PC ARC/INFO user with a single complete workstation. The commission has worked towards developing a regional database and has a fairly complete database for two towns. The common elements of that database are:

- Assessor
- Zoning
- Wetlands
- Species Habitat

These data layers supplement the data available from MASSGIS and while they are only available for two of the commissions dozen towns, this represents a significant effort in producing data for use at the regional level. The commission has recently been given a permanent funding source and has been authorized by the people of Cape Cod to participate in land use policy making. This should further the development of their data and software.

Another useful spatial information system at the regional level is the Massachusetts Water Resources Authority (MWRA). This authority is responsible for the delivery of drinking water and the disposal of waste water for forty four cities and towns in Massachusetts. In addition to this, MWRA has an active role in cleaning up Boston Harbor. MWRA has a Digital Equipment Company VAX 6000. MWRA has

ESRI's ARC/INFO software as well as other software for spatial analysis. By using ARC/INFO, MWRA is able to take advantage of the statewide database available to them from MASSGIS. The decision to use ARC/INFO is difficult for MWRA, because the package does not have some of the engineering capabilities of other packages, the supplemented database was a large part of MWRA's decision to go with ARC/INFO.

2.2.4.4 GIS In The Private Sector

There is an increasing trend towards the use of GIS in private industry. According to a 1990 customer survey, 34% of the GIS that was sold was to private firms. This trend is said to be the result of the emerging workstation environment and of the decreased price of computing in general (Hamilton, interview 1991).

Several other factors have contributed to the increase of Privatized GIS's. These factors include the increased availability of digital data such as TIGER files, the increased use of consulting firms for GIS related tasks, and the increased use of GIS for private tasks. Private tasks may include the siting of a shopping mall or the private search for waste sites.

Many land use planning consultants have embraced GIS technology. The use of GIS has replaced older modeling techniques and has

served as a focal point for developing new ones. Models in land use planning have been constructed that were considered unfeasible before the use of GIS. Software developers and consultants are not only using GIS to improve the old modeling techniques, but are developing models that take advantage of GIS.

Camp, Dresser and McKee (CDM), an international civil engineering and land use planning group, is one private firm that is embracing the use of GIS technology. Recently CDM was contracted by the South Essex Sewer District to help with the siting of a new sewage treatment plant. They performed a site search using GIS, a process that would have taken a tremendous amount of time without the use of a GIS, which revealed 7 sights with potential.

In addition to a normal site search, CDM performed an economic analysis based on costs of transportation, infrastructure and conflicts. This analysis used the GIS to find the additional costs associated with each of the 7 sites. By using a triangular irregular network, which processed the spatial data, the consultants were able to establish "cost lines". These cost lines were then used to rank each sight. The results allowed CDM to narrow the focus even further. This part of the model would have been virtually impossible to complete without the use of a GIS (Interview with April Nichols, CDM GIS Manager, May 1991).

2.3 Conclusion

This chapter had two purposes essential for the completion of this report. The first was to gather data necessary for the development and calibration of the suitability model. The second purpose was to provide information on the recent trends in industrial development and zoning to assist towns revising their current zoning and trying to attract industry to their community.

The review and assessment of the data layers available from MassGIS made it apparent that the creation of a suitability model utilizing existing state-wide data was possible. The data layers needed for such an assessment including land use, roads, and aquifers was available and at a scale and accuracy that made it useful for the model. The additional data necessary, most important slope and soils, was assessed and found useable. The realization from analyzing this data source was the time constraint involved with digitizing the soils data. Because of this information the application of the second phase of the model will now have to be limited to two towns.

The understanding of the METLAND model and the use of it as the basis for developing the Industrial Suitability Model will increase the validity of the model's results. The METLAND Research Group has been rating land suitability for 20 years, so many of the METLAND suitability models have been thoroughly tested.

The review of the two case studies, The Blackstone River Valley and the City of Chicopee, have proved valuable in two ways. The first is the use of some of their factors for assessing industrial land such as ownership and proximity to transportation systems. The other value gained was in seeing how limiting their techniques for assessment were because the assessments did not involve the use of sufficient spatial information or the use of currently available data bases. The reports did not explain how the acreage remaining after unsuitable lands were eliminated was calculated, nor did they have the ability to produce maps as found in this report.

The evaluation and review of several Geographic Information Systems and their application is both a source of information for communities looking toward GIS for their town and to evaluate the best system to use for this study. ARC/INFO's analytical and presentation abilities, along with the data available for this system has made it the obvious choice for this study.

Geographic Information Systems are a growing trend, and the application of this new technology in the field of Planning and land use decision making is still in its infancy. It is obvious from this research that this technology can and needs to be applied to the assessment of industrial lands. What is also apparent is towns need to be proactive in attracting industry to their

community. The application of GIS technology can provide the information towns need to attract industry to their community.

Indeed, this State of the Art provides the study team with a sufficient basis for the development of a useful process to assess the suitability of existing lands zoned for industry. The process advocated by this study can even more appropriately be used to find future industrial land prior to zoning it. This way the land zoned industrial would be much more suitable for industry than those which are zoned without such suitability assessment

3. METHODS

This chapter describes the methods by which the study was accomplished. Data Development, Section 3.1, describes how specific data layers were developed that were not readily available from MassGIS. The two main priorities in developing these data layers was to use sources and techniques that were as accurate as possible and to create this digital information in an economical and timely manner.

These two priorities are often at opposite ends of the spectrum since often using the quick approach to data development is the most inaccurate. This was why the research from Chapter 2 was so important in developing these data layers. Without understanding the accuracy of the source data, how it was developed, and understanding the accuracy limits of the source data, any results that were derived from data would be highly questionable.

The Industrial Suitability Model, Section 3.2, describes how the model was developed and operates. The model consists of two phases, with each phase following specific steps by which it assesses the data. Maps and data are produced in both phases

during several different steps. Phase One, Identify is a five step procedure and Phase Two, Suitability, is four part procedure with each part following a specified number of steps.

The information gathered from Chapter 2 was essential for creating and calibrating the model. The METLAND "cookbook" approach for assessing land was followed closely, its procedure having passed the test of time. The two case studies provided information as to the types of criteria to use for evaluating industrial lands. The study of industrial trends helped determine the final suitability categories, *Suited for All Industry*, *Suited for Light Industry*, and *Not Suited For Industry*.

The uniqueness of this approach, compared to the two case studies from Chapter 2, is the utilization of a Geographic Information System. What also makes this model unique is the use of readily available data for that system. This was done to allow the model to be run statewide, and make the development and operation of the system economically feasible and possible. This model, data development and all, was designed, developed, and functioning in four months. Without utilizing existing data, this would have been impossible. The use of a GIS was essential for producing the type of information presented in Chapter 4.

3.1 Data Development

Although much of the data used for this study was obtained from MassGIS as discussed in Section 2.1.3, several data layers had to be created and/or interpreted from other sources. The two most complex data layers to manage were the slope and parcel data. Slope because of the interpretation necessary to derive a slope and parcel data because of the enormous time constraints involved in digitizing individual parcels. Obtaining slope data offers several alternatives. Those alternatives are described below followed by a description of the two methods for obtaining the parcel information and the process used for digitizing the industrial zoning.

3.1.1 Zoning

The zoning data layer is composed of data digitized by the project team. The source data is comprised of zoning maps of each town. Each town with formal industrial zones is digitized. The digitizing process is three phased. Phase one is to select the town with zoning to be digitized out of the town boundaries file. The next phase is to add tic registration points to the town boundaries and digitize the zoning. The third phase is to look at the digitized zoning and to create a checkplot. The checkplot is matched against the original source map to determine its accuracy.

Since only the industrial zones need to be digitized, the attributes for the zoning are fairly simple to assign. Any zone that is industrial in its by right use is simply indicated with an 'IND.' in the ZONETYPE data field. Those areas in a town that are not industrial are simply indicated with a blank in the ZONETYPE data field.

3.1.2 Slope

In the process of constructing a suitable model several methods of finding slope were attempted. The process was to investigate different procedures for interpreting slope and to decide upon the proper slope calculation method.

One of the major factors rating land suitability is the study and classification of slope. Slope is the ratio of the change in elevation over a given distance of land. This ratio is written as rise over run (rise/run). The difficulty of creating a slope map is that the slope categories must be interpreted to a ratio based on the distance between elevation contours. There are a number of methods for interpreting elevation contours for designating the slope of an area. The study team investigated several possible methods and the results are reported below.

The first method considered was the use of USGS digital elevation models (DEMs). The USGS is in the process of creating these models for all lands they have coverages for. The DEM can be easily interpreted to a slope map, and are accurate enough to be useful for this study. Currently they have only selected areas available. Unfortunately our study area has not been completed by USGS.

The second method is to attempt to create a DEM by taking X,Y and Z coordinates from certain points in the area and interpolating this into a contour map. Then a slope map can be interpreted from that. This method is very viable except that it requires a great degree of accuracy on the part of the X,Y and Z coordinates. This type of accuracy would require a great deal of field work that is not feasible for this study. This requirement for field work eliminates this option.

The third method attempted was to create a slope map by interpreting a USGS quad map into a slope map using a mechanical "slope jig". A slope jig is a measuring scale with the calculated slope ratio on it. The difficulty is in the application of the jig. On a standard 1:25000 scale USGS map with 10 foot elevation contours, a 3 percent slope is approximately 1/10th of an inch apart, and the greater slopes are even closer together. Attempting to interpret slope at this scale is highly inaccurate, the reliability and validity of the results being highly questionable.

The fourth option is to use the slope classification found in the Soil Conservation Service soil surveys. While there are known inaccuracies in this method, this option appears to be the only viable option for this study given time, scale, technological, and financial constraints. Future methods of slope classification will revolutionize the methods used by industry and this study, however until those methods become available the interpretation of slope from soil surveys is our only viable and feasible option for this project.

3.1.3 Parcels

The parcel data is difficult to obtain because it is available only at the town level and is broken down onto several, sometimes dozens of maps. They are usually at a very large scale of 1" = 40' or 1:4,800. This, combined with the fact that these maps are usually difficult to obtain, make digitizing the parcels an arduous task. Time constraints alone making digitizing the parcel infeasible for this study. Since the parcels have an RF of 1:4800 this data layer will have a much finer resolution than the rest of the study and may contribute to a belief in the accuracy of the study that is simply not supported by the other data.

It is for these reasons that the parcels have been viewed in two different ways. First by utilizing digitized parcels, and second

by simply counting the amount of parcels in the industrial zone and producing an average parcel size estimate for the entire industrial zone.

The source rectification, digitization procedure was estimated to take approximately 10 hrs time for a 300 acre industrial zone. This is considerably longer than the .5 hour that it took to actually count the parcels in the zone and divide by the overall acreage of the industrial zone.

The difference between the two types of parcel information used by the study is in the rating of the zone regarding its parcel size. By digitizing the parcels an actual median can be calculated. The other method of counting the parcels and calculating an average can be considered less accurate as it does not account for the character of the parcels only the number in the industrial zone.

Comparing the two methods of measurement reveals that there is some difference between the systems. For example using the entire town of Southampton as a basis, experiments to find the average parcel size and the median parcel size were conducted. For the entire town of Southampton the average parcel size is 7.6 acres, however the median parcel size is 1.2 acres. Further examination of the parcels reveals that the amount of land consumed over the median is 95%. This in conjunction with the fact that the largest parcel in the town is 1842.5 acres indicates that there are a number of

large parcels in the sample, and that the parcel index for the entire town should be high, meaning large parcels.

Examining the industrial zone in Southampton reveals that there are similar characteristics. The median parcel size is 1.08 acres, The average parcel size is 6.35 acres. and the largest parcel is 66.721 acres. The amount of land consumed by parcels larger than the median is 96% while the amount of land consumed by parcels larger than the average is 82%. These numbers combined with the presence of the 66 acre parcel indicates that this industrial zone should have a high overall parcel rating. This indicates a favorable ownership pattern. Less owners of an area of land make consolidating that land easier.

The final method of parcel rating is the simple counting technique. By finding the approximate number of parcels in the study area and calculating the percent of land in terms of a parcel land use pattern, an estimate can be made about the number of owners within the area. Using average parcel size, by dividing the total area by the number of parcels counted, instead of using the mean parcel size (digitized parcel data is needed to determine mean), an ownership rating can be determined.

While the counting technique is not as accurate as the digitizing and parcel index technique, the time differentiation, no parcel

digitization is necessary, may make the difference with which technique is used.

Methods for finding slopes and parcels have been discussed in this section. As there are numerous methods for finding each, and different accuracy issues that come with each, the study has focused on finding the appropriate one for each. This study used the parcel counting technique for evaluating ownership and interpreted slopes from the SCS soils data. The research in this section presents alternative methods that may be used for other purposes.

3.2 The Industrial Suitability Model

The suitability model developed for this project has several key aspects. It uses readily available data which is produced for the entire state. This enables the transfer of this model to the state level in a relatively simple operation. The model is done in two phases with each phase and intermediate parts producing specific results (See Chart # 3.1). Phase One is Identify and Phase Two is Suitability. This two phased process allows for added interpretation of the results and to understand at what level land becomes unsuitable for industrial development.

INDUSTRIAL SUITABILITY MODEL

OVERVIEW OF MODEL

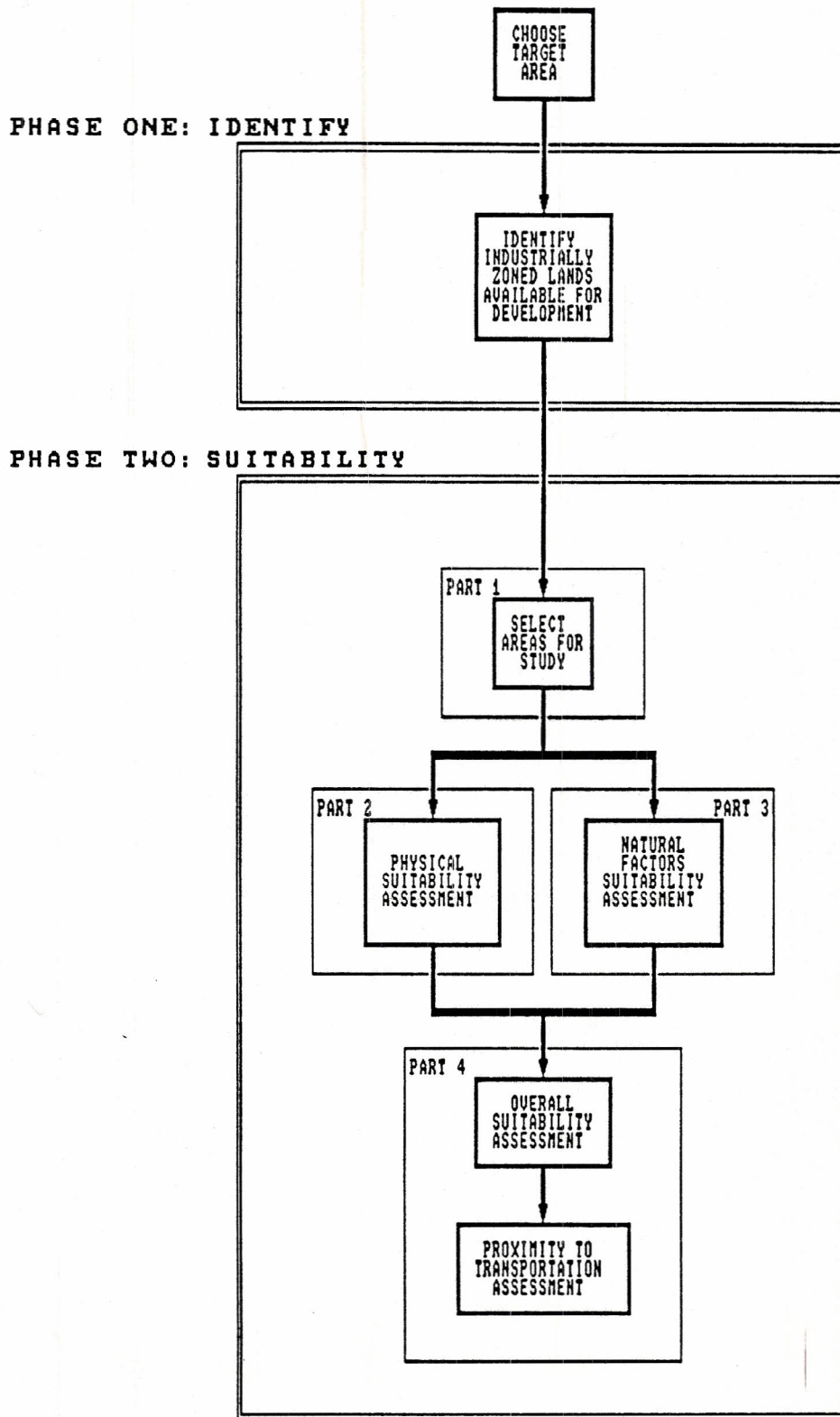


CHART # 3.1

This model is designed to be carried out at the regional level. Therefore the information produced should not be used to determine an individual sites specific suitability for sevelopment. The information is for towns to assess their current industrial zoning and for assessing large areas of land as to their general suitability. The following sections describe how the suitability model is carried out.

3.2.1 Phase One: Identify

The purpose of this phase is to examine the entire study area, find the formal industrial zones, and then to assess the information in the industrial zones as to their land use, size, and proximity to transportation networks to identify lands available for industrial development that are zoned industrial. The results of this phase are carried out in 5 steps.

- STEP 1: Survey Towns
- STEP 2: Digitize Industrial Zoning
- STEP 3: Identify and Aggregate Land Uses
- STEP 4: Mapping Data
- STEP 5: Proximity to Transportation Corridors

Steps 1 to 3 create the study area for Phase Two by ruling out the majority of land unavailable for industrial development and further focusing the study to specific areas based on availability and size of the are. Steps 4 and 5 provide statistical information for the whole study area. The region is assessed looking at the acreage of land for each aggregated land use type within the industrially

zoned lands of the Pioneer Valley (see Chapter 3 on land use aggregation). These statistics are compiled for the entire region and each town within the study area. Further study is then done to determine the amount of land within 1,000 feet of existing rail lines and within 1 mile of existing major roads. Chart # 3.2, located at the end of this section, diagrams this procedure.

STEP 1: Survey Towns

Step 1 in the Identify Phase is to survey the towns within the study area looking for formal industrial zones. This step is done by surveying the local and regional planning agencies. The information requested for each town included :

1. Does the town have industrial zones ?
2. Does the town have a zoning map showing the industrial zones?
3. What is the scale, date and source of the zoning map?
4. Can a copy of the zoning map be obtained ?

The product from the survey is a collection of town maps that have industrial zones. These maps can then be used as source maps for digitizing the zoning.

STEP 2: Digitize Industrial Zoning

The survey of towns yields an inventory of towns with industrial zones. The survey also yields a stack of maps, that can be digitized. The digitizing process, when complete, allows a reading

of both area and perimeter for each industrial zone. The zoning data is constructed for each town and then compiled to give a measured number of industrially zoned acres for the entire study area. The zoning is digitized into a town boundary coverage from MassGIS. The source for these boundaries is from USGS quad sheets (See Section 2.1.3.6 of this report) so the projection for the zoning is corrected to State Plane Coordinates.

STEP 3: Identify and Aggregate Land Uses

Working from the town by town zoning, the industrial zones can be examined for their 1985 land uses. The land uses are available for the state and are surveyed from aerial photographs. The 21 land use classes can be aggregated into broader categories for use.

The Land Use/Land Cover data available from The University of Massachusetts Resource Mapping unit is divided into 21 different categories. Those categories reflect different land use types as interpreted from stereo aerial photo pairs. These are categorized in the following table.

UMASS Resource Mapping Land Use Categories

1	Intensive Agriculture	12	Medium Residential
2	Extensive Agriculture	13	Light Residential
3	Forest	14	Salt Wetlands
4	Fresh Wetlands	15	Commercial
5	Mining	16	Industrial
6	Open Lands	17	Open and Public Space
7	Participation Recreation	18	Transportation
8	Spectator Recreation	19	Waste Disposal
9	Water based Recreation	20	Water
10	Multi-Family Residential	21	Woody Perrenials
11	Dense Residential		

TABLE # 3.1

These 21 categories are to be aggregated into 5 categories. These five categories are designed to describe land use as it specifically addresses an industrial zone. Those aggregated categories are:

Aggregated Land Use Categories

1	Proper Use	(existing industrial land use in an industrial zone)
2	Conflicting Use	(existing non-industrial use in the zone)
3	Wetlands and Water	
4	Available	(land use types that could be developed)
5	Commercial	(existing)

TABLE # 3.2

The complete aggregation was determined by assigning each of the land use types to one of the aggregated uses. The following table illustrates the aggregation.

Land Use by Aggregation

Aggregate Category

Land Use Category

1 Proper use	Industrial
2 Conflicting use	Mining, Participation Recreation, Spectator Recreation, Water based Recreation, Multi-Family Residential, Dense Residential, Medium Residential, Light Residential, Waste Disposal
3 Wetlands and Water	Fresh Wetlands, Salt Wetlands, Water
4 Available	Intensive Agriculture, Extensive Agriculture, Forest, Open Lands, Woody Perennials
5 Commercial	Commercial

TABLE # 3.3

These aggregated uses fulfill the needs of this study. By eliminating the land that is already in use, the study can focus on only those areas still available for development. Commercial is separated out in the aggregation because it is postulated that this area could more easily be converted back to industrial use at a future time than could residential. Non-forested wetlands and water features are eliminated from the study at this point as well.

Grouping agricultural uses in the study area does not constitute a value judgment. It simply acknowledges the development trends of the past and the ease with which agricultural land can be developed to a more intense use.

STEP 4: Mapping Data

An identification map is made for each town based on its zoning map and the land use data. This map shows the town's industrial zones, and the relation of those zones to the town boundaries, major roads, and railroads within the town. The map is shaded to reflect the five aggregated land use classes; Proper use, Conflicting use, Water or Wetlands, Commercial use, and Available. The map is completed with text describing the acreage of the aggregated land uses in the industrial zones, and the percentage of that use. The graphs following each map show the relationship between the amount of industrially zoned land currently being used for industry compared to the other aggregated land uses.

After the town level work is done, the aggregated industrial land uses are compiled for the entire study area. This process allows the entire study area to be mapped and analyzed. This map is presented in a similar format to the town level maps with all five categories being graphically depicted, and the amount of land in each category presented in a table on the map. This map is difficult to present at the report size, and is replicated in a large format (36" X 48" map). This map further illustrates the land use relationship within industrial lands in the context of the entire valley.

Finally available lands can be identified by their size, and grouped into three categories. Available lands that have a

contiguous size of less than 50 acres are aggregated into one category, land areas greater than 50 acres but less than 100 acres are grouped into another category and available land areas greater than 100 contiguous acres are identified as a third category. The map also textually conveys the amount of land that is in each size classification.

STEP 5: Proximity to Transportation Corridors

Additionally at the regional level, the "available" lands can be counted in terms of the land masses relation to the existing transportation. This map shows the "available" lands, the railroad buffer at 1000 feet around existing rails, and the major roads buffer at 1 mile. Text describes the amount of available land within the rail buffer, the amount of available land within the major road buffers and the amount of available land outside both buffers. This map is used to illustrate the proximity of the industrial lands to existing transportation systems.

The Identify Phase of the study is designed to eliminate from further analysis industrial lands that are not available for development. The steps of the Identify phase have helped the selection process by identifying lands to rate in terms of their industrial suitability. This phase has also provided useful information as to how lands zoned industrial in the Pioneer Valley are being used.

PHASE ONE: IDENTIFY

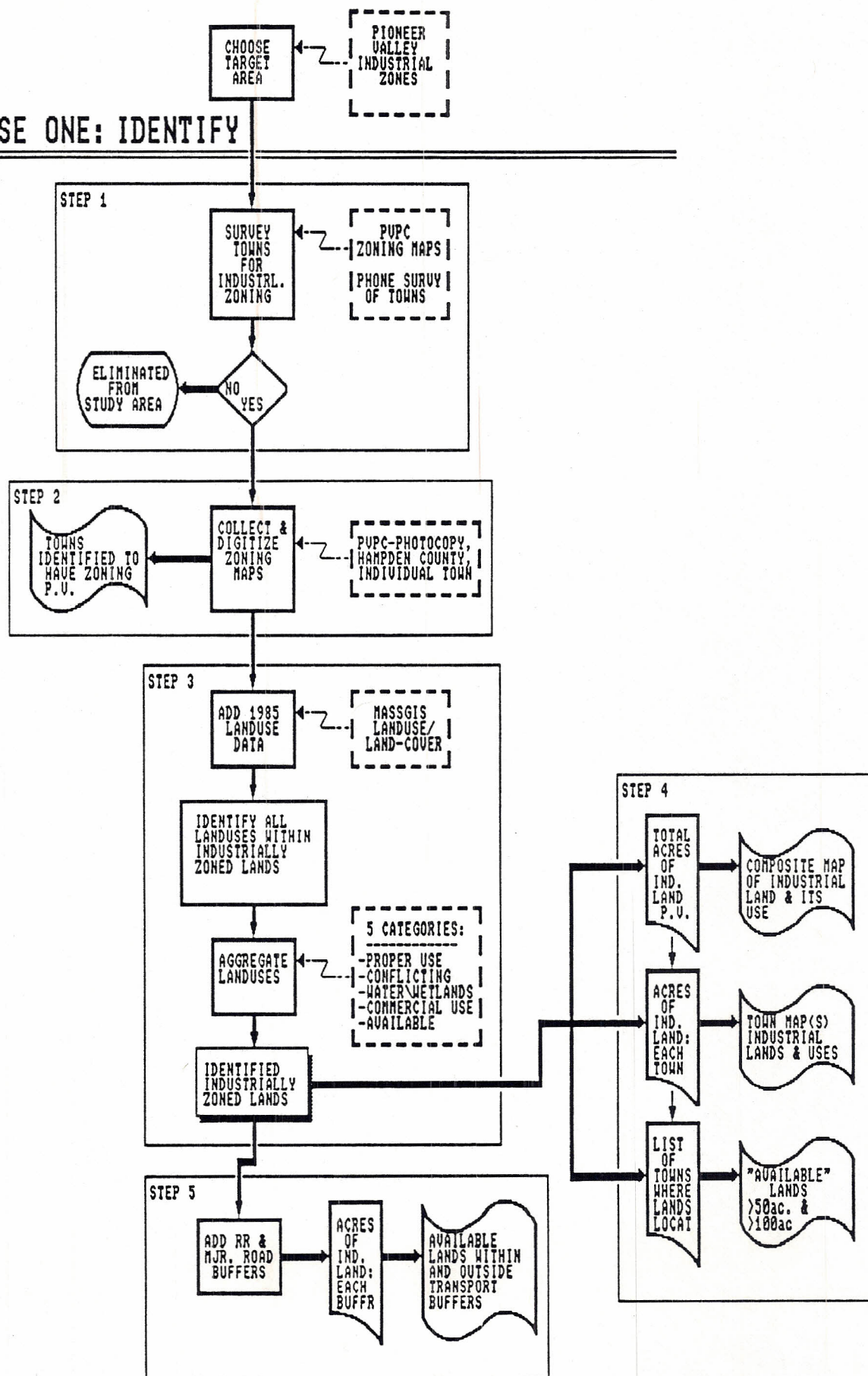
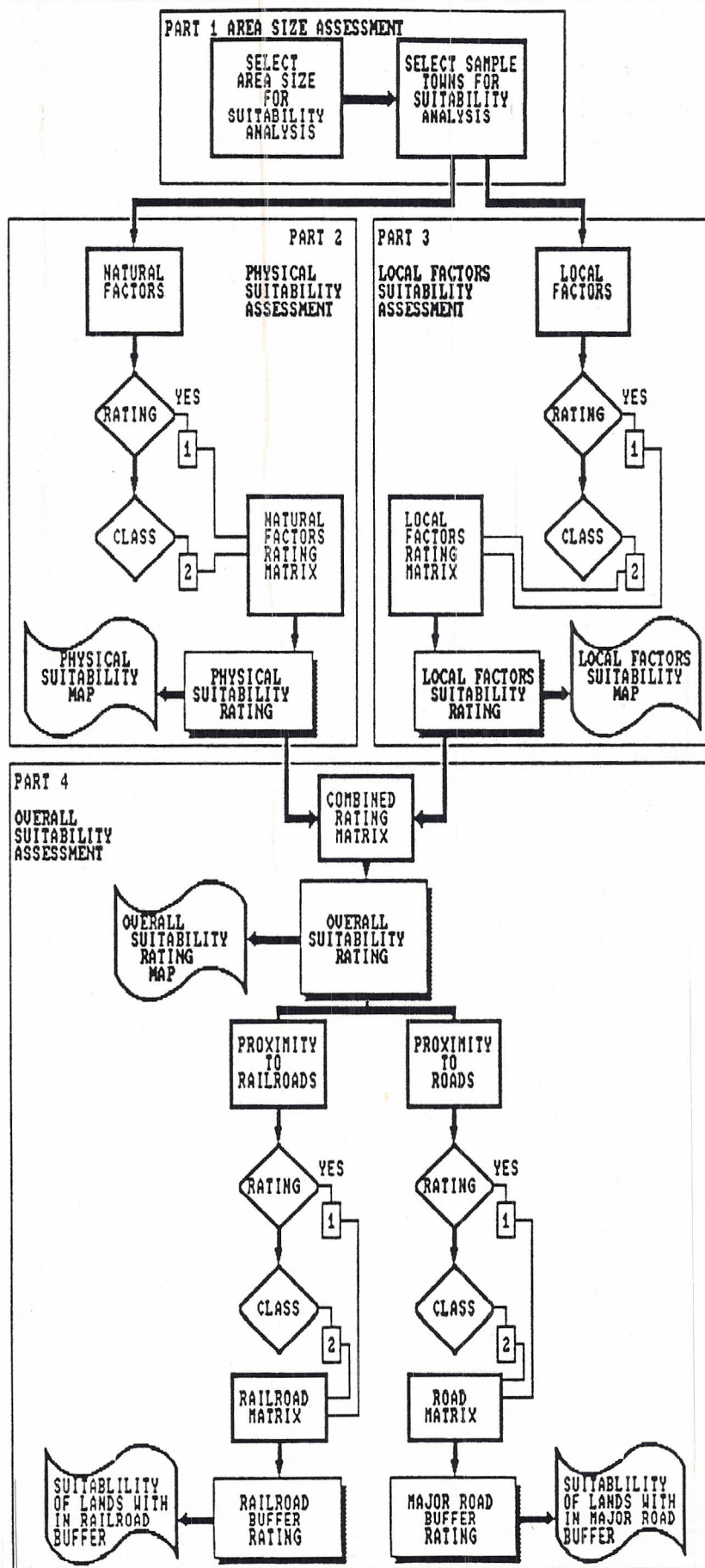


CHART # 3.2

3.2.2 Phase Two: Suitability Assessment

The Identify Phase located the lands in the Pioneer Valley that were zoned industrial and were "available" for development. That is vacant industrially zoned land. The Suitability Phase assesses only identified available lands, categorizing it into three different suitability classes; *Suitable for All Industry*, *Suitable for Light Industry*, and *Not Suitable for Industry*. . This four-part assessment consists of Part 1; selecting the appropriate minimum size for an area in order for it to be assessed, Part 2; rating the natural factors, Part 3; rating factors within local control, and Part 4; an overall proximity assessment and assesment to both major roads and railroads on the land determined to be suitable for development. The following flow chart, Chart # 3.3, illustrates this procedure. The following sections describe in greater detail how the three suitability ratings were carried out.

PHASE TWO: SUITABILITY



KEY :

[DESCRIPTION BOX]

PROCESS

NEW COVERAGE CREATED

MAP COMPOSITION

AGG. DATA FROM MAPS

CHART # 3.3

3.2.2.1 Part 1: Area Size Assessment

STEP 1: Select Area Size

First the "Identified Industrially Zoned" lands are categorized into three mutually exclusive classes based on their contiguous acreage, over 100 acres, between 50 and 100 acres, and the less than 50 acres. The assumption is that industrial land less than 50 acres is not enough land mass to economically develop for industry and the preferred size is at least 100 acres. The case studies and experts interviewed support this classification (See Chapter 2 of this report).

STEP 2: Select Towns

The project team chose two areas over 100 acres as the test sites for running the suitability model. The Southampton site was chosen because the added digital data needed for this phase already existed. The University of Massachusetts Resource Mapping Unit had complete data layers for the entire town that were easily utilized in our assessment. Belchertown was the other site chosen. The Belchertown site fit the requirements and was suitable for comparison with the Southampton site. The following chart illustrates this procedure.

PHASE TWO: SUITABILITY

PART 1: AREA SIZE ASSESSMENT

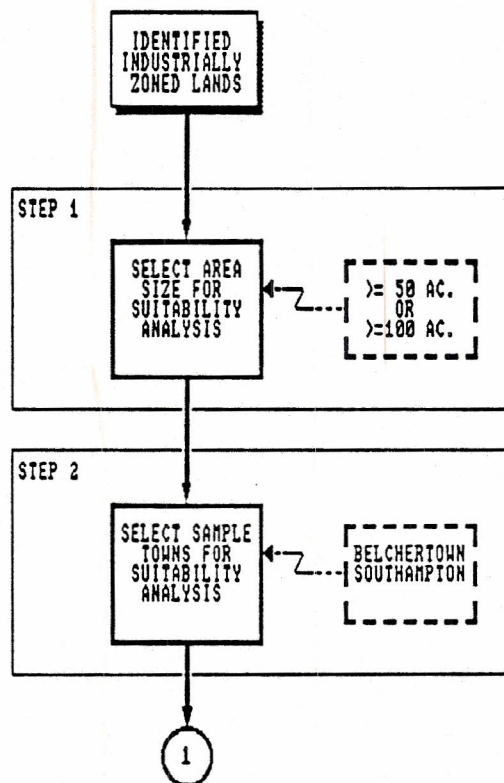


CHART # 3.4

3.2.2.1 Part 2: Physical Suitability

Part 2, Physical Suitability looks at the following natural factors: Slope Classification, Soil Engineering Ratings, Aquifer Recharge Areas, Non-Forested Wetlands, and Open Space. These factors are entered into the database as different layers. The different factors are then segregated into different classes based on standard suitability ratings and knowledge gained through our state-of-the-art research. The results are then mapped, showing the rated areas and their acreage. Chart # 3.5 on the next page shows how each of the six steps are carried out.

PHASE TWO: SUITABILITY

PART 2: PHYSICAL SUITABILITY

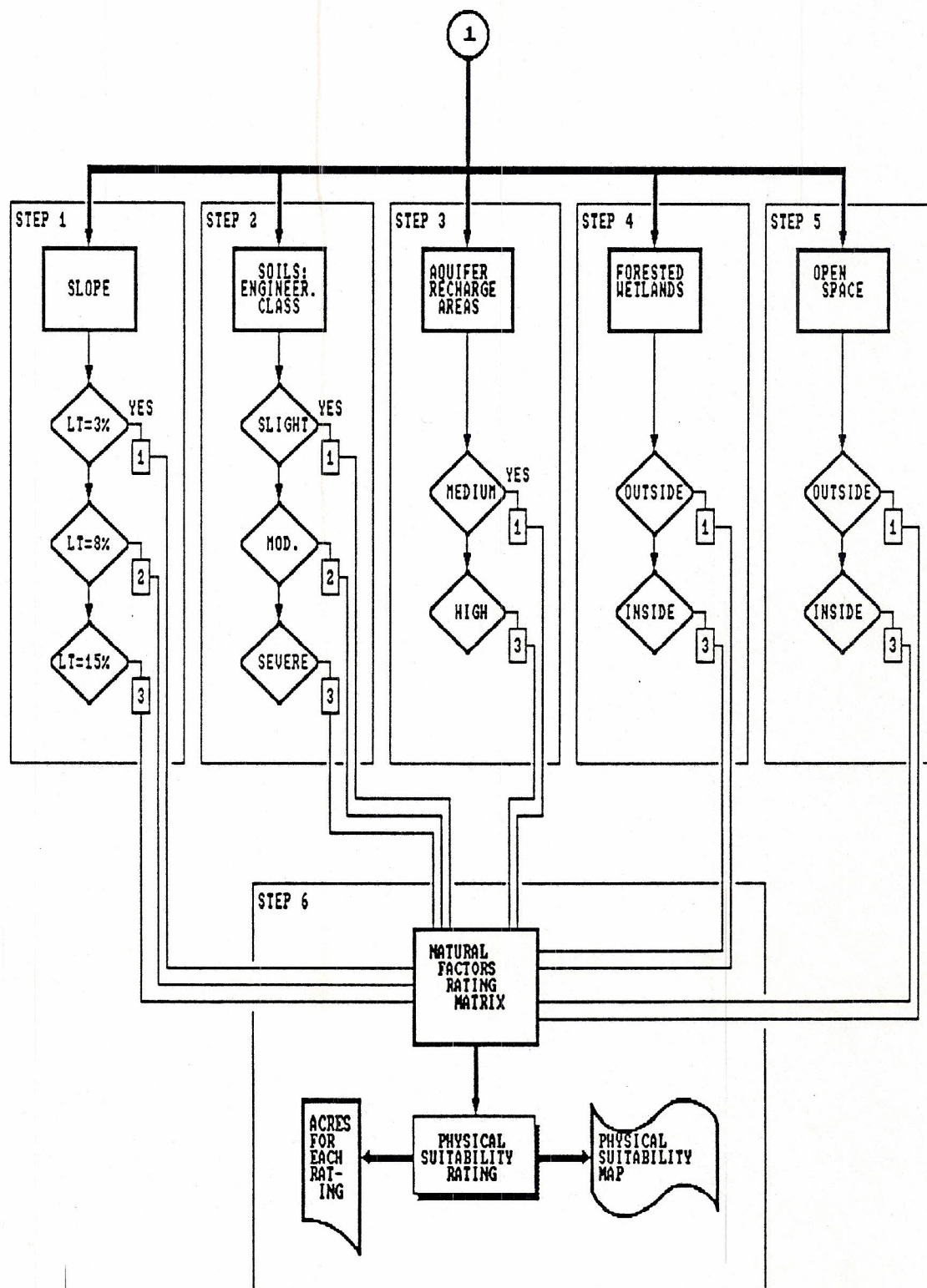


CHART # 3.5

STEP 1: Slope Classification

The slope is classified into four categories, less than 3%, 3-8%, 8-15%, and greater than 15%. Slopes over 15% are considered too costly to build on and are eliminated from analysis. Slopes less than 3% are significant in that they are suitable for rail access. Trains cannot travel on slopes greater than 3%. A 3% slope is also ideal for large warehouse or manufacturing/assembling facilities. Modern factories are horizontal in nature. It is less expensive to move materials on one level, therefore a large building footprint is required. The more grading that is necessary to level a site, the more expensive the plant is to build. This is why the lower slope categories receive the higher suitability rating. Light and smaller industries do not fit this trend so the slope rating is not as critical a factor.

STEP 2: Soil Classification

The soil engineering classes are broken down per the Soil Survey rating, slight, moderate, and severe. This is discussed in section 2.1.3.1.

STEP 3: Aquifer Recharge Classification

STEP 4: Forested Wetlands Classification

STEP 5: Open Space Classification

The last three factors, Aquifer Recharge, Forested Wetlands, and Open Space, are rated in an "all or none" fashion. The aquifer coverage is either in a high or medium recharge area. Land within a high recharge area is considered unsuitable for development

because industrial development within these areas is seen as too great of a threat to the ground water. The other two factors are classified in the same manner. If the area is a forested wetland or public open space, it is designated not available for development.

STEP 6: Rating of Natural Factors

The first two factors, Slope and Soils, are now combined in the first stage of the two stage *Natural Factors Rating Matrix*, Table 3.4. Soils designated severe and slopes over 15% are considered unsuitable for development. The remaining classifications are put into the second stage of the *Natural Factors Rating Matrix* which combines all the factors to come up with a Physical Suitability Rating. The matrix shows this graphically. The final physical suitability rating is then mapped, with the acreages displayed for each rating category.

PART 2: PHYSICAL SUITABILITY

NATURAL FACTORS RATING MATRIX

STEP 6

- 1 = Suitable for All Industry
- 2 = Suitable for Light Industry
- 3 = Not Suitable for Industry

STAGE 1

		SOIL ENGINEERING CLASS		
		SLIGHT	MOD.	SEVERE
SLOPE	0 - 3%	1	1	2
	3 - 8%	1	2	2
	8 - 15%	2	2	3
	< 15%	3	3	3

STAGE 2

		STAGE 1 RATINGS		
		1	2	3
AQUIFER RECHARGE	MOD.			
FOREST WETLANDS	OUTSIDE	1	2	3
OPEN SPACE	OUTSIDE			
AQUIFER RECHARGE	SEVERE			
FOREST WETLANDS	INSIDE	3	3	3
OPEN SPACE	INSIDE			

TABLE # 3.4

3.2.2.3 Part 3: Local Factors Suitability

The local factors are classified much the same way as the physical suitability, although analyzing the data and placing it into the various classifications requires statistical interpretation of the information. The three "local" factors examined were Conflict with Neighbors, Ownership, and Sewers. Chart # 3.6 on the next page illustrates this procedure. The following describes in greater detail how the statistical process for determining the factor classifications was carried out.

STEP 1: Determination of Land Use Conflicts

The same process that was used to aggregate the land use categories in the Identify Phase was repeated to aggregate the land uses into conflict rating classifications. Here again are the 21 original land use categories:

UMASS Resource Mapping Land Use Categories

1	Intensive Agriculture	12	Medium Residential
2	Extensive Agriculture	13	Light Residential
3	Forest	14	Salt Wetlands
4	Fresh Wetlands	15	Commercial
5	Mining	16	Industrial
6	Open Lands	17	Open and Public Space
7	Participation Recreation	18	Transportation
8	Spectator Recreation	19	Waste Disposal
9	Water based Recreation	20	Water
10	Multi-Family Residential	21	Woody Perrenials
11	Dense Residential		

TABLE # 3.5

PHASE TWO: SUITABILITY

PART 3: LOCAL FACTORS SUITABILITY

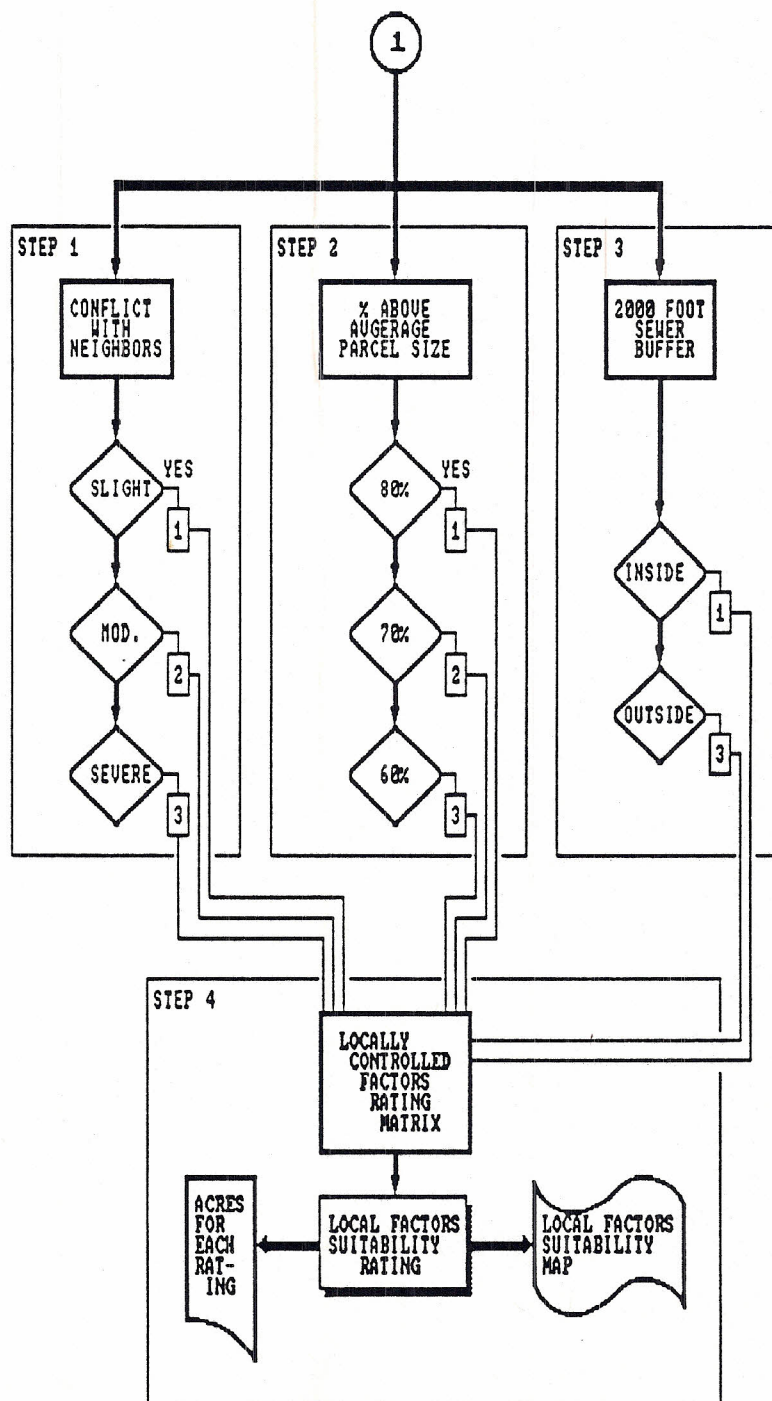


CHART # 3.6

Given these 21 categories, the study team then looked at each land use in terms of its potential for conflict, or hostility towards industrial development within the zone. The irony of the situation is apparent. Land uses that are in conflict with the actual zoning on the land (Industrial) can prevent industry from building through political pressure and other means.

By buffering the industrial zone to 1,000' and looking at the land uses, three types of conflict were determined. They are as follows:

1. **Low Conflict:** Land uses with little or no conflict towards industrial development.
2. **Moderate Conflict:** Land uses that would not produce actively hostile neighbors, but are not complementary to an industrial use.
3. **High conflict:** Land uses that are likely to produce hostile neighbors and are inherently incompatible with an industrial use.

Conflict Categories

<u>Conflict rating</u>	<u>Land use category</u>
Low conflict:	Commercial, Transportation, Mining, Waste Disposal
Moderate conflict:	Intensive Agriculture, Extensive Agriculture, Forest, Open Lands, Woody Perennials
High conflict:	Fresh Wetlands, Participation Recreation, Spectator Recreation, Water based Recreation, Multi-Family Residential, Dense Residential, Medium Residential, Light Residential, Salt Wetlands, Open and Public Space, Water

TABLE # 3.6

The result of this system looks similar to a donut. The available land under study is encircled by the buffered land uses surrounding the industrial zone. These are the areas analyzed as to their potential conflict. The final step to be created is a conflict "index" for the entire industrial zone.

The determination of a conflict "index" is to simply take the acreage of each type of conflict and determine the percentage of the entire area each conflict classification represents. Simple rules have been determined to define the overall parcel index. They are as follows:

If more than 33 percent of the area surrounding an industrial zone is rated "high" then the overall parcel index is "High".

If more than 50 percent of the area surrounding an industrial zone is rated "low" then the overall parcel index is "Low".

"Moderate" is assigned to any area not fulfilling one of the two first categories.

If both high and low are determined to be appropriate then high is assigned to the overall parcel index.

The reason for applying the "High" rating is that if more than a third of the surrounding area has the potential to be actively opposed to industrial development, then the area is likely to be of a high conflict potential.

The reasoning for the "Low" rating is that if 50 percent of an area is already of low industrial conflict, then the area is likely to allow added industrial development.

STEP 2: Classification of Ownership Rating

Ownership was the second factor considered. The purpose for looking at ownership is the premise that the greater the number of owners of a particular area, the more difficult it is to assemble the land for development (Section 2.1.4.1 The Blackstone River Valley).

The ownership rating was estimated from a count of the parcels contained within the available industrial area being studied. The total acreage of the industrial area being studied was divided by the parcel count to get an average parcel size. Looking at the percentage of parcels above the average parcel size then gave the project team an estimation of the number of parcels within the area relative to their size. It is assumed that having a few large parcels within an area will make land assembly easier (Section 2.1.4.1 The Blackstone River Valley). Therefore this process gives a more accurate estimate of the ownership difficulty than going by a straight parcel count. The 80, 70, 60 percent ownership classifications were chosen to represent the difference in parcel sizes and their relative difficulty for assembly. The process for acquiring and analyzing this data, and its accuracy relative to other techniques, is discussed in Section 3.1.1 Data Input.

Using the average parcel size the team needed only to count the number of parcels within the area. This accomplished two objectives. It decreased the time needed for data gathering by an estimated 95% (Digitizing of the parcel map is not necessary), allowing this factor to be evaluated, and it increased the ability of this process to be implemented on a state wide basis. Again, the process for acquiring and analyzing this data, and its accuracy relative to other techniques, is discussed in Section 3.1.1 Data Input.

Time constraints also prevented the project team from actually checking the ownership names from the assessors list for repetitious owners. As this process is only to get an estimation of the potential conflict, and the process is designed to be readily implemented at the state level, the time savings relative to the accuracy lost is reasonable.

STEP 3: Proximity to Sewer

The sewer rating is similar to the transportation ratings. The sewers were digitized as a coverage and a 2,000 foot buffer was placed around the line. Land was then evaluated as either inside or outside the buffer. Land inside the buffer was given the higher rating because the cost for hooking into the sewer system would be less. It is assumed that any industry developing in the valley will have to use a sewer system to avoid breaching any

environmental laws or regulations. Sewer systems are generally required for any type of industrial development.

STEP 4: Rating of Local Factors

The different ratings for each of the local factors are then compiled in a rating's matrix as was used in Suitability 1. This "Locally Controlled Factors Rating Matrix" is shown in Table # 3.7. The resulting ratings classifications are mapped listing the acreage for each rating.

PART 3: LOCAL RAT. MATRIX TABLE # 3.7

3.2.2.4 Part 4: Overall Suitability Rating

The Overall Suitability Rating combines the ratings from Part's 2 and 3 creating a composite suitability assessment. This rating is then evaluated as to its proximity to the rail and major road networks in the valley. This is illustrated in Chart # 3.7.

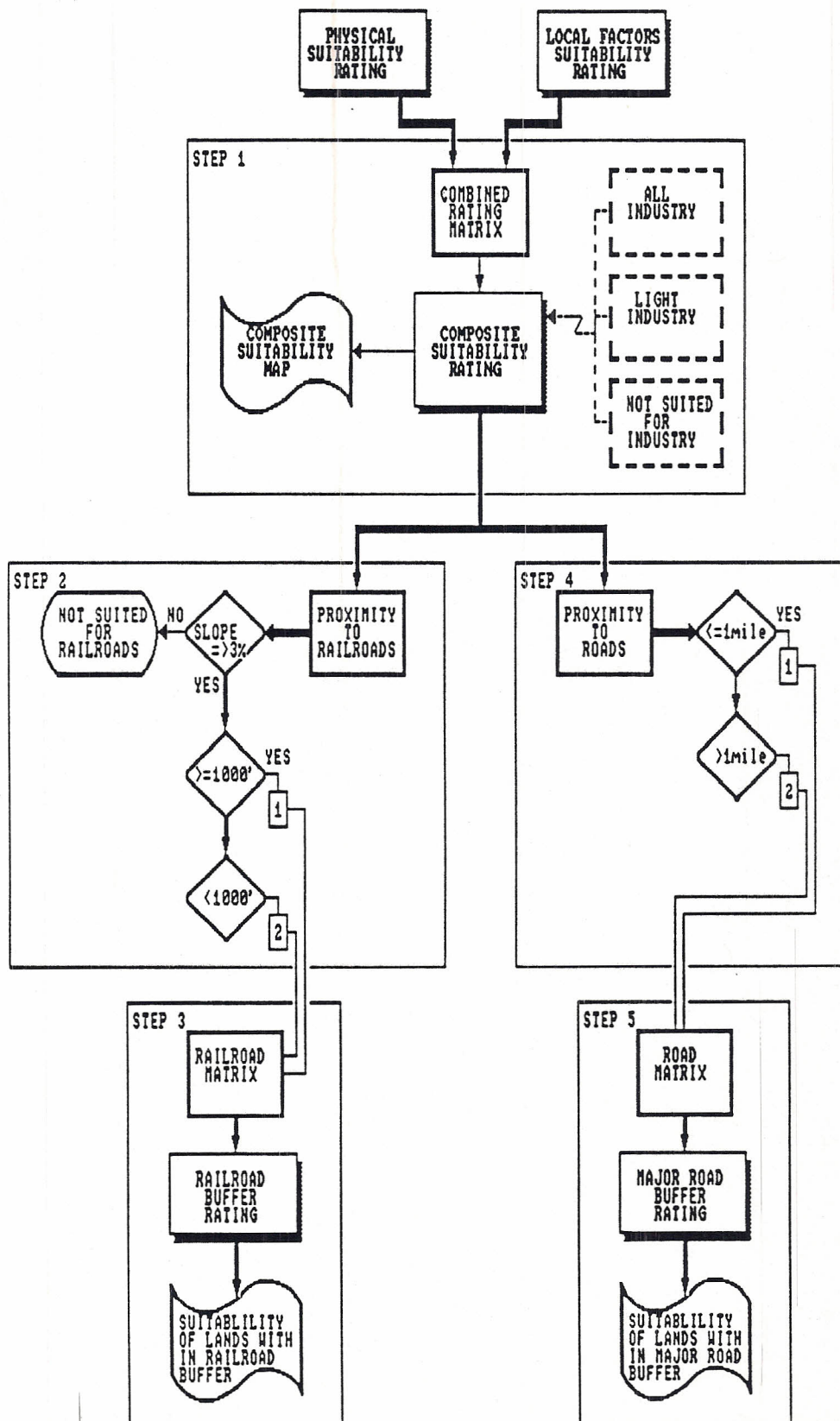
STEP 1: Combined Suitability Rating

The overall suitability is a simple process of combining the two previous rating categories in a "Combined Rating Matrix" (Table # 3.8). The resulting rating categories, *Suitable for All Industry*, *Suitable for Light Industry*, and *Not Suited for Industry*, are mapped with their resulting acreage figures.

The three classifications designate lands with few restrictions for development, those lands with characteristics that prevent certain industries from developing, and lands that are unsuited for development. The broad categories are used because this study is not intended to pinpoint lands for specific industries, but to locate areas with the potential for development. The specific characteristics of each of these categories can be determined by examining the three ratings matrices that were used to assemble the ratings into the three categories.

PHASE TWO: SUITABILITY

PART 4: OVERALL SUITABILITY RATING



All Industry would include any type of industry, specifically heavy industry or large warehouse/distribution development that requires large flat land, buildable soils, limited environmental restrictions, and a low "Conflict with Neighbors" rating. Light Industry would include smaller industrial parks or industry that can utilize vertical space such as high tech or the assembly of lightweight merchandise. They produce less noise and pollution compared to heavy manufacturing or shipping and so generally have a lower conflict with neighbors as well. They may also have less need for rail access. Rails are the most economical when shipping heavy materials or products.

STEP 2: Classification of Railroads

The Overall Rating Classification is then evaluated first against its proximity to rails. The railroads are buffered by 1,000' and all suitable lands with a slope of less than 3% are assessed to see if they fit within the rail buffer.

STEP 3: Rating of Railroads

The results of Step 2 are placed into a railroad matrix creating a railroad buffer rating. Land is rated either inside or outside the buffer. The results of this coverage are then mapped.

STEP 4: Classification of Major Roads

The major roads are buffered at a mile distance on either side and assessed the same way but without the slope criteria since trucks

are not restricted by slope as severely as trains. The upper limit for trucks are generally slopes of 15%.

STEP 5: Rating of Major Roads

The results of Step 4 are then placed in the roads matrix defining land as either inside or outside the buffer. The major roads buffer coverage is then created along with a map displaying these results.

The four-part process of the Suitability Phase of this model produces five separate suitability maps that categorize the land into three categories; Suitable for All Industry, Suitable for Light Industry, and Not Suitable for industry. The five products are a suitability map and figures based on natural factors, another based on locally controlled factors, a composite suitability map, and rails and roads proximity maps using the composite suitability map as its base.

The advantage of producing the different suitability maps is in being able to see where and what has the greatest impact to impeding development within these industrial zones. These results can directly benefit policy makers in their decision making process.

PART 3: LOCAL FACTORS SUITABILITY

LOCAL FACTORS RATING MATRIX

STEP 4

- 1 = Suitable for All Industry
- 2 = Suitable for Light Industry
- 3 = Not Suitable for Industry

STAGE 1

		CONFLICT WITH NEIGHBORS		
		SLIGHT	MOD.	SEVERE
% AREA ABOVE	80%	1	2	3
AVERAGE	70%	2	2	3
PARCEL SIZE	60%	3	3	3

STAGE 2

		STAGE 1 RATINGS		
		1	2	3
2000'	INSIDE	1	2	3
SEWER BUFFER	OUTSIDE	3	3	3

TABLE # 3.7

4. APPLICATION

The Suitability Model, after being developed, was tested on the Pioneer Valley. The Identify Phase was carried out on the entire valley while the four-part Suitability Phase was tested on two towns in the Valley. Only two towns were used for Phase Two: Suitability, because of the time constraint involved with digitizing the additional data needed for this phase. The results from this assessment are discussed below.

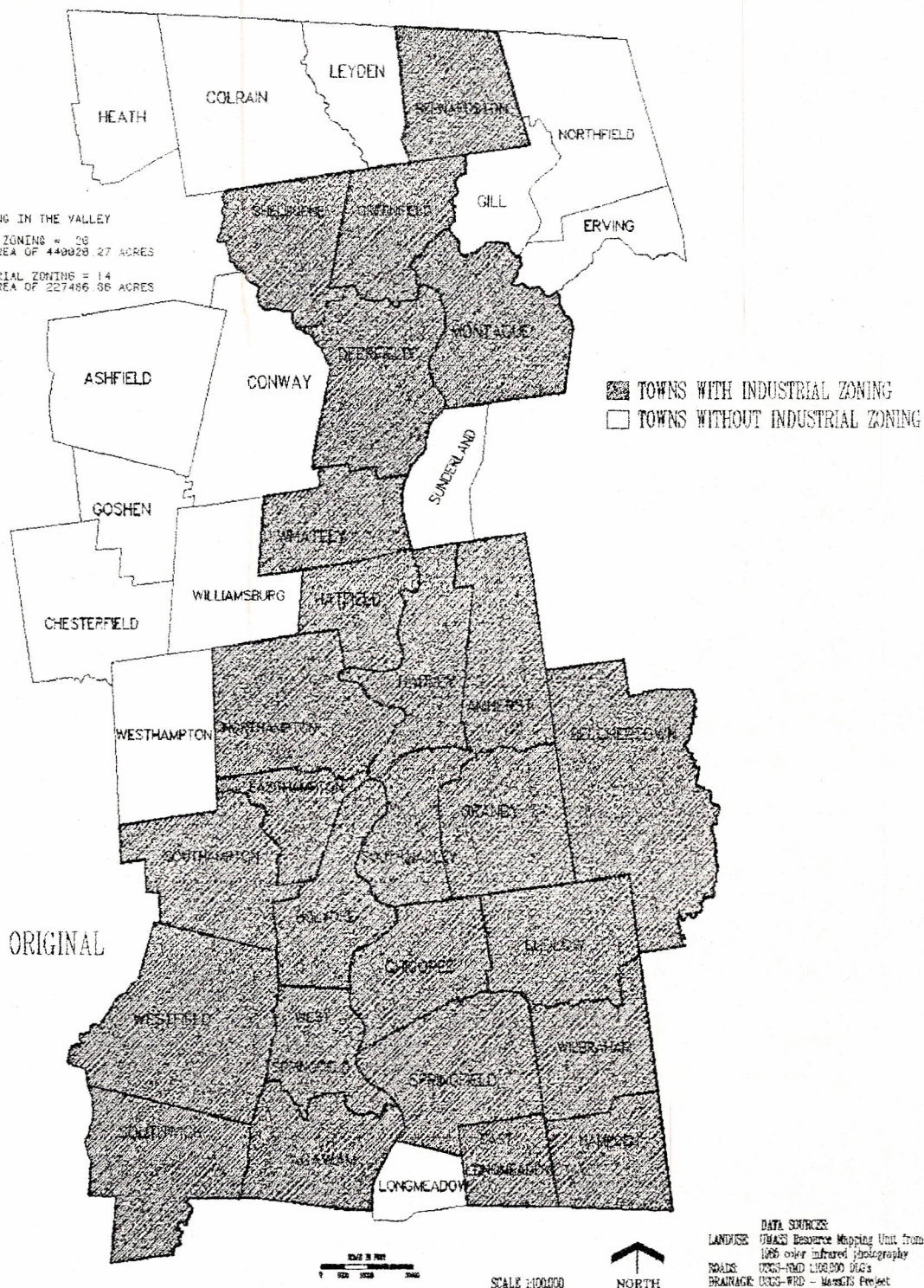
4.1 Application of Phase One: Identify

STEP 1: Survey Towns

The first criteria of the study is that only industrially zoned lands are being studied. The original study area consisted of 40 town within the Pioneer Valley. After surveying the towns for industrial zoning, 26 remained in the study area. Most of the towns within the Valley that do not have formal industrial zones are small hill towns that do not have land suitable industrial land. Map # 4.1 displays the towns that made this first cut. This means that 14 towns, or 35 percent of the towns comprising most of the Pioneer Valley are without formal industrial zoning. This calculates out to be 227,466.86 acres, or 34 percent of the land area. Only the remaining 26 towns and their land area was used for the remaining steps.

TOWNS WITH INDUSTRIAL ZONING IN THE STUDY AREA

TOWNS WITH INDUSTRIAL ZONING IN THE VALLEY
 # OF TOWNS WITH INDUSTRIAL ZONING = 36
 THOSE TOWNS HAVE A TOTAL AREA OF 449928.27 ACRES
 # OF TOWNS WITHOUT INDUSTRIAL ZONING = 14
 THOSE TOWNS HAVE A TOTAL AREA OF 227486.86 ACRES



REDUCTION FROM ORIGINAL

DATA SOURCES:
 LANDUSE: UMASS Resource Mapping Unit from
 1986 color infrared photography
 ROADS: USGS-RMD 1:100,000 DIGS
 DRAINAGE: USGS-RMD - Watershed Project
 from 1:25,000 manuscripts

CENTER FOR ECONOMIC DEVELOPMENT
 LANDS ZONED AND SUITABLE FOR INDUSTRY

STUDY AREA WITHIN PIONEER VALLEY



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STEP 2: Digitize Industrial Zoning

The zoning that was digitized for this project was taken from a variety of source maps. The maps ranged from 1" : 800' to 1" : 1500' in scale and ranged from 1971 to 1990 in date. While this meant a great range of information had to be compiled and standardized, this comprised the basis of the work for the study area. The digital copy of the zoning data is a close copy of the original, but the varied source maps and age may contribute to some error in the zoning data. Corrections and updates were made to the data whenever possible.

The digitizing of only the industrial zones was a decision based on time constraints and the needs of this study. The full zoning for each town would have been a tremendous asset as a database, but was not useful for this study since only industrial zones were being analyzed for their suitability for development. The time saved digitizing only industrial zones could be estimated at a range of between 3 to 10 hours per town.

STEP 3: Identify and Aggregate Land Uses

The industrial zoning of these towns was then measured and the acreage for the aggregated land uses was summed. The land uses were aggregated into five categories as described in the Methods Chapter. The results of this process are mapped on Map # 4.2 at the end of this section. As was predicted, only 58 percent of the total acreage within the industrial zones for all of the Pioneer

Valley is still available for development, although this does not include the 15 percent of land being used for industry at present. Chart # 4.1 at the end of this section displays the results of this aggregation.

General zoning principles maintain that towns should have at least 10 percent of their land area zoned industrial in order to maintain a sound tax base. Calculating the land area within the 26 town study area, only 6 percent of the land is zoned industrial with only 15 percent of that area being used at present for industry. This means only 0.9 percent of the total land in the study area is being used for industry. Adding the land zoned and available for industrial development totals only 4.5 percent of the total land in the study area. At only this level of the study, the Pioneer Valley has less than half the land area needed for industrial development.

STEP 4: Mapping Data

This step consisted mainly of creating maps based on the information collected in the previous step. The individual town maps, along with their ensuing charts provide information on each towns industrial land. The maps follow this section to provide a more fluent reading of this assessment step. This base information collected was also used to explore the data, which is the purpose for using GIS technology in this study.

A major factor in developing industrial land is the total contiguous acreage available to assemble and develop in any given area. The general industry standard (and the client's request) is that at least 100 contiguous acres are needed to interest development of industry in any area. It was decided to evaluate areas between 50 and 100 acres as a comparison. Map # 4.3 shows the location of the 50 and 100 acre zoned industrial land areas. Found in the study area were 33 areas over 100 acres adding up to 11,848 acres. A total of 1,411 acres in 55 areas were found within land areas between 50 and 100 acres. This eliminates an additional 2,511 acres that can be labeled as available for development. An additional 1,411 acres are eliminated when the 100 acre minimum is used. Comparing this figure with the entire Pioneer Valley, only 2.6 percent of the lands comprising the valley have the potential for industrial development based on the 100 acre minimum requirement for development. *This cuts almost in half the land left available for development following step 2.* The following table describes the distribution of these lands throughout the valley.

TOWNS WITH INDUSTRIAL AREAS OVER 50 AND 100 ACRES

Town/City	Number of Parcels:	
	50 - 100 ac.	over 100 ac.
Agawam	4	3
Amherst	1	0
Belchertown	1	1
Bernardston	1	1
Chicopee	5	0
Deerfield	3	2
Easthampton	2	1
E. Longmeadow	1	1
Granby	1	1
Greenfield	2	1
Hadley	4	3
Hampden	1	1
Hatfield	2	1
Holyoke	1	1
Ludlow	4	2
Montague	2	2
Northampton	0	0
Shelburne	0	0
South Hadley	2	2
Southampton	1	1
Southwick	2	2
Springfield	4	1
West Springfield	1	0
Westfield	5	4
Whately	2	1
Wilbraham	1	1
TOTAL	53	33

TABLE # 4.1

There is a good distribution of 100 acre or greater industrial lands throughout the valley. Montague contains the greatest acreage (2,437ac.), this site having originally been considered for a nuclear power plant.

PART 4: OVERALL SUITABILITY RATING

COMBINED RATING MATRIX

STEP 1

- 1 = Suitable for All Industry
- 2 = Suitable for Light Industry
- 3 = Not Suitable for Industry

COMPOSITE SUITABILITY

LOCAL FACTORS SUITABILITY RATING

		1	2	3
PHYSICAL	1	1	2	3
SUITABILITY	2	2	2	3
RATING	3	3	3	3

TABLE # 3.8

STEP 5: Proximity to Transportation Corridors

The industrial lands found available for development were then evaluated as to their proximity to the two transportation networks studied. Only 4,798 acres of the available zoned industrial lands were within the 1000 foot railroad buffer and an additional 8,483 acres were within the 1 mile major roads buffer. As access to transportation is a very important factor in choosing industrial land, these figures demonstrate the premise that there is not enough "true" industrial land in the valley. Only 1.1 percent of the total land area in the study area is available for industrial development, zoned industrial, and within the 1,000 foot railroad buffer. Three percent of this same area is within the major roads buffer. Map # 4.4 located at the end of this section shows the lands within proximity to the transportation buffers.

Summary of Phase One

The end result of the first phase of the Industrial Suitability Model shows the original hypothesis to be true. The original hypothesis stated that a significant portion of the land zoned industrial in the Pioneer Valley is not suitable for development (1. INTRODUCTION, p.1). The results show that there is not enough land zoned industrial in the Pioneer Valley. Only 6 percent of the total land in the Valley is zoned industrial and almost half of that land is not available for industrial development because it is not within a close enough proximity to any transportation network.

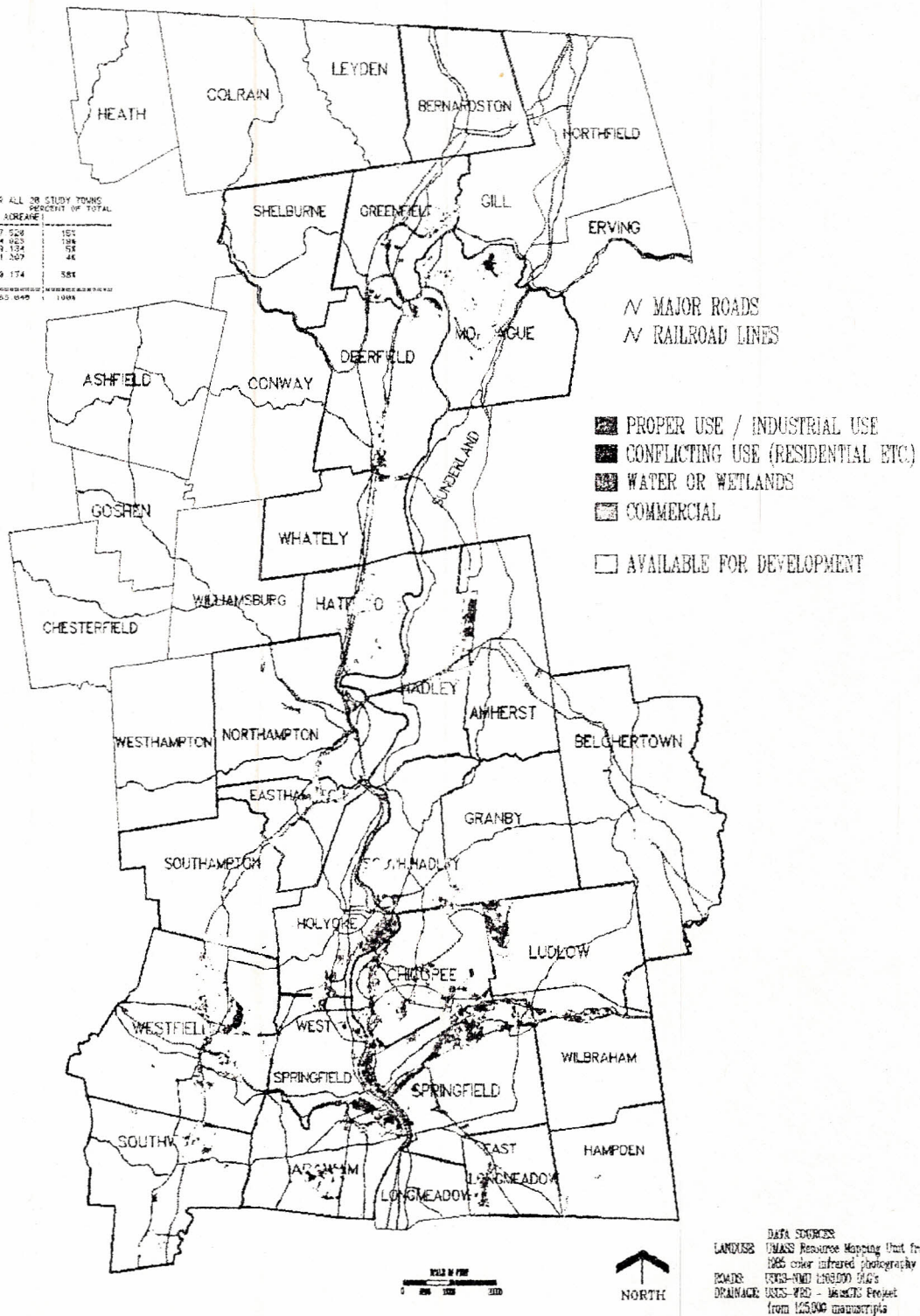
Factoring in contiguous land area and transportation proximity reduces the amount of useable industrial land even more. Three percent of the available land is within proximity to a transportation buffer and also only 2.7 percent of the available industrial land is of a size greater than 100 contiguous acres. Each of these two percentages are not mutually inclusive, that is the areas comprising these two categories are not necessarily the same land area. Therefore, the amount of land that is both within proximity to transportation and over 100 acres in size is only a portion of both percentages.

These lands identified as available for industrial development, which total less than 3 percent of the total land area for the Pioneer Valley, have not even been assessed as to their suitability for development. The second phase of the model addresses this, which will further reduce the percentage of lands in the Valley available and suitable for development. The following maps and charts produced in Step 4 of the Identify Phase give a more detailed and visual picture of the available industrial lands in the Pioneer Valley.

AGGREGATED LAND USES WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE STATISTICS FOR ALL 38 STUDY TOWNS
FREQUENCY OF OCCURRENCE PERCENT OF TOTAL

AGGREGATED LAND USE	TOTAL ACREAGE	PERCENT OF TOTAL
PROPER USE	4047 526	15%
CONFLICTING USE	3144 963	12%
WATER OR WETLANDS	1200 134	5%
COMMERCIAL USE	751 307	3%
AVAILABLE	15778 174	58%
TOTAL	28963 049	100%



DATA SOURCES
LAND USE: MASS Resource Mapping Unit from 1985 color infrared photography
ROADS: 1:50,000 ROAD LOGS
DRAINAGE: USGS-250 - 1:50,000 Project from 1:50,000 maps

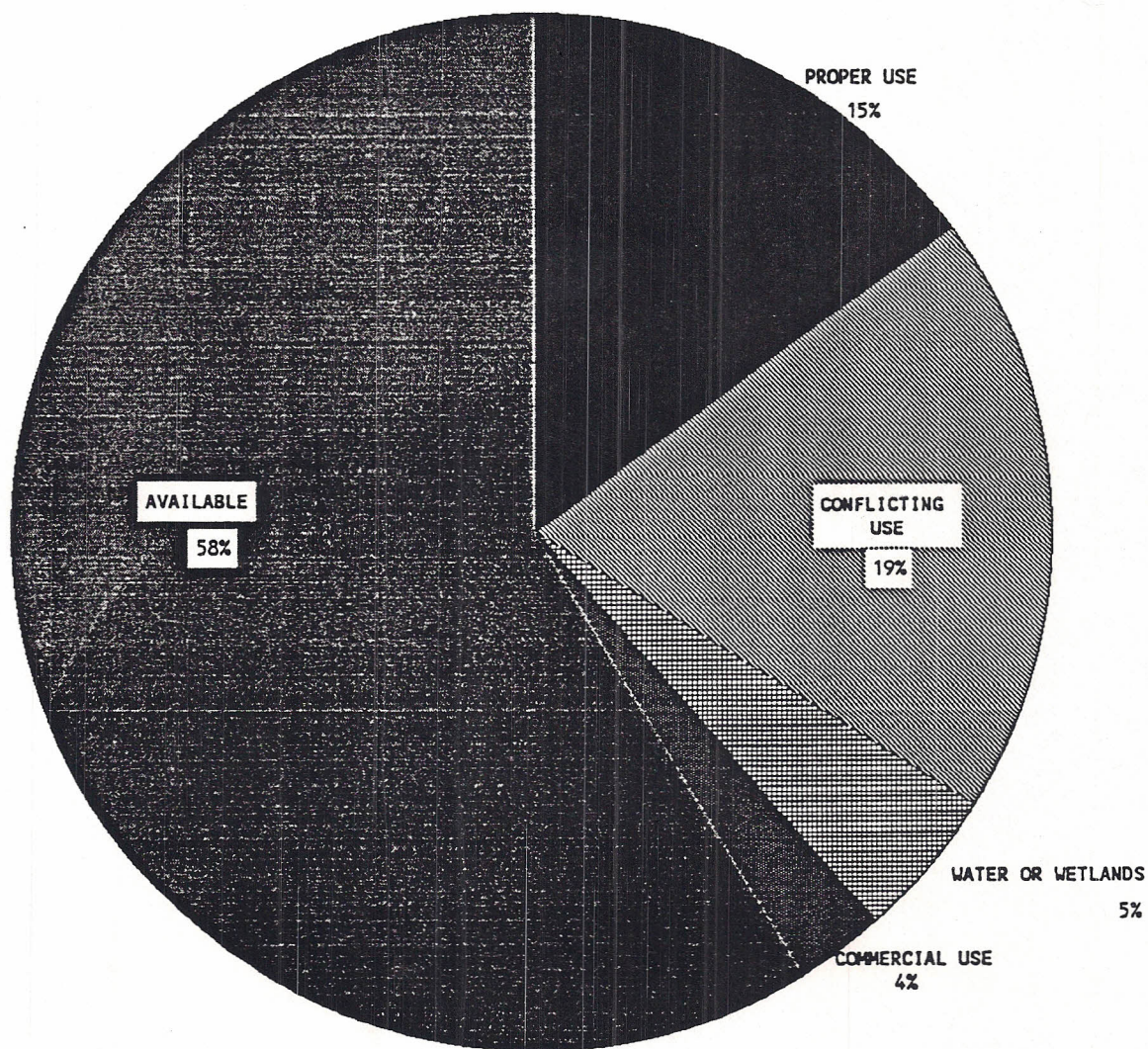
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LANDS ZONED AND SUITABLE FOR INDUSTRY

STUDY AREA WITHIN PIONEER VALLEY



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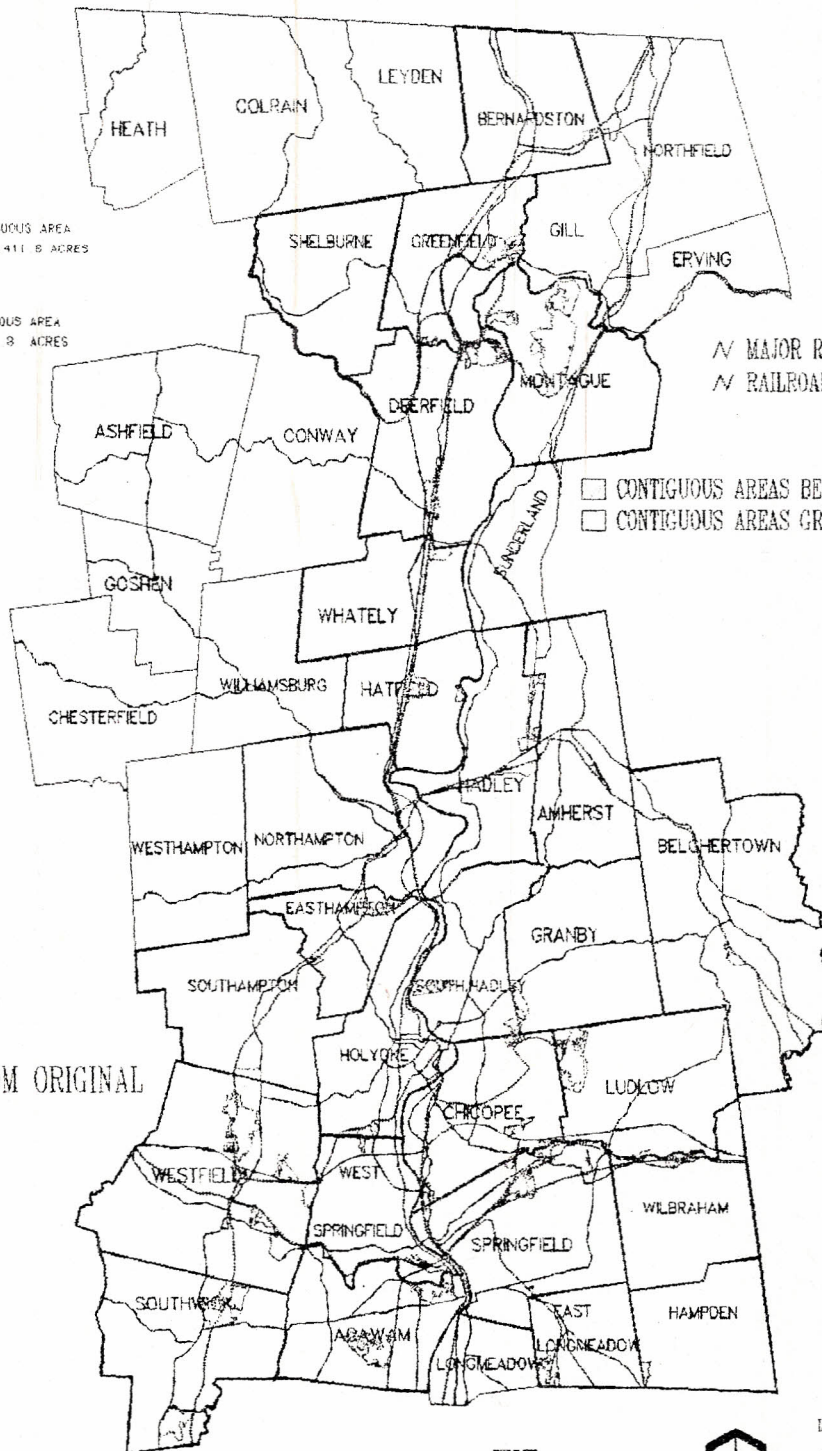
PERCENTAGE OF AGGREGATED LAND USES
WITHIN INDUSTRIAL ZONES:
COMPOSITE TOTAL



CONTIGUOUS "AVAILABLE" LANDS BY SIZE

AVAILABLE LANDS WITH CONTIGUOUS AREA
BETWEEN 50 AND 100 ACRES 1411.6 ACRES

AVAILABLE LANDS WITH CONTIGUOUS AREA
GREATER THAN 100 ACRES 11847.3 ACRES



MAJOR ROADS
RAILROAD LINES

CONTIGUOUS AREAS BETWEEN 50 AND 100 ACRES
CONTIGUOUS AREAS GREATER THAN 100 ACRES

REDUCTION FROM ORIGINAL

SCALE IN FEET
0 100 200 300



DATA SOURCES
LANDS: UMass Resource Mapping Unit from
1965 color infrared photography
ROADS: 1965-VMD 1:50,000 Scale
DRAINAGE: 1965-VMD - MassGIS Project
from 1:25,000 manuscripts

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STUDY AREA WITHIN PIONEER VALLEY



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PROXIMITY OF AVAILABLE LANDS TO TRANSPORTATION

AVAILABLE LAND WITHIN 1000' RAILROAD BUFFER 4705 378

AVAILABLE LAND OUTSIDE 1000' OF RAILROAD
BUT WITHIN 1 MILE MAJOR ROAD BUFFER 8492 955

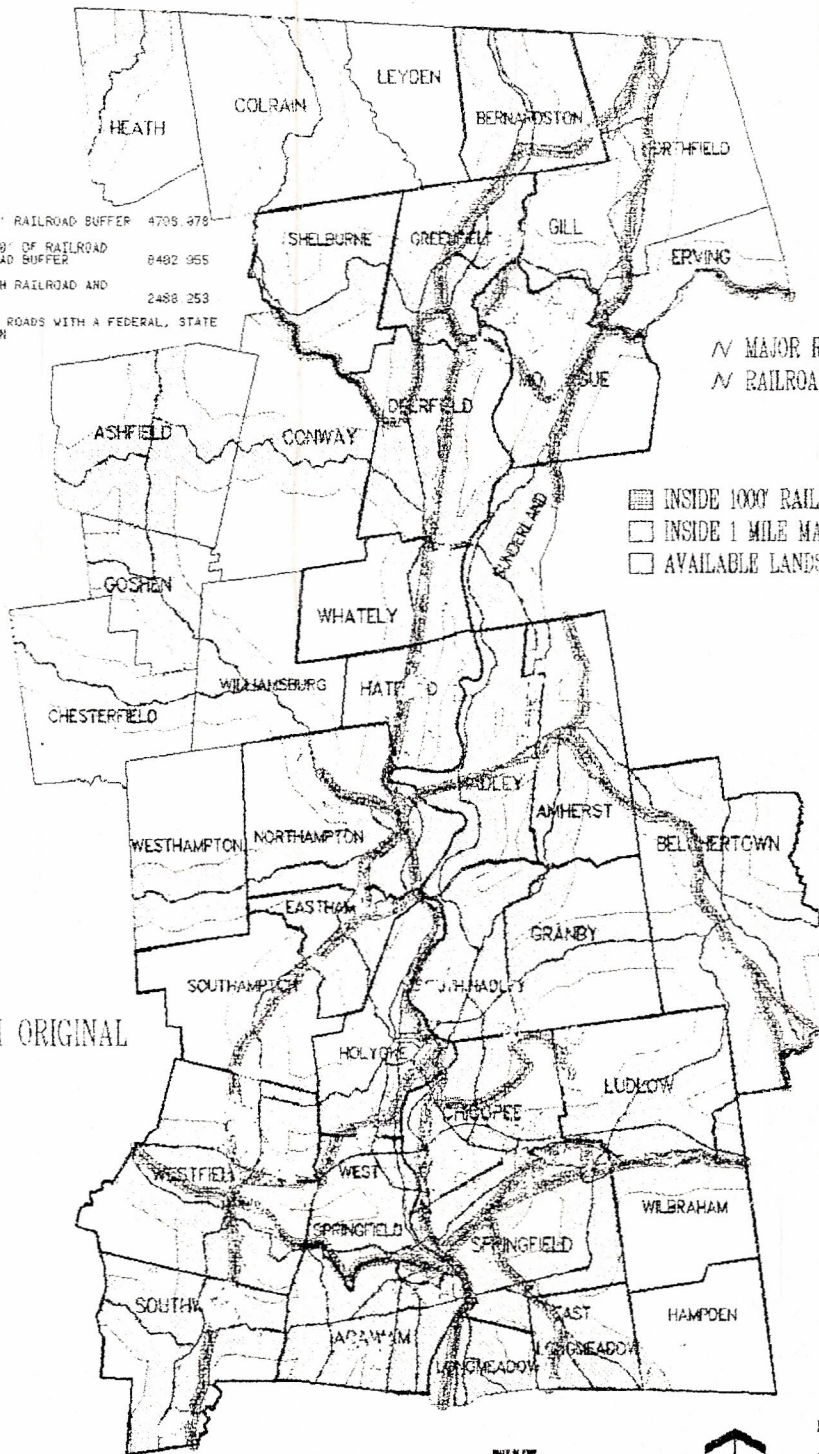
AVAILABLE LAND OUTSIDE BOTH RAILROAD AND
MAJOR ROAD BUFFERS 2488 253

MAJOR ROADS ARE DEFINED AS ROADS WITH A FEDERAL, STATE
OR U.S. HIGHWAY DESIGNATION

~ MAJOR ROADS
~ RAILROAD LINES

■ INSIDE 1000' RAILROAD BUFFER
□ INSIDE 1 MILE MAJOR ROAD BUFFER
□ AVAILABLE LANDS (INDUSTRIALLY ZONED)

REDUCTION FROM ORIGINAL



SCALE 1:100
0 500 1000



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS AND 1:50,000 D.C.
DRAINAGE: USGS-PCD - MASSGIS Project
from 1:25,000 manuscripts

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STUDY AREA WITHIN PIONEER VALLEY



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
AGAWAM

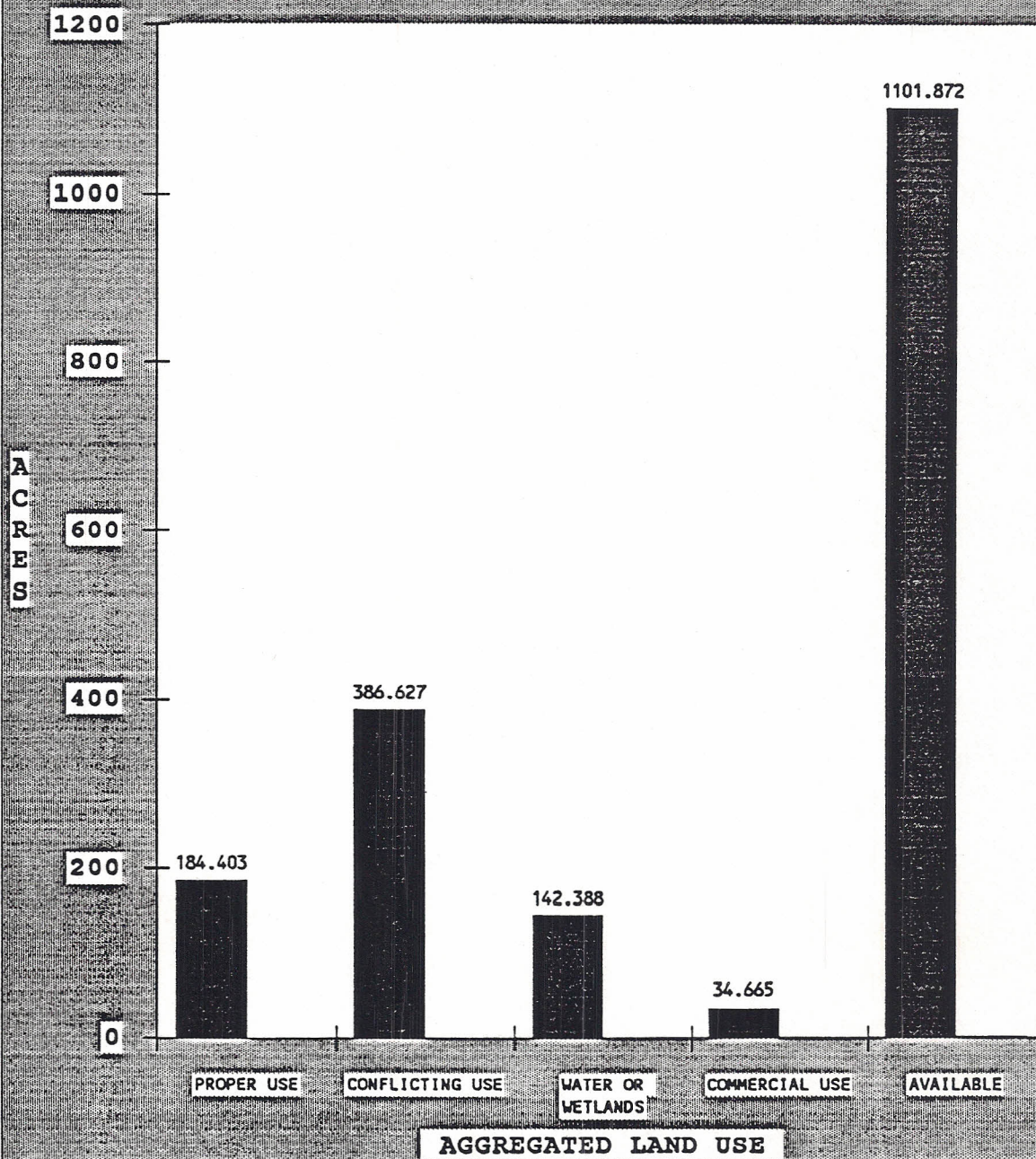
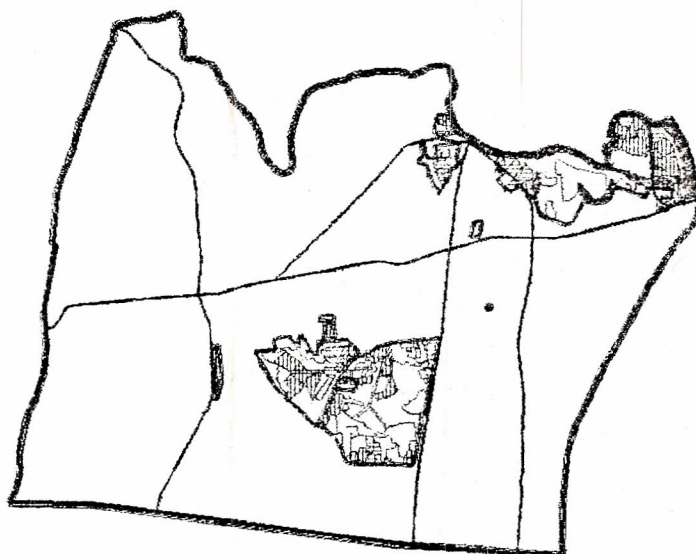







CHART # 4.2

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	AGAWAM	
	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	184 403	10%
CONFLICTING USE	386 627	21%
WATER OR WETLANDS	142 388	8%
COMMERCIAL USE	34 665	3%
AVAILABLE	1101 972	59%
TOTAL	1849 960	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: UMMS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS AND 1:50,000 DGS
DRAINAGE: USGS-750 - MMSGS Project
from 125,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

AGAWAM



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
AMHERST

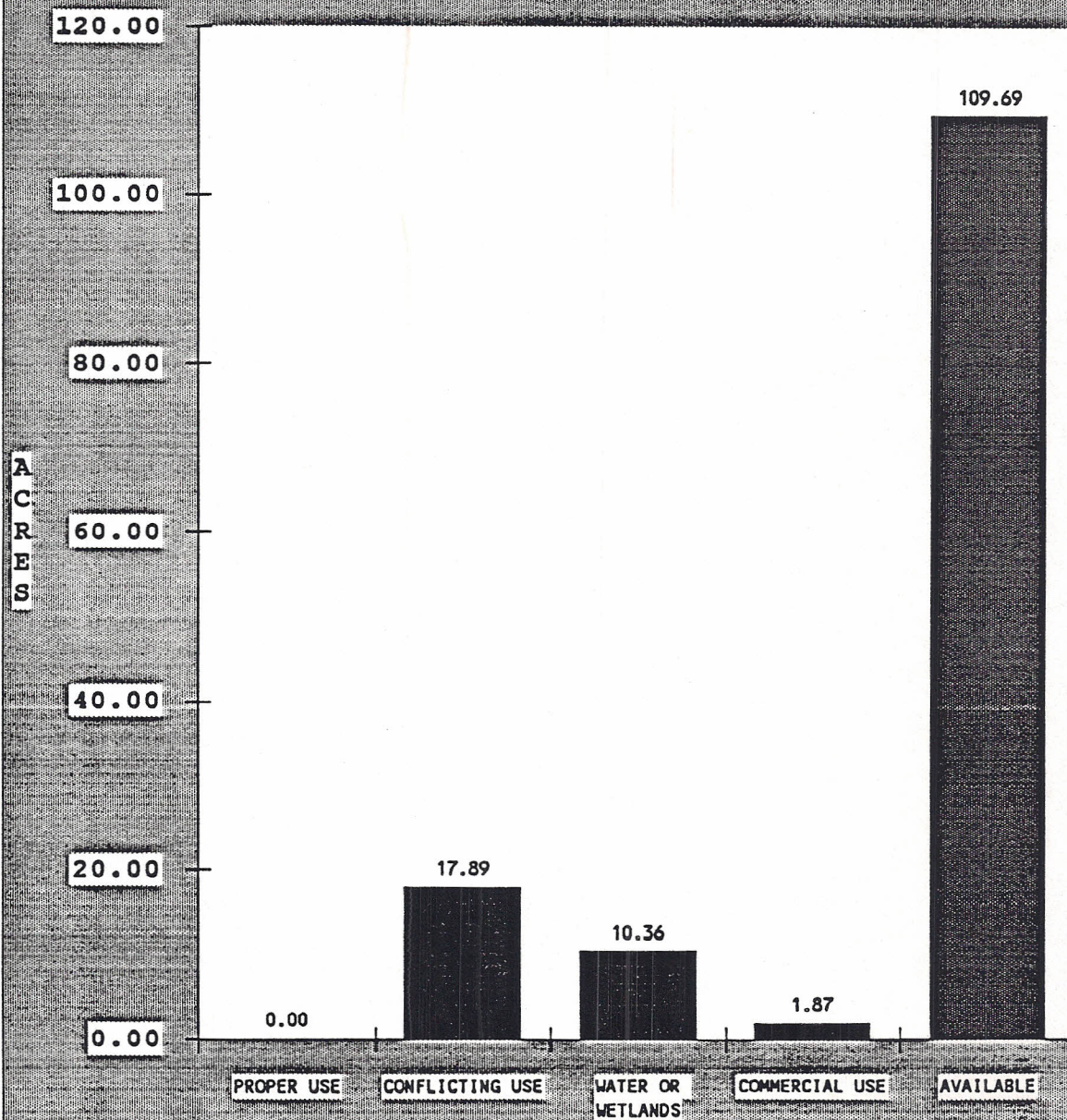
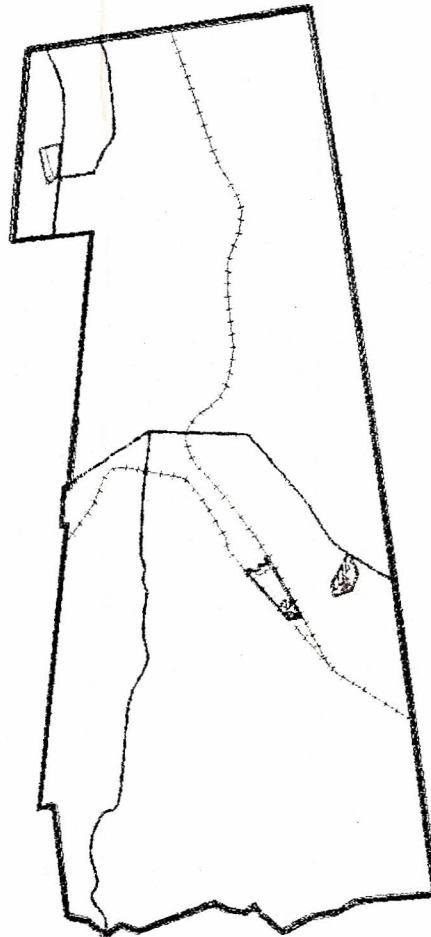







CHART 4.3

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AMHERST		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
CONFLICTING USE	17 888	13%
WATER OR WETLANDS	10 350	7%
COMMERCIAL USE	1 874	2%
AVAILABLE	109 602	78%
TOTAL	139 812	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: UNACI Resource Mapping Unit from
1955 color infrared photography
BOUND: 1955-1960 USGS 1:25000 maps
DRAINAGE: 1955-1960 USGS 1:25000 maps
from 1:25000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

AMHERST



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
BELCHERTOWN**

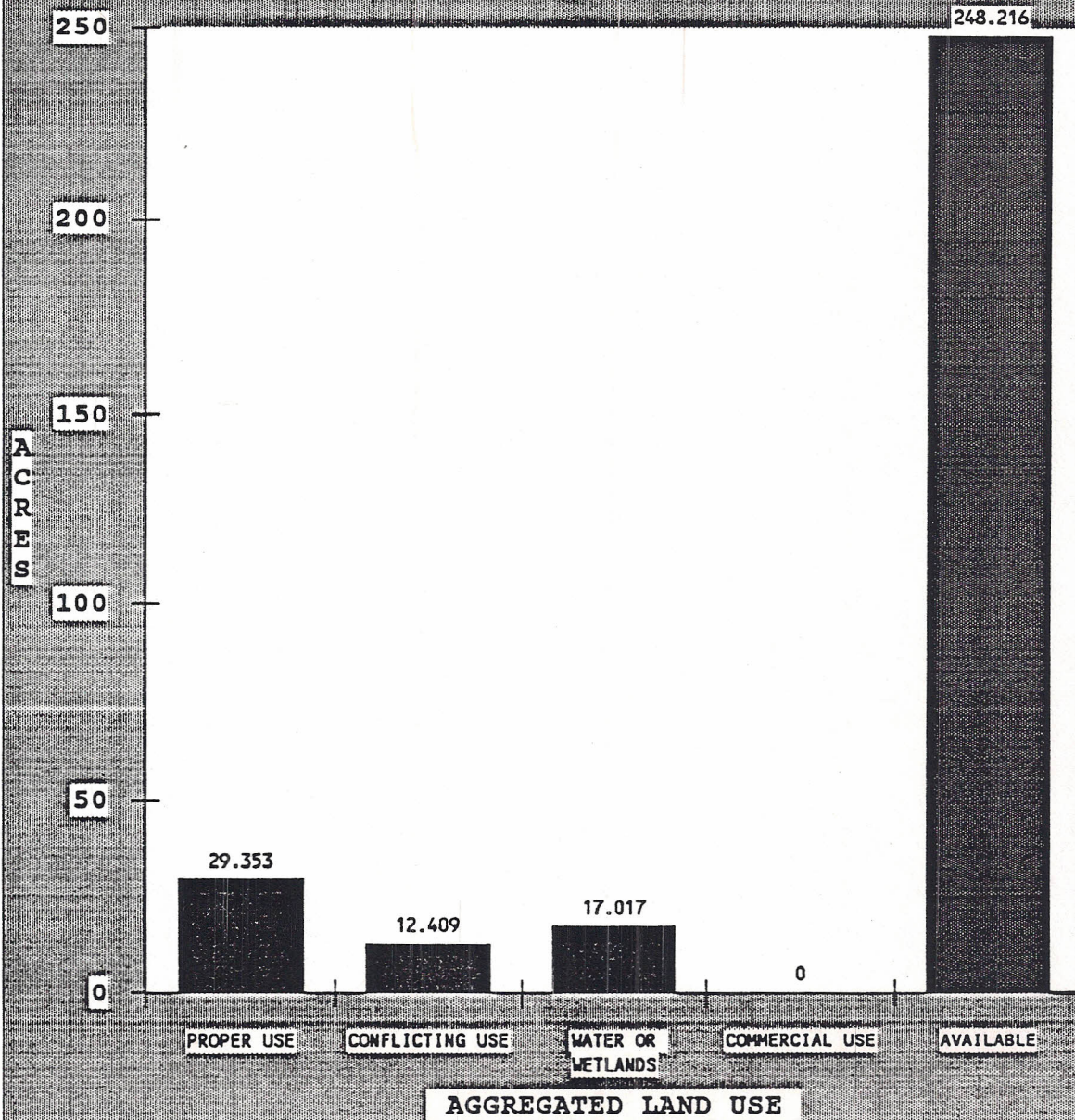
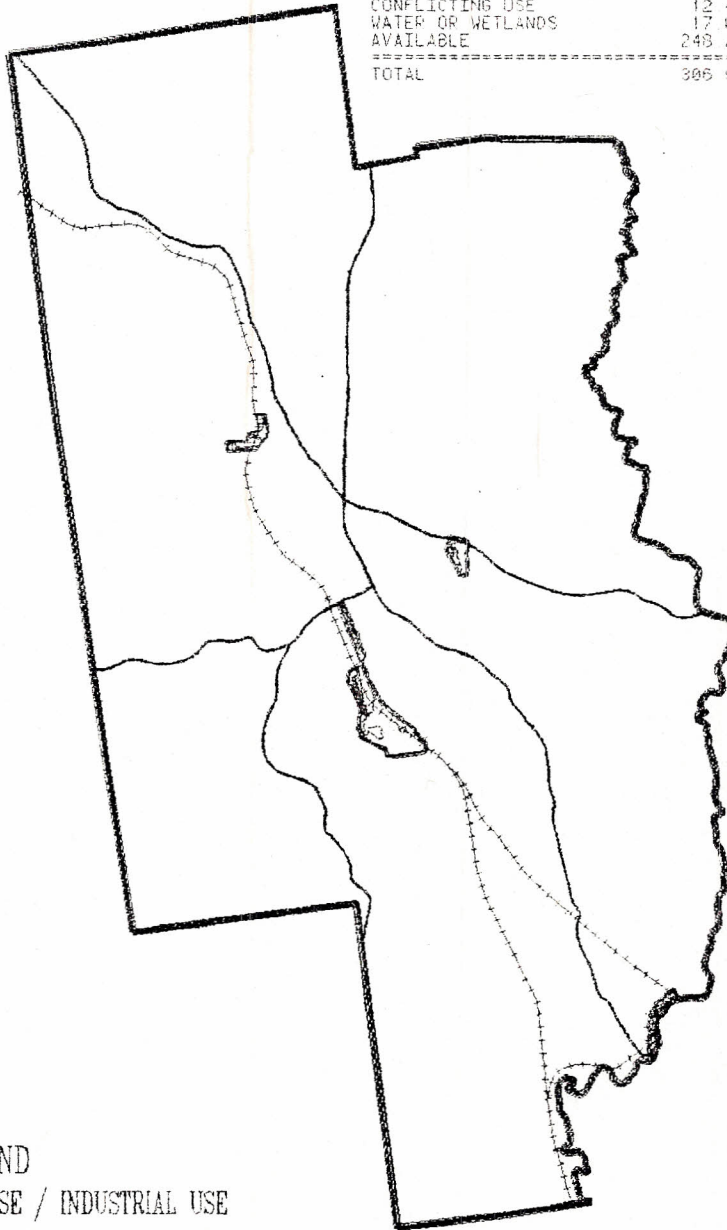


CHART # 4.4

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	BELCHERTOWN AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	29 353	10%
CONFLICTING USE	12 409	4%
WATER OR WETLANDS	17 017	6%
AVAILABLE	248 216	80%
TOTAL	306 992	100%



LEGEND

- PROPER USE / INDUSTRIAL USE
- CONFLICTING USE (RESIDENTIAL ETC.)
- WATER OR WETLANDS
- COMMERCIAL
- AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCE:
LANDUSE: UMMS Resource Mapping Unit from
1986 color infrared photography
ROADS: USGS-NHD 1:50,000 DLS
DRAINAGE: USGS-WBD - MASSGIS Project
from 1:25,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

BELCHERTOWN



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
BERNARDSTON

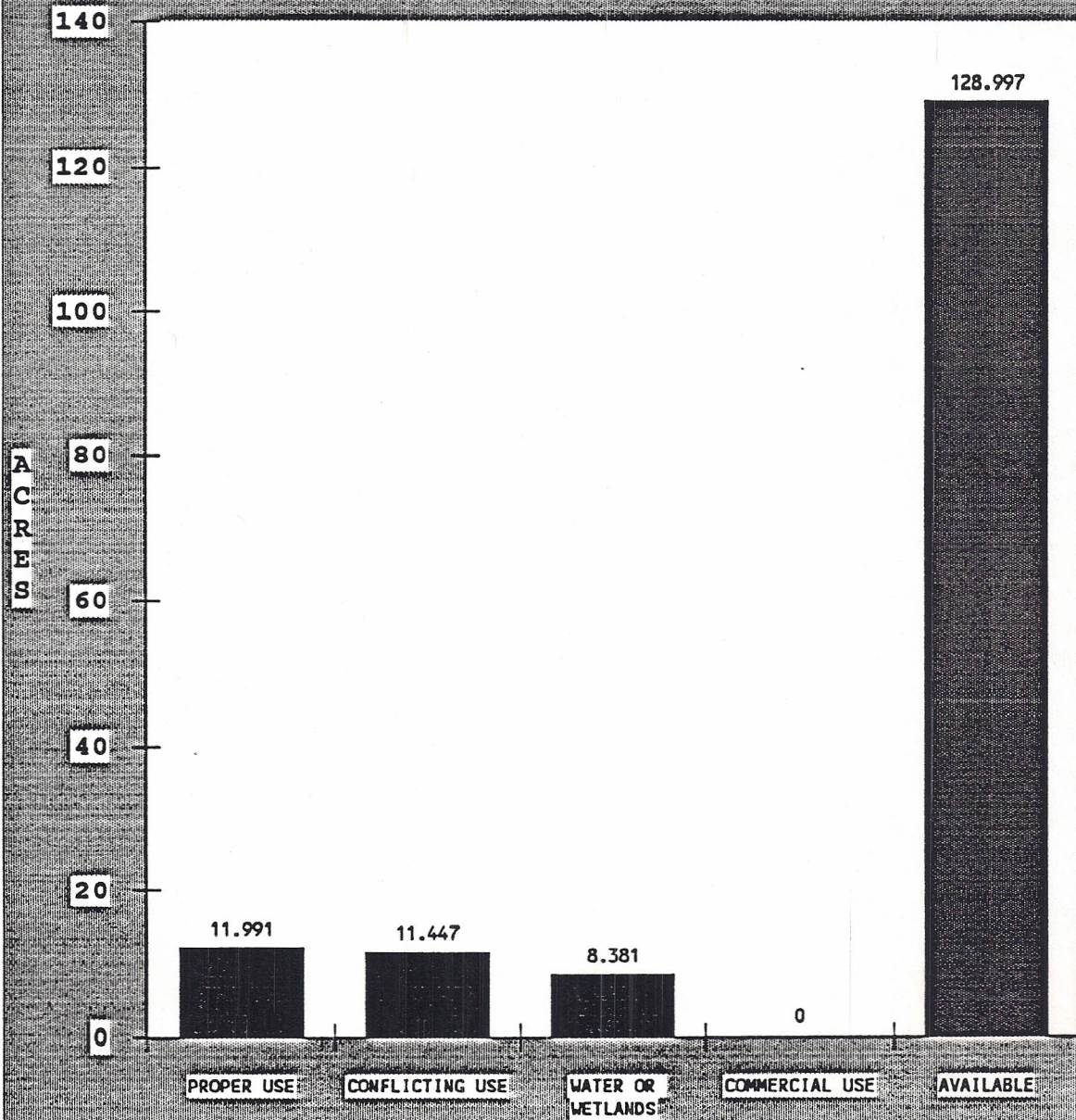
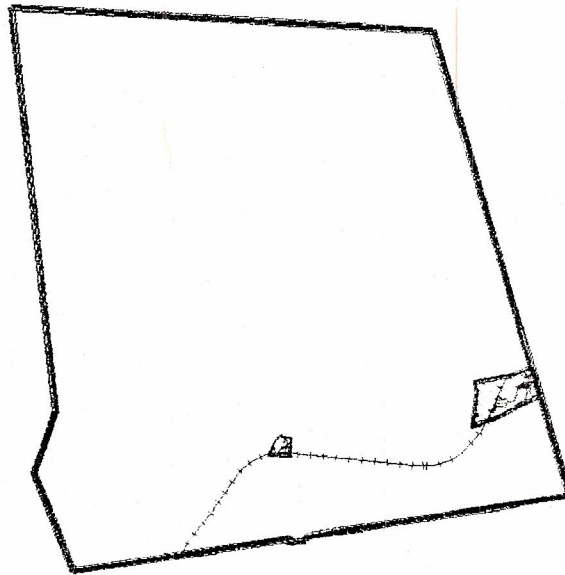







CHART # 4.5

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	BERNARDSTON AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	11 991	7%
CONFLICTING USE	11 447	7%
WATER OR WETLANDS	8 381	5%
AVAILABLE	126 997	81%
TOTAL	160 815	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UMASS Resource Mapping Unit from
1986 color infrared photography
ROADS: USGS-NOI 1:50,000 MGA
DRAINAGE: USGS-NOI - Watershed Project
from 1:25,000 manuscript

CENTER FOR ECONOMIC DEVELOPMENT
LANDS ZONED AND SUITABLE FOR INDUSTRY

BERNARDSTON



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
CHICOPEE

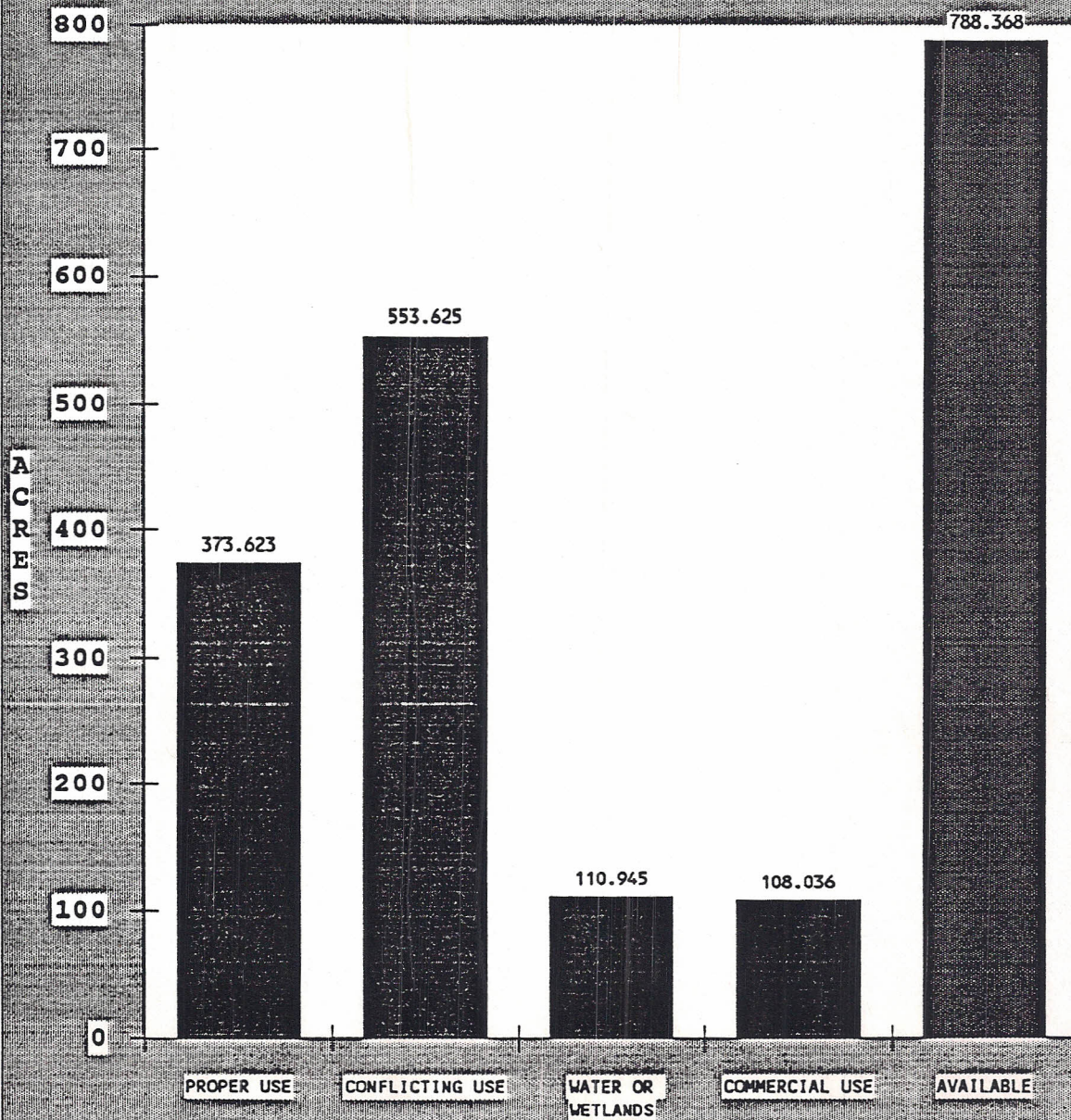
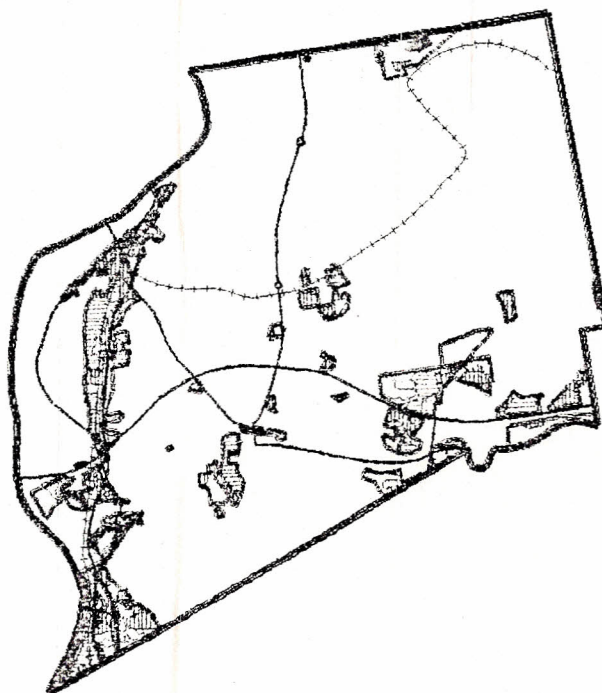







CHART # 4.6

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	CHICOPEE AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	373 623	19%
CONFLICTING USE	553 625	29%
WATER OR WETLANDS	119 645	6%
COMMERCIAL USE	103 036	5%
AVAILABLE	788 368	41%
TOTAL	1934 596	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LAND USE: UNASIS Resource Mapping Unit from
1965 color infrared photography
ROADS: USGS-NOI 1:50,000 DGS
DRAINAGE: USGS-NOI - Watershed Project
from 1:50,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

CHICOPEE



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
DEERFIELD

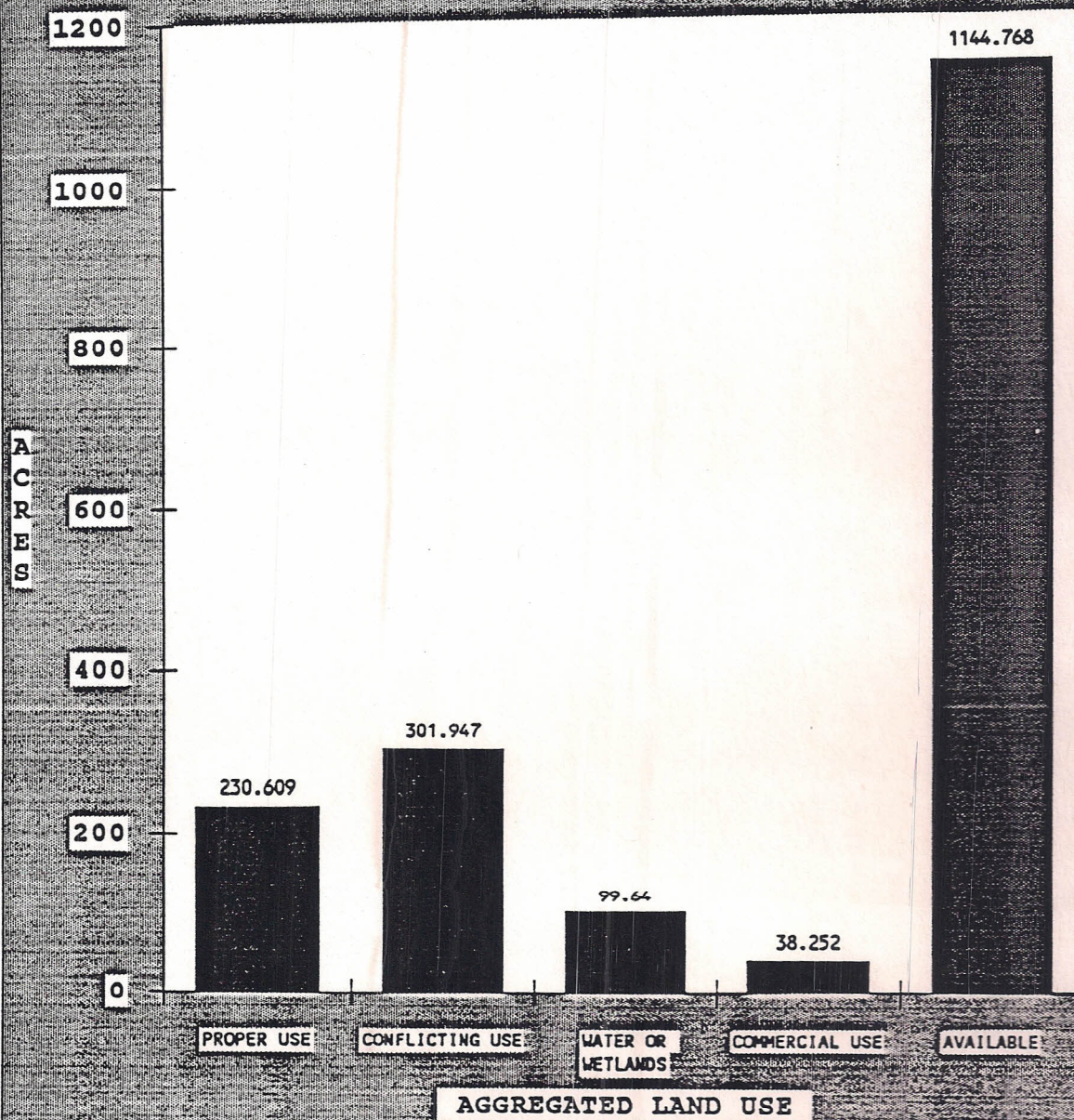
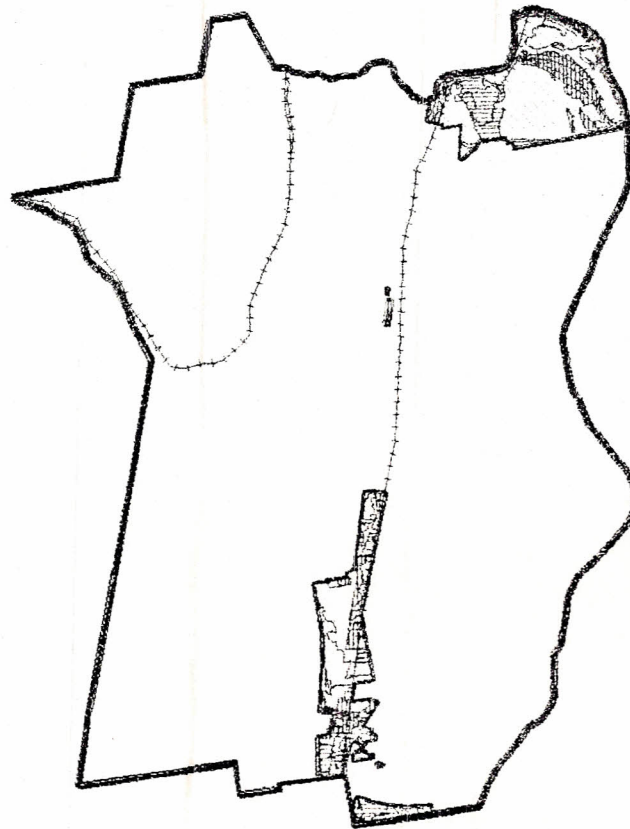







CHART # 4.7

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	DEERFIELD AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	230 609	13%
CONFLICTING USE	301 947	17%
WATER OR WETLANDS	99 640	5%
COMMERCIAL USE	38 252	2%
AVAILABLE	1144 768	63%
TOTAL	1815 213	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: UMMS Resource Mapping Unit from
1966 color infrared photography
ROADS: USGS-NHD 1:50,000 scale
DRAINAGE: USGS-RD - MassGIS Project
from 1:25000 manuscripts

CENTER FOR ECONOMIC DEVELOPMENT
LANDS ZONED AND SUITABLE FOR INDUSTRY

DEERFIELD



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
EASTHAMPTON

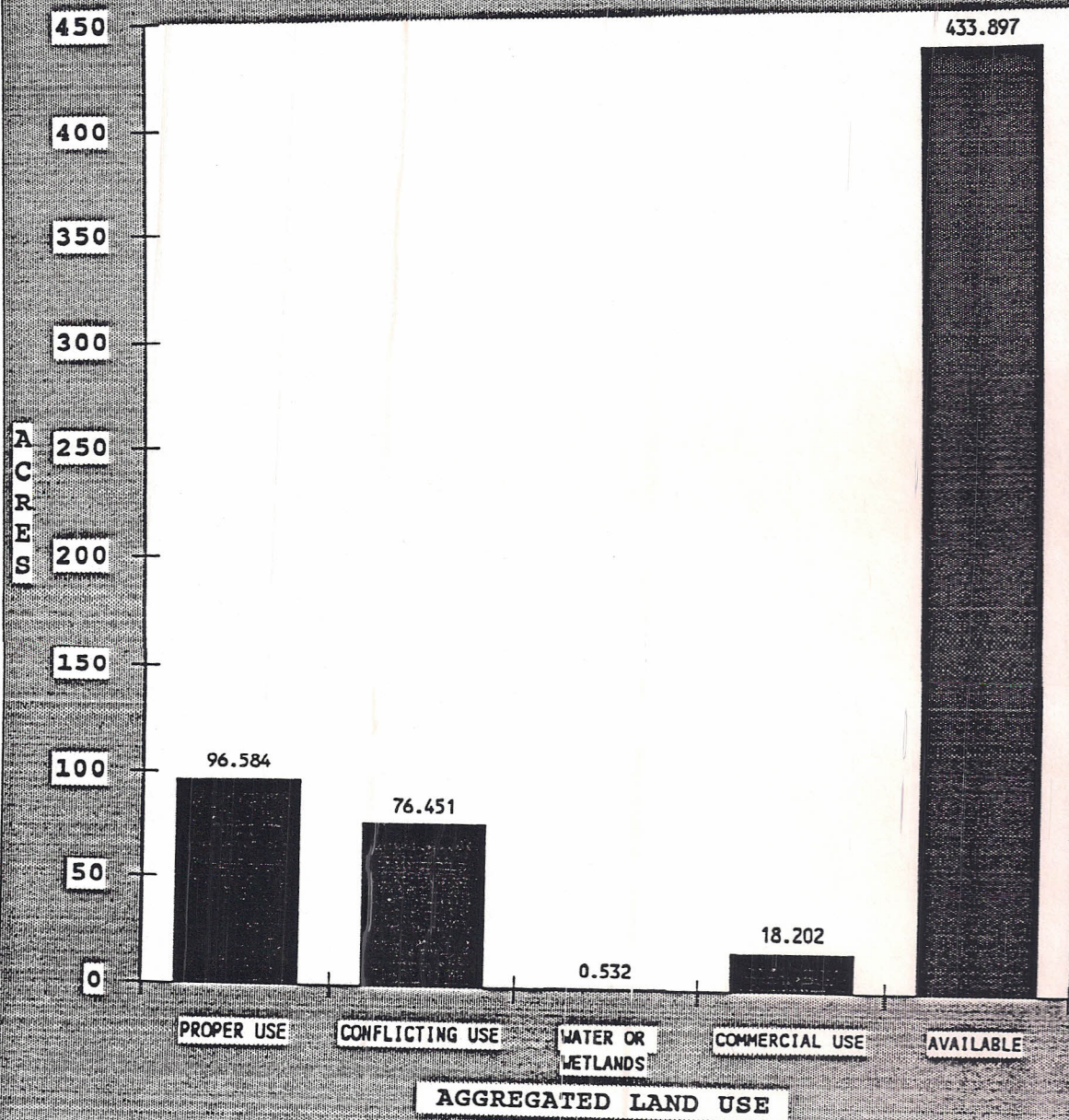
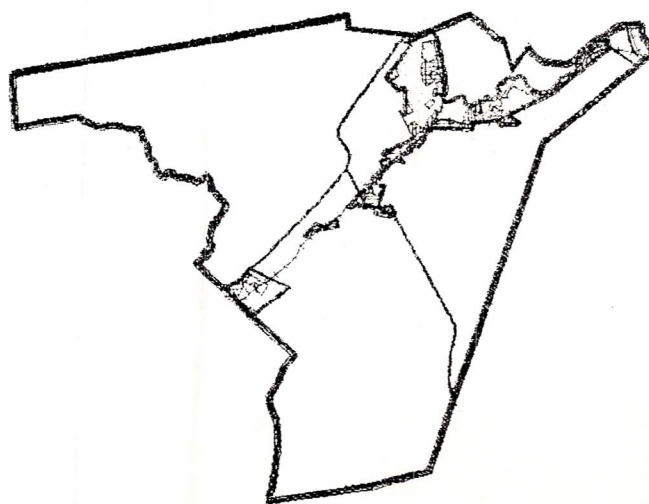







CHART # 4.8

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	EASTHAMPTON AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	96 584	15%
CONFLICTING USE	76 451	13%
WATER OR WETLANDS	0 532	0%
COMMERCIAL USE	18 202	3%
AVAILABLE	433 897	69%
TOTAL	625 665	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UMass Research Mapping Unit from
1985 color infrared photography
BOUND: USGS-NOI 1:50,000 DGS
DRAINAGE: USGS-NOI - MassGIS Project
from 1:50,000 manuscripts

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EASTHAMPTON



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
EAST LONGMEADOW**

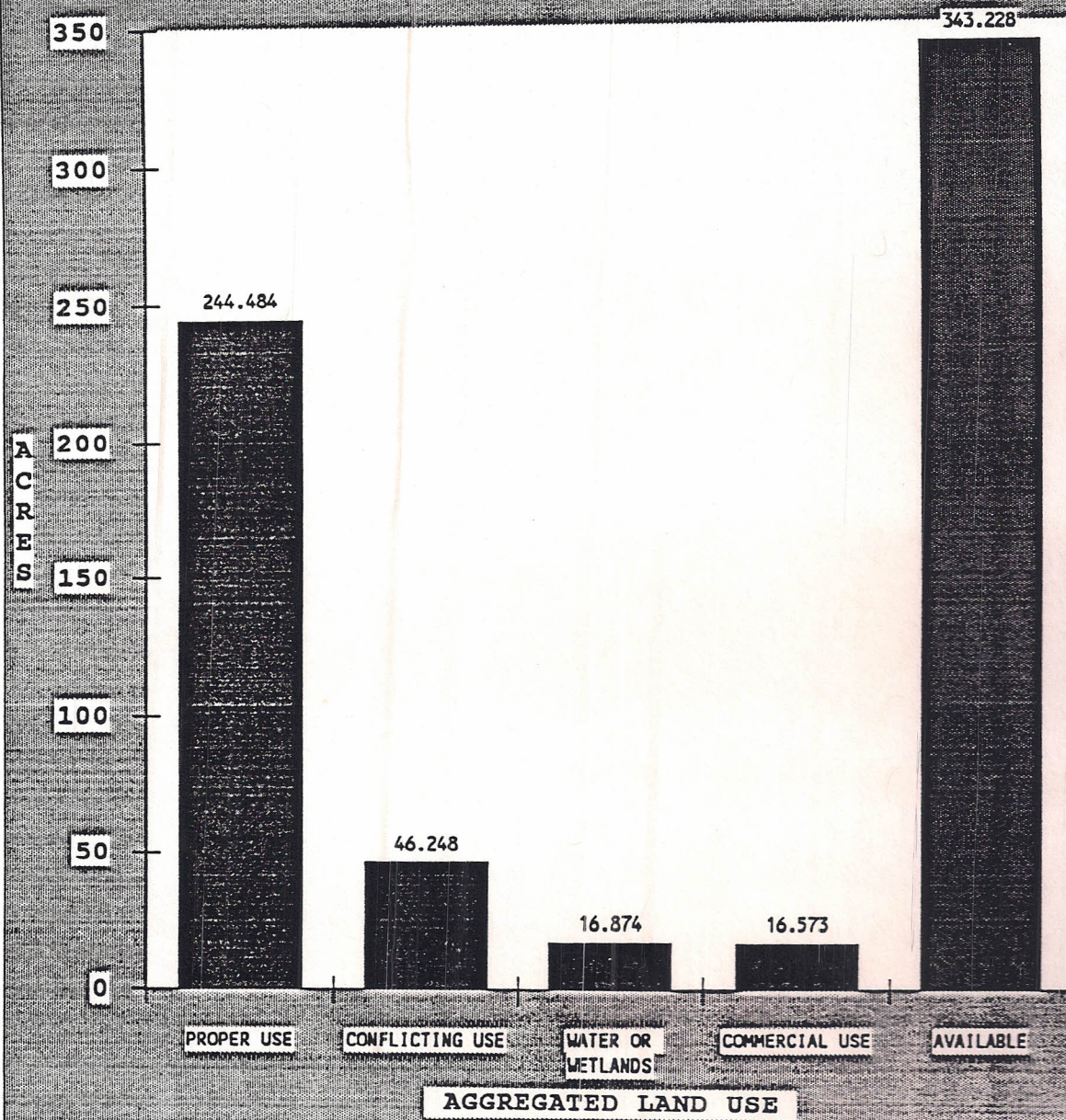
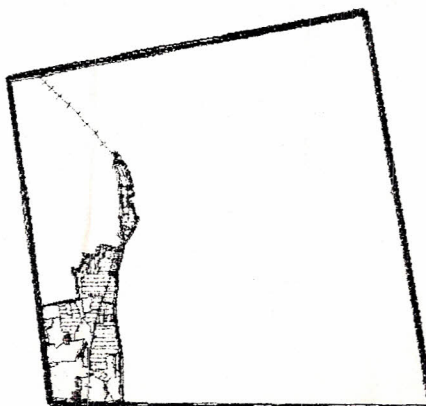







CHART # 4.9

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	EAST LONGMEADOW AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	244 484	37%
CONFLICTING USE	46 248	7%
WATER OR WETLANDS	18 374	3%
COMMERCIAL USE	16 573	2%
AVAILABLE	343 228	51%
	667 467	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from
USGS color infrared photography
ROADS: UMMS-UMMS 1:25000 Data
DRAINAGE: USGS FPD - UMMS Project
from 1:25000 manuscripts

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EAST LONGMEADOW



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
GRANBY

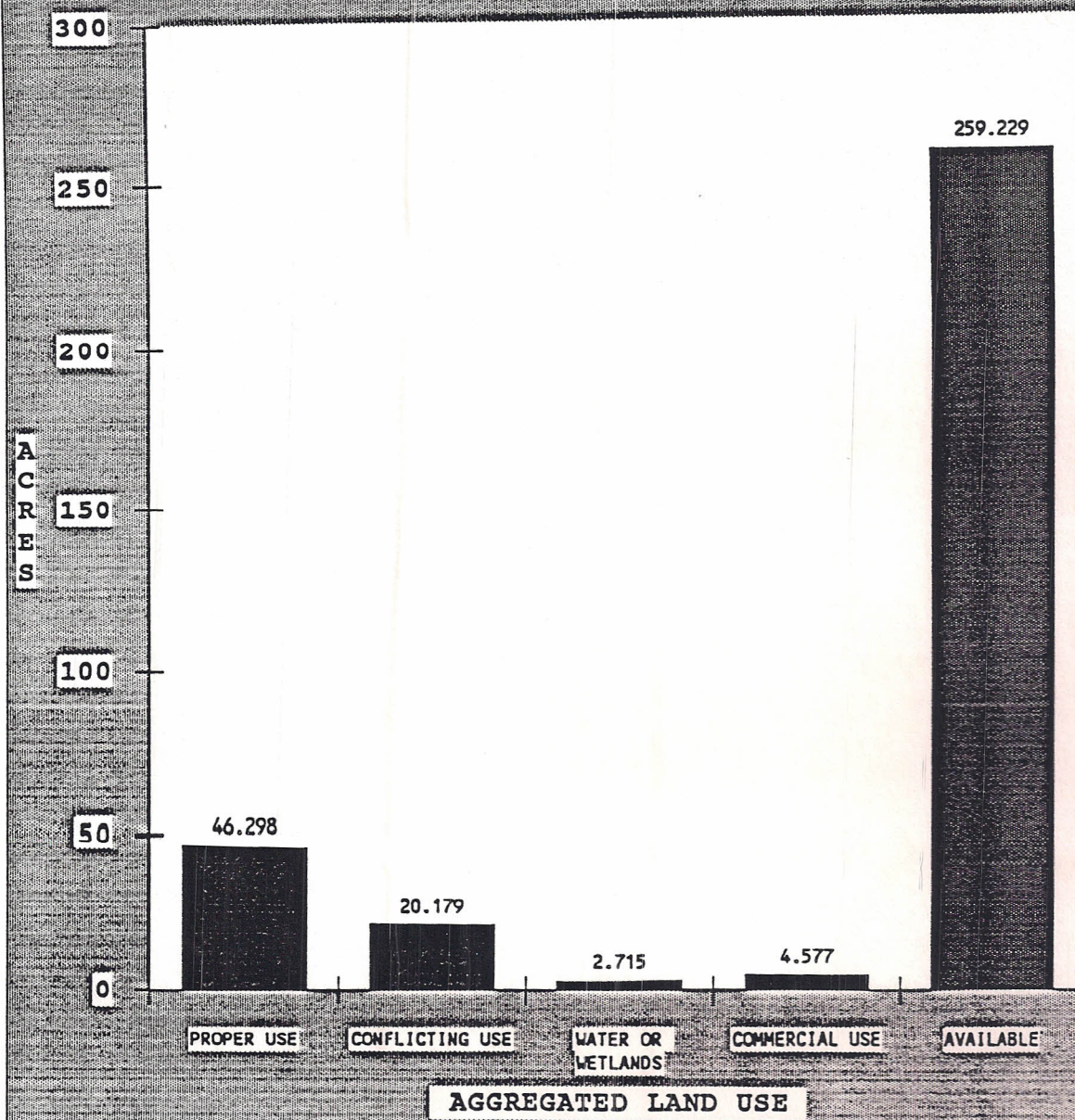
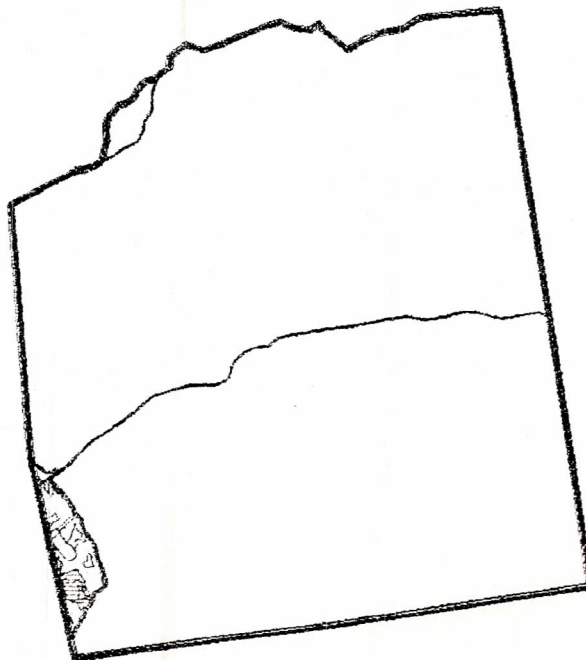







CHART # 4.10

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

GRANBY		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	46 295	14%
CONFLICTING USE	20 179	6%
WATER OR WETLANDS	2 712	1%
COMMERCIAL USE	1 577	2%
AVAILABLE	259 229	78%
TOTAL	332 992	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UNASIS Resource Mapping Unit from 1986 color infrared photography
BOUND: 1963-1964 LAND USE
DRAINAGE: 1963-1964 - Granby Project from 19500 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

GRANBY



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
GREENFIELD**

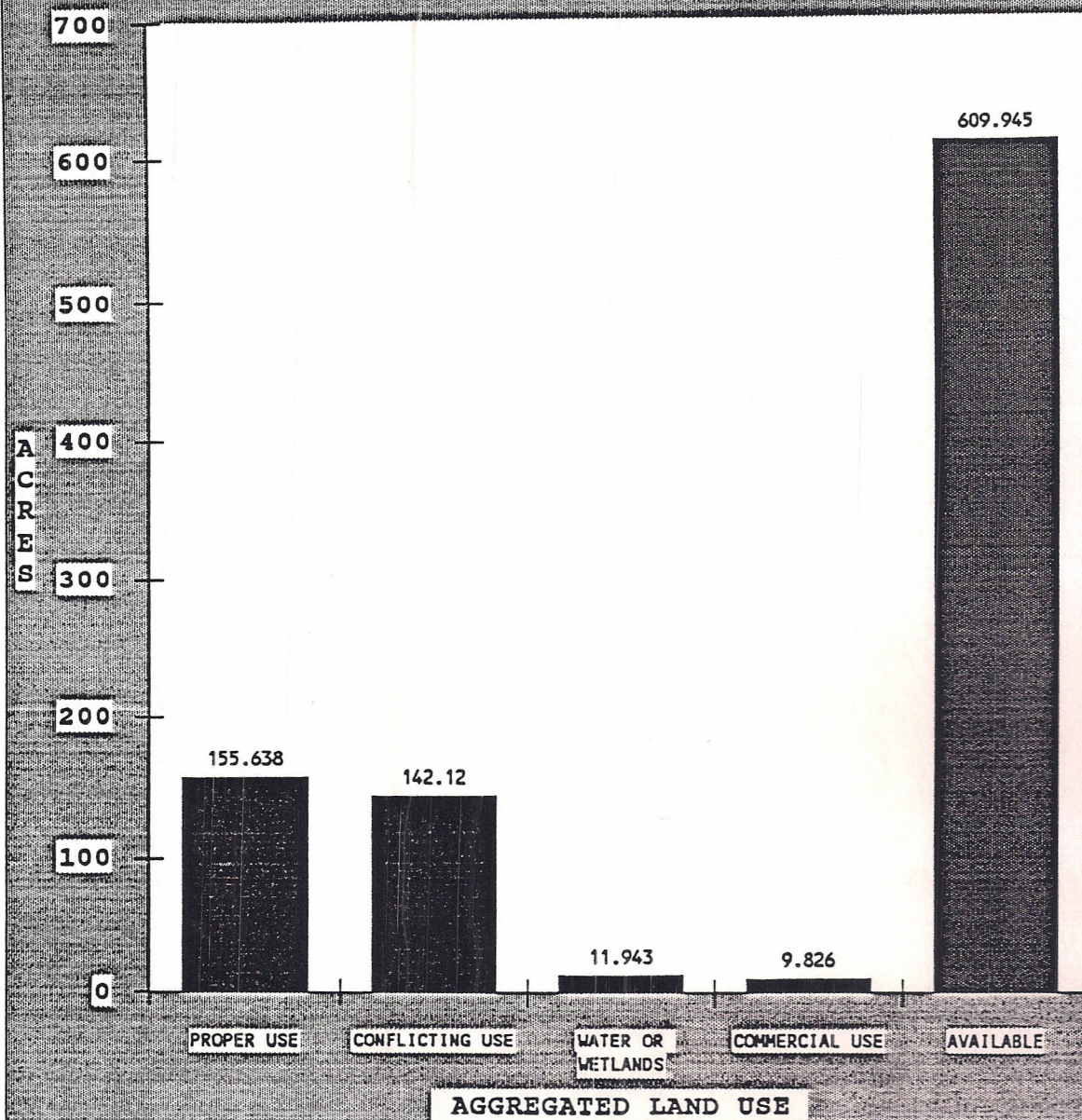
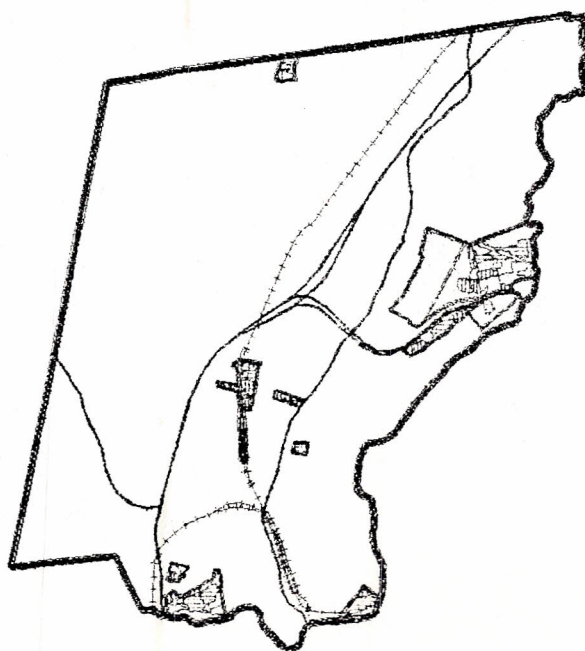







CHART # 4.11

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	GREENFIELD AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	155 838	17%
CONFLICTING USE	142 120	15%
WATER OR WETLANDS	11 943	1%
COMMERCIAL USE	9 826	1%
AVAILABLE	609 945	66%
TOTAL	929 476	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCE:
LANDUSE: UMMS Resource Mapping Unit from
1986 color infrared photography
BOUND: USGS-NHD 1:50,000 DGS
DRAINAGE: USGS-FRD - WASHG Project
from 1:25,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

GREENFIELD



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
HADLEY

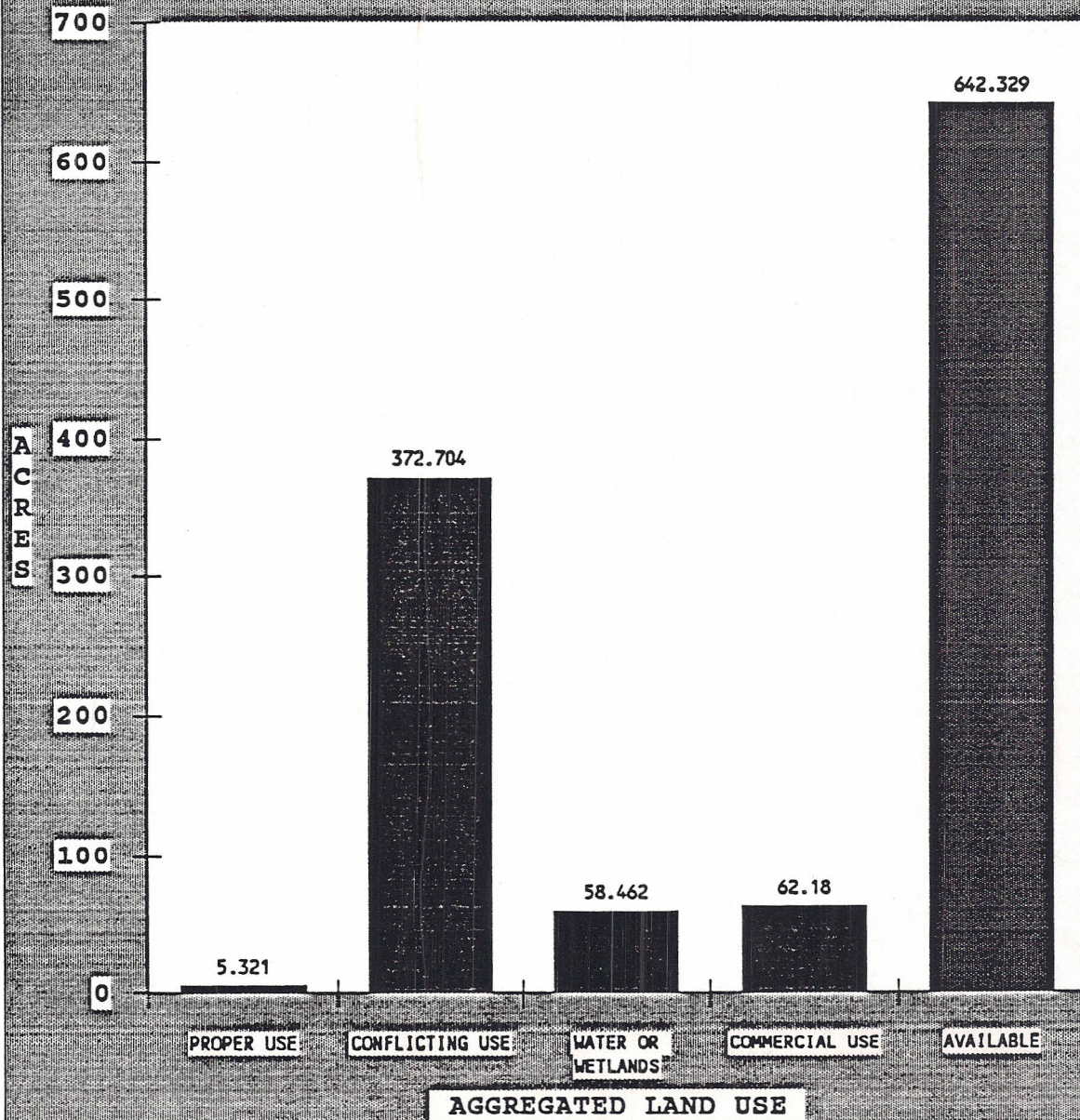
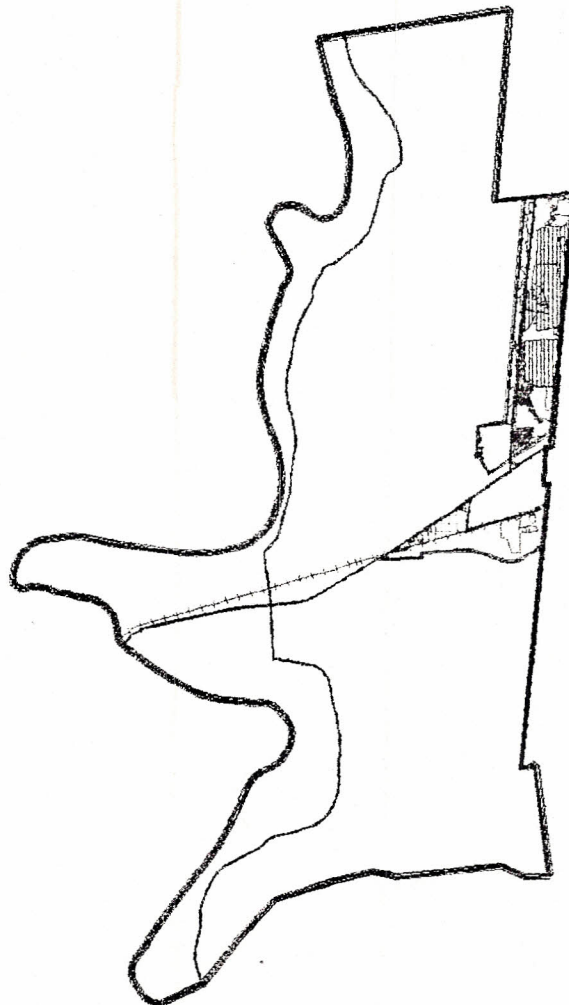







CHART # 4.12

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

HADLEY		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	5 321	1%
CONFLICTING USE	372 704	33%
WATER OR WETLANDS	58 462	5%
COMMERCIAL USE	62 180	5%
AVAILABLE	642 329	56%
TOTAL	1140 997	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES:
LANDUSE: UMASS Resource Mapping Unit from 1986 color infrared photography
ROADS: USGS-AND 1:50,000 DGS
DRAINAGE: USGS-FED - Mearns Project from 1950-60 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

HADLEY



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
HAMPTON

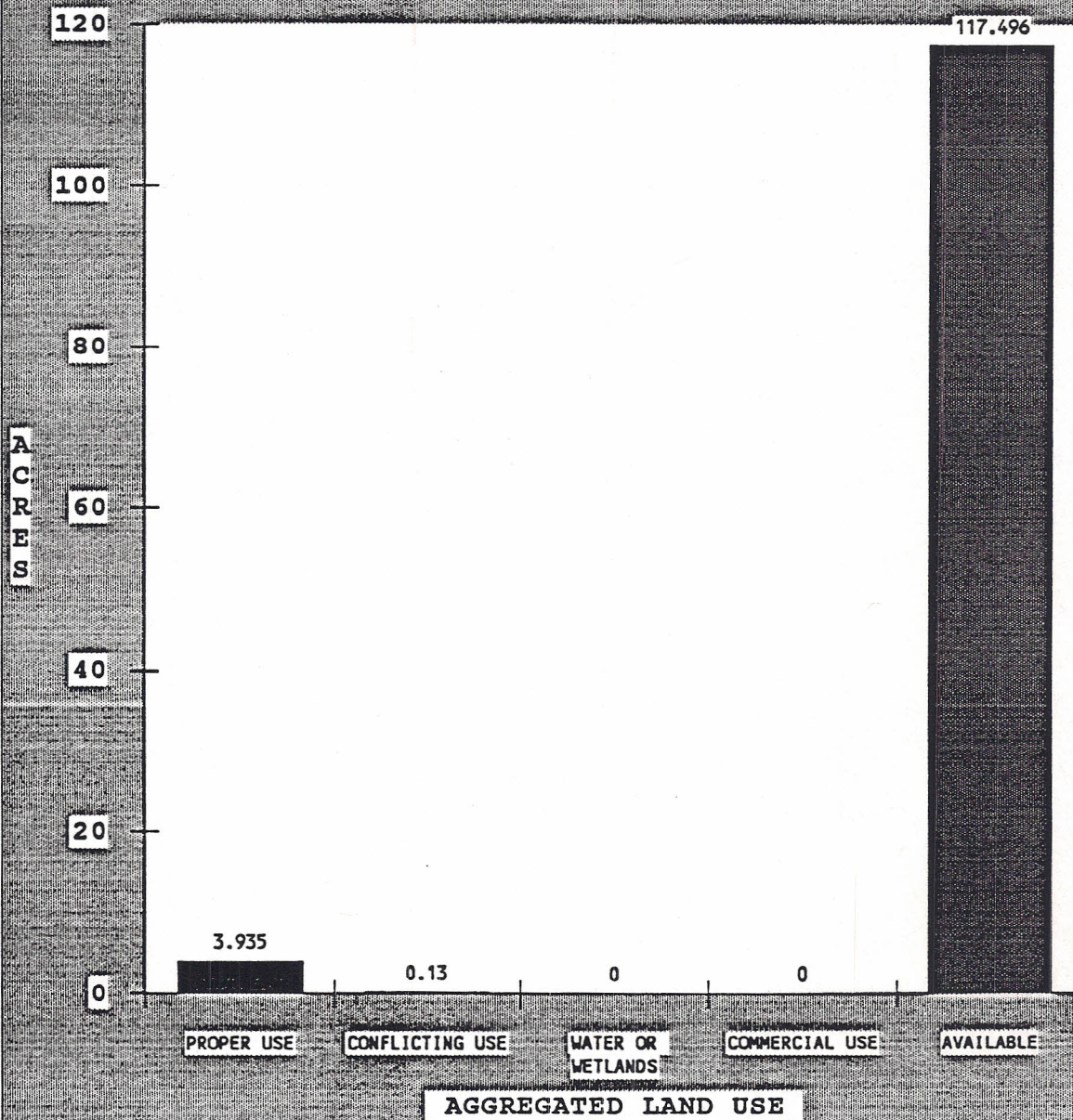
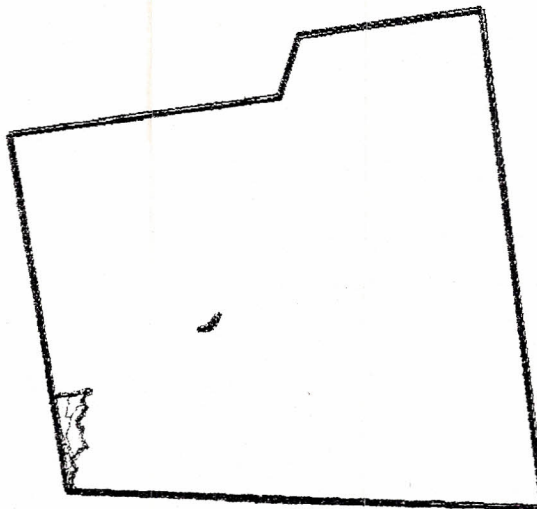







CHART # 4.13

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	HAMPDEN AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	3 935	3%
CONFLICTING USE	0 130	0%
AVAILABLE	117 496	97%
TOTAL	121 561	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: UMASS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-ND 1:50,000 DGS
DRAINAGE: USGS-WD - MAASCI Project
from 1:25,000 manuscripts

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HAMPTON



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
HATFIELD

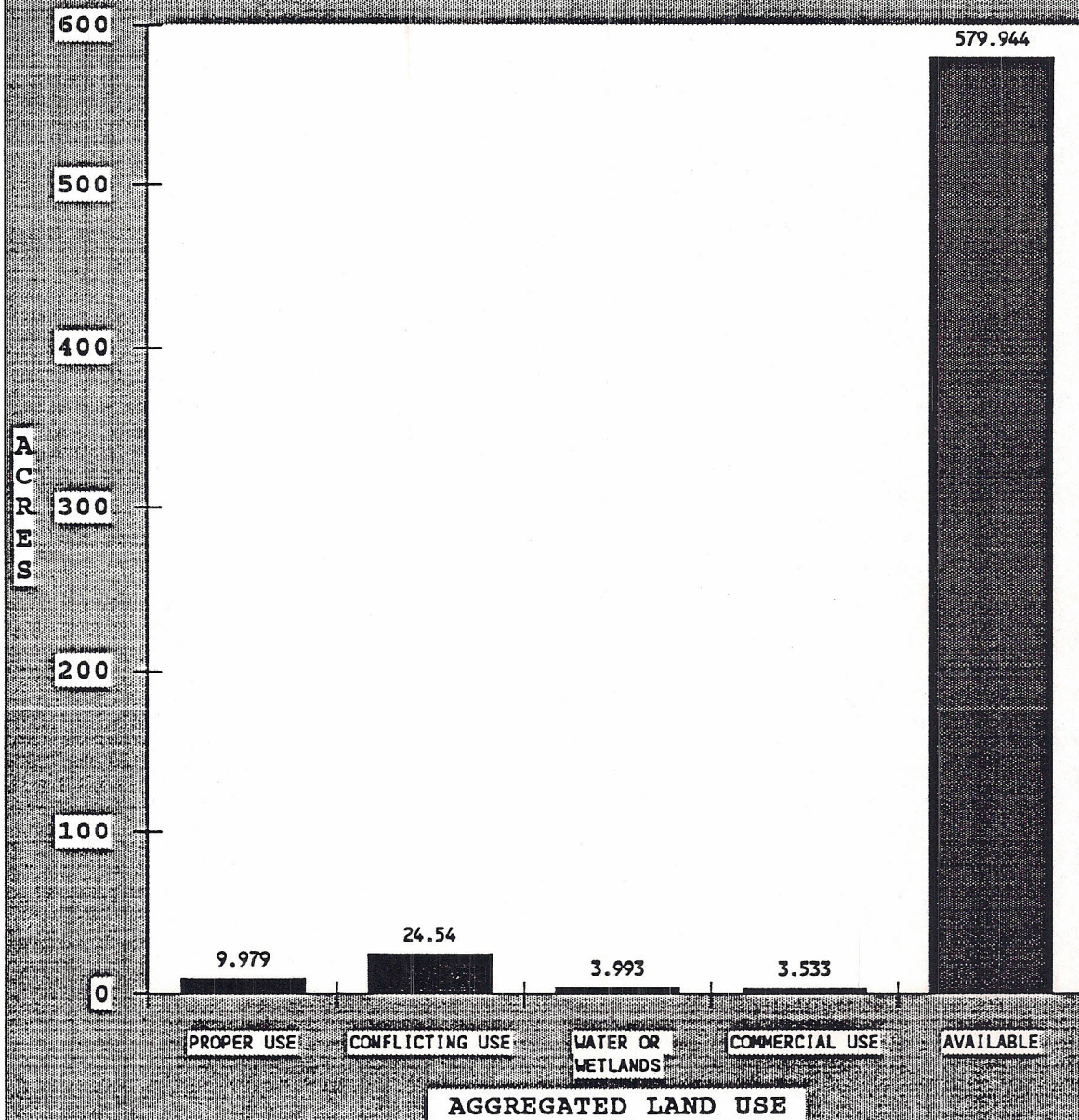
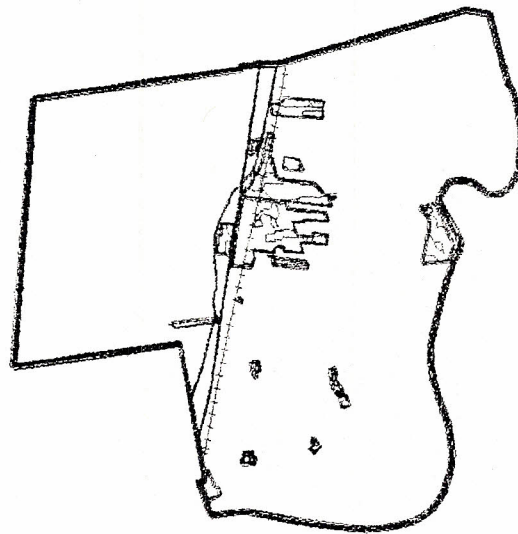







CHART # 4.14

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

HATFIELD		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	9 979	2%
CONFLICTING USE	24 540	3%
WATER OR WETLANDS	3 993	1%
COMMERCIAL USE	3 533	1%
AVAILABLE	579 944	93%
TOTAL	621 991	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from
1965 color infrared photography
ROADS: USGS-ND 1:50,000 DLE's
DRAINAGE: USGS-WFD - MassGIS Project
from 195,000 manuscripts

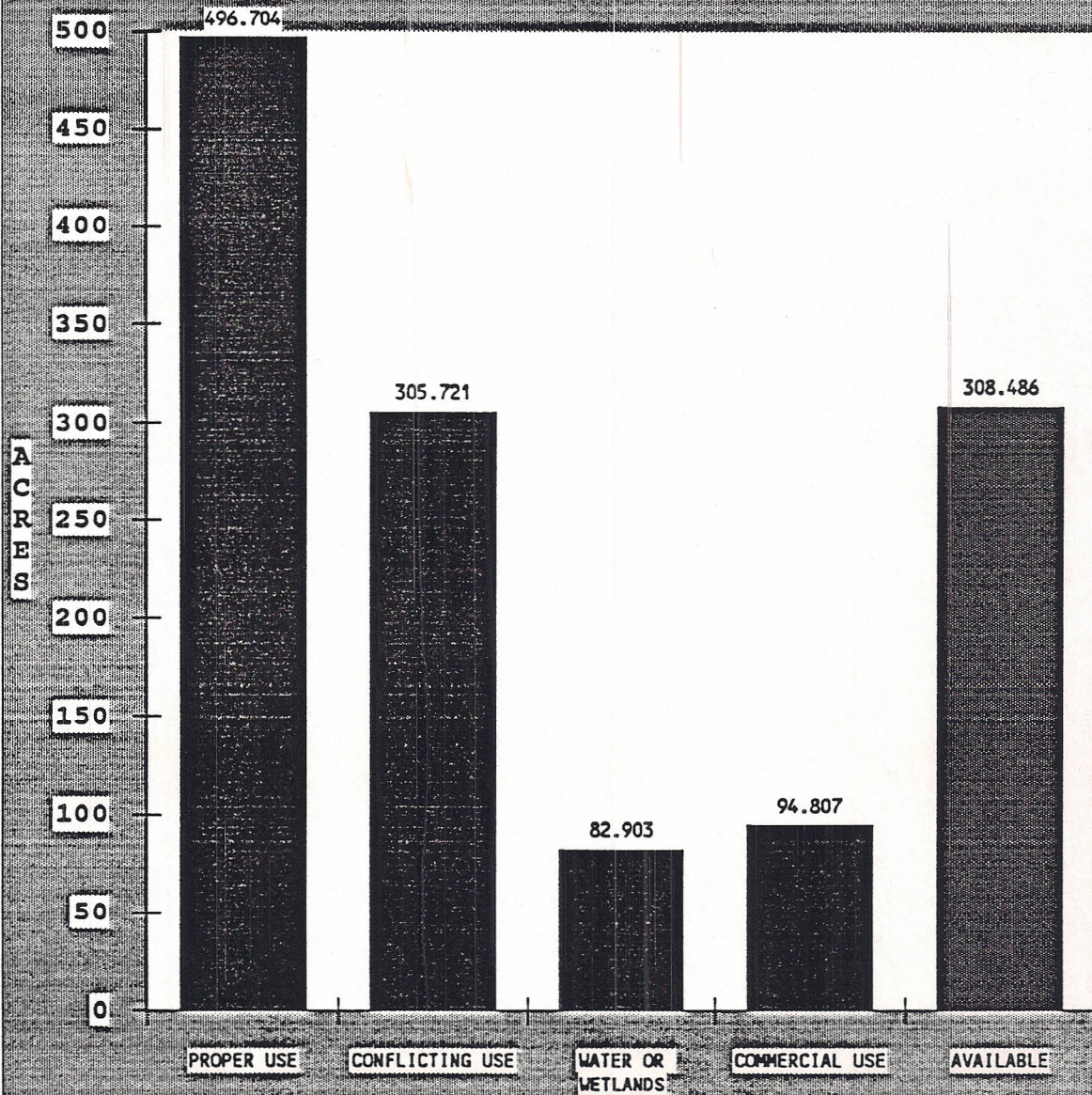
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LANDS ZONED AND SUITABLE FOR INDUSTRY

HATFIELD



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
HOLYOKE

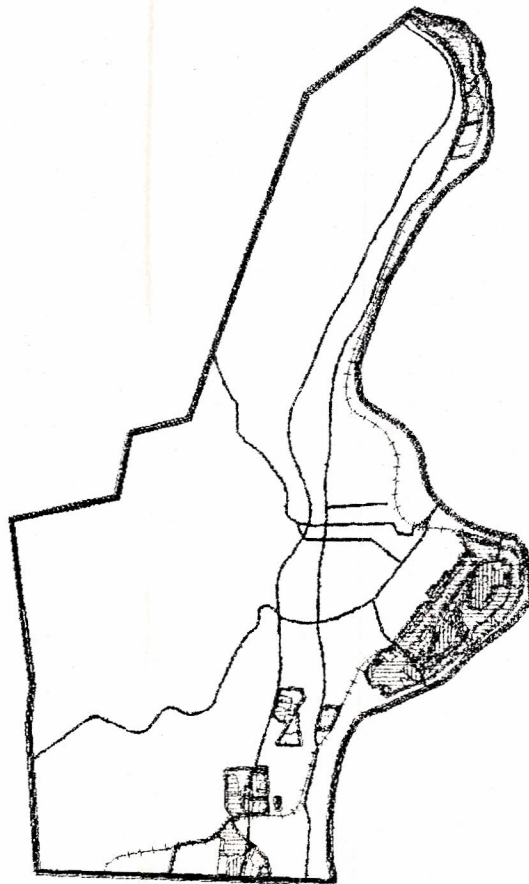


AGGREGATED LAND USE






CHART # 4.15

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	HOLYOKE AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	498 704	33%
CONFLICTING USE	305 721	24%
WATER OR WETLANDS	22 903	5%
COMMERCIAL USE	94 807	7%
AVAILABLE	308 466	24%
TOTAL	1298 620	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCE:
LANDUSE: UNAS Resource Mapping Unit from
1965 color infrared photography
ROADS: 1965-1970 1:50,000 DLS
DRAINAGE: 1965-1970 - MassGIS Project
from 125,000 manuscripts

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HOLYOKE



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
LUDLOW

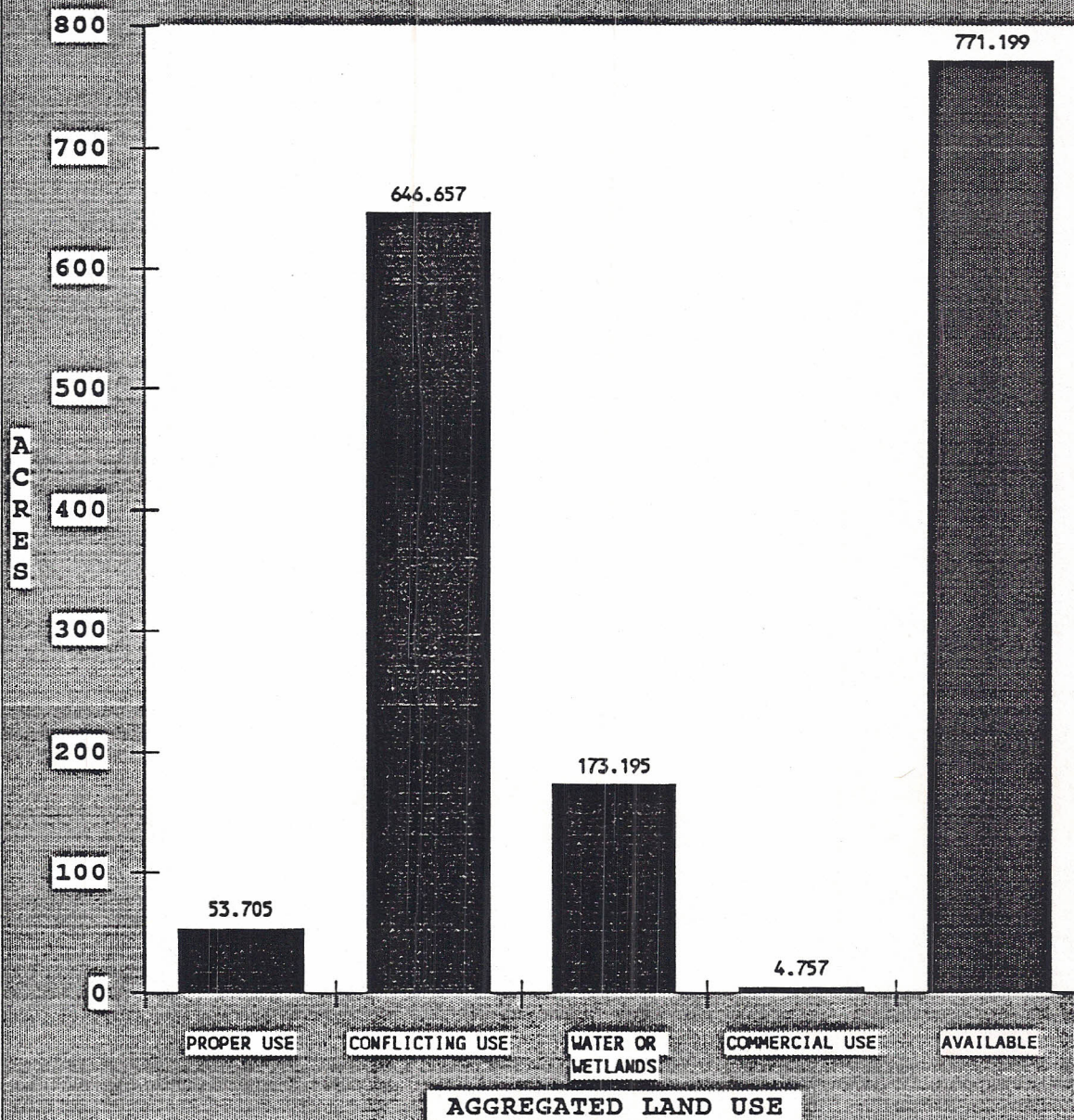
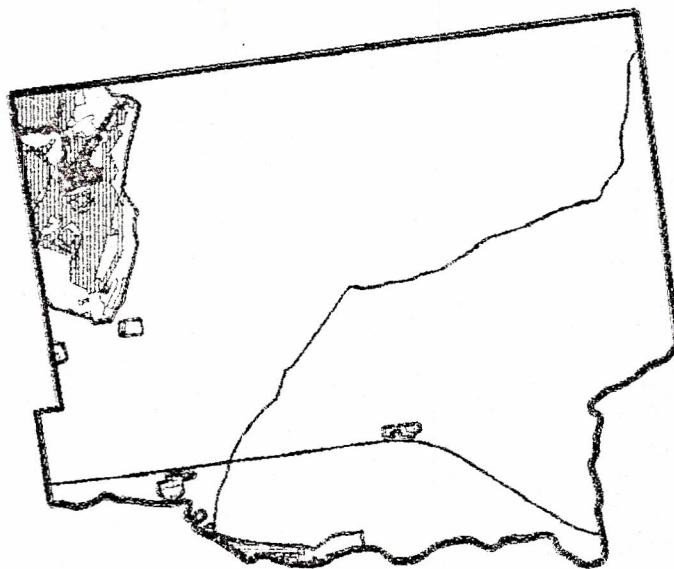







CHART # 4.16

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

LUDLOW		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	53 705	4%
CONFLICTING USE	646 657	59%
WATER OR WETLANDS	173 195	16%
COMMERCIAL USE	4 757	1%
AVAILABLE	771 199	46%
TOTAL	1049 510	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from 1965 color infrared photography
ROADS: USGS-ND 1:50,000 DGS
DRAINAGE: USGS-WFO - MasGIS Project from 125,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

LUDLOW



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
MONTAGUE**

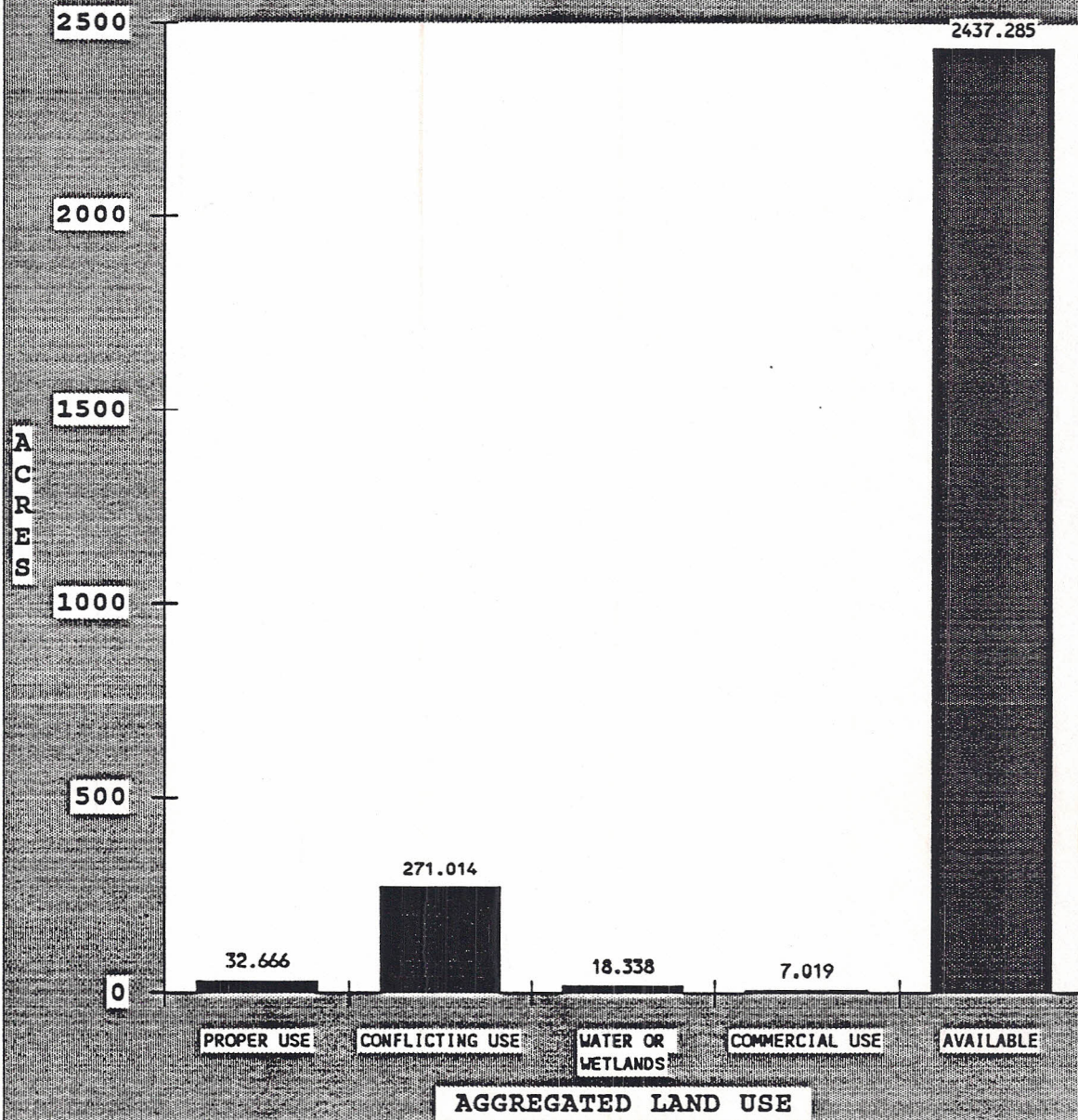







CHART # 4.17

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	MONTAGUE AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	32.686	1%
CONFLICTING USE	271.814	10%
WATER OR WETLANDS	13.338	1%
COMMERCIAL USE	7.819	0%
AVAILABLE	2437.285	88%
TOTAL	2786.921	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES
LANDUSE: UMMS Resource Mapping Unit from
1985 color infrared photography
BOUND: USGS-AMD 100,000 PGs
DRAINAGE: USGS-WBD - Montague Project
from 1:25,000 manuscripts

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MONTAGUE



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
NORTHAMPTON

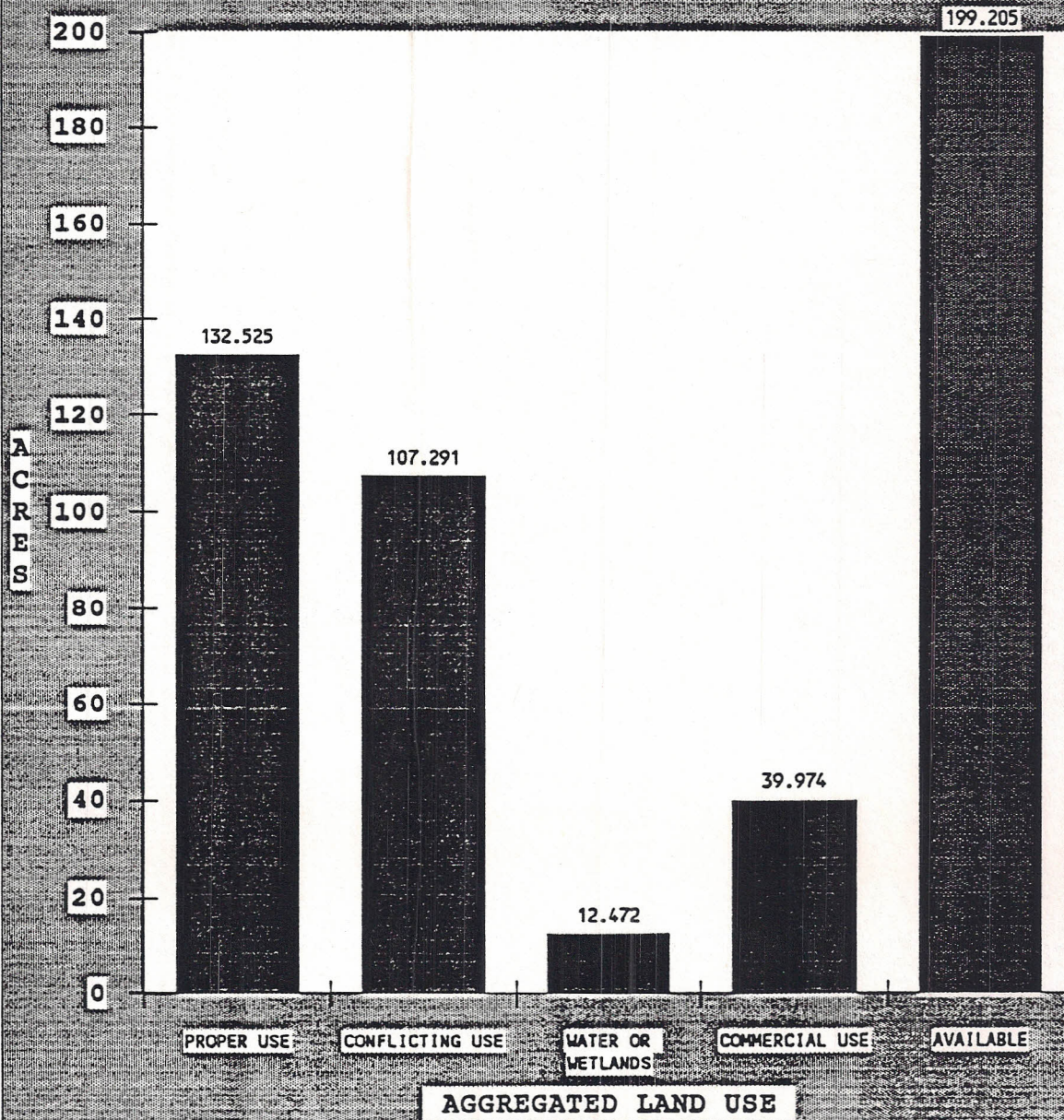
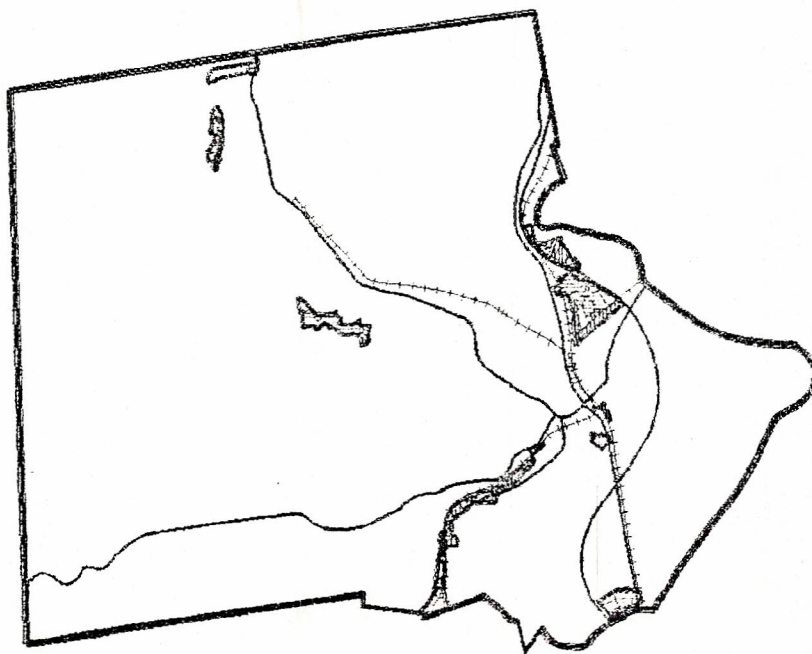


CHART # 4.18

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	NORTHAMPTON AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	132 525	27%
CONFLICTING USE	107 291	22%
WATER OR WETLANDS	12 472	2%
COMMERCIAL USE	39 974	8%
AVAILABLE	199 205	41%
TOTAL	491 460	100%



LEGEND

- PROPER USE / INDUSTRIAL USE
- CONFLICTING USE (RESIDENTIAL ETC.)
- WATER OR WETLANDS
- COMMERCIAL
- AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDS: UNASS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-ND 1:50,000 DGS
DRAINAGE: USGS-VTD - MassGIS Project
from 125,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

NORTHAMPTON



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
SOUTHAMPTON

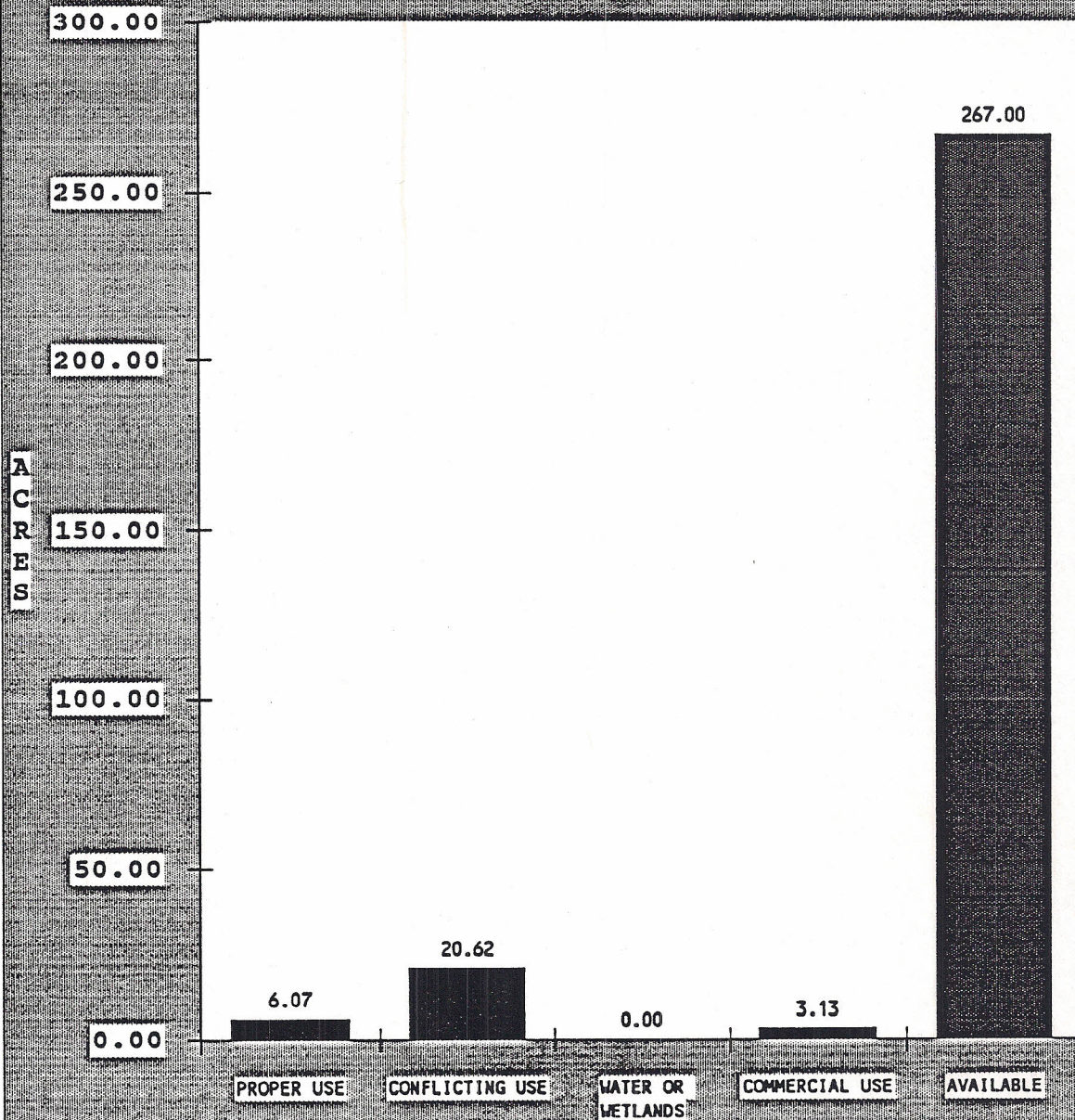
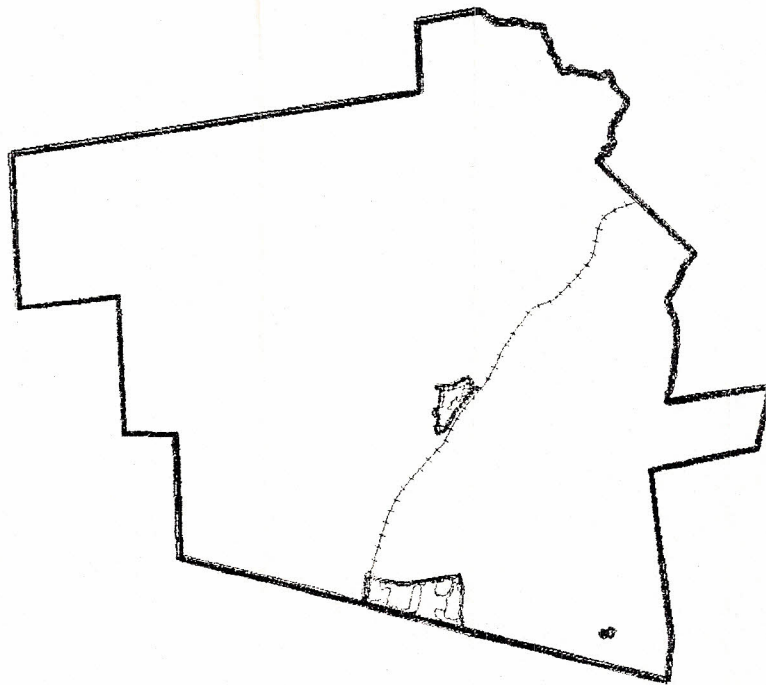







CHART # 4.21

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	SOUTHAMPTON AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	6 071	2%
CONFLICTING USE	20 615	7%
COMMERCIAL USE	3 125	1%
AVAILABLE	266 998	90%
TOTAL	296 807	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCE
LANDUSE: UNAS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-MD 1:100,000 DLG
DRAINAGE: USGS-FRD - MassGIS Project
from 125,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

SOUTHAMPTON



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University of Massachusetts, Amherst

LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
SHELburn

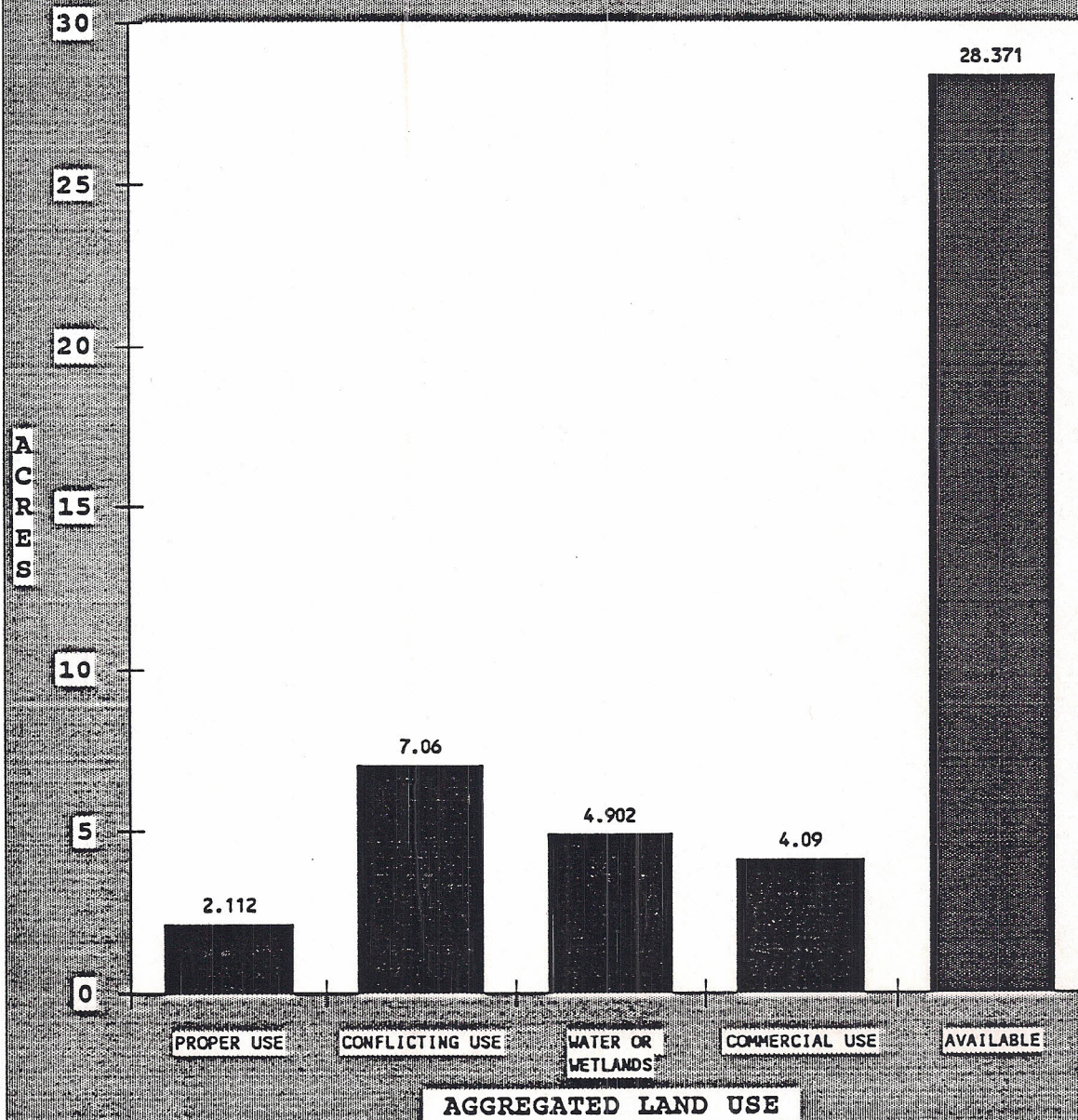
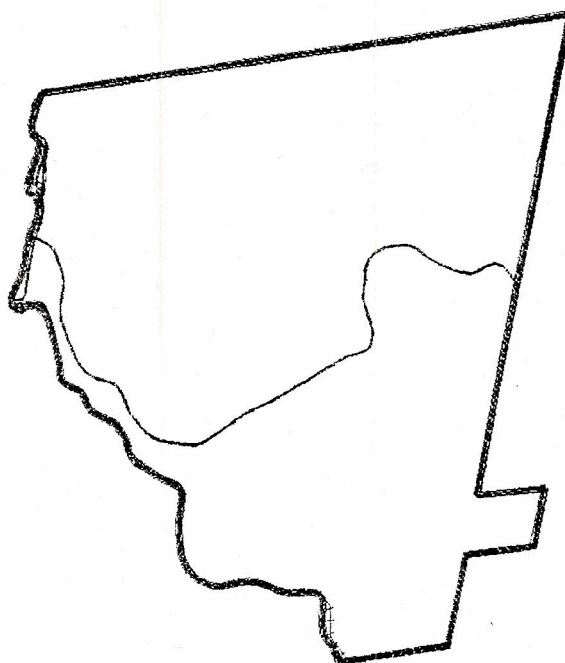







CHART # 4.19

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	SHELBURNE AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	2,112	5%
CONFLICTING USE	7,060	15%
WATER OR WETLANDS	4,002	11%
COMMERCIAL USE	4,000	9%
AVAILABLE	20,371	51%
TOTAL	46,537	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES:
LANDUSE: UNMASS Resource Mapping Unit from
1986 color infrared photography
ROADS: USGS-WMD 1:50,000 DIG
DRAINAGE: USGS-WMD - Waters Project
from 1:25,000 manuscripts

CENTER FOR ECONOMIC DEVELOPMENT
LANDS ZONED AND SUITABLE FOR INDUSTRY

SHELburn



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
SOUTH HADLEY

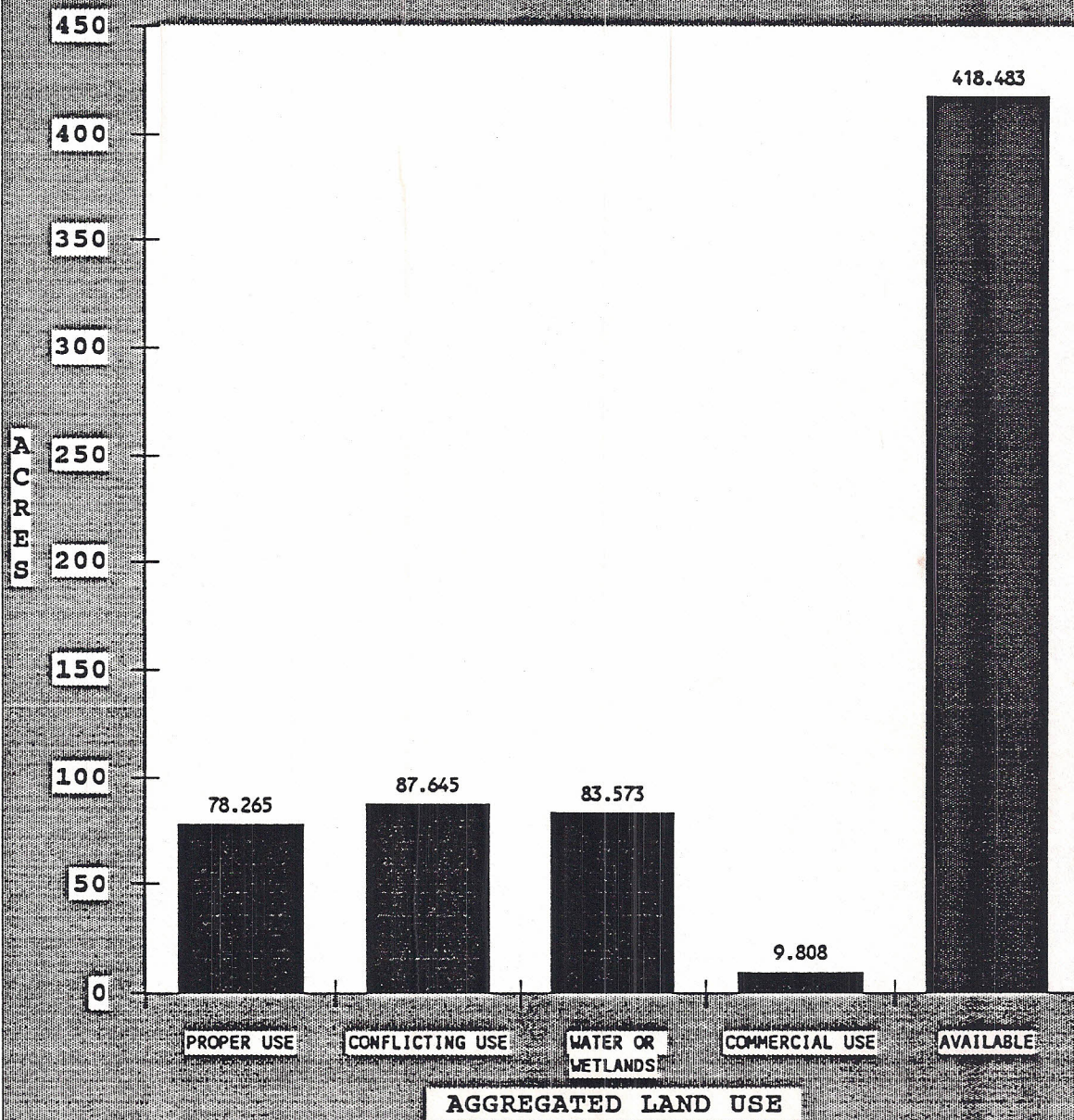
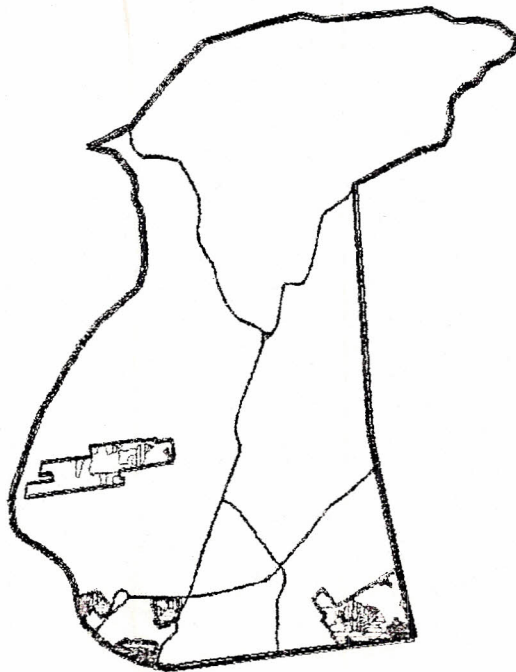







CHART # 4.20

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	SOUTH HADLEY AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	78 285	12%
CONFLICTING USE	87 645	13%
WATER OR WETLANDS	83 573	12%
COMMERCIAL USE	9 808	1%
AVAILABLE	418 489	62%
TOTAL	677 770	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: UMARI Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-AMD 1:50000 DGS
DRAINAGE: USGS-FED - MASSGIS Project
from 1:25000 manuscripts

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SOUTH HADLEY



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
SOUTHWICK

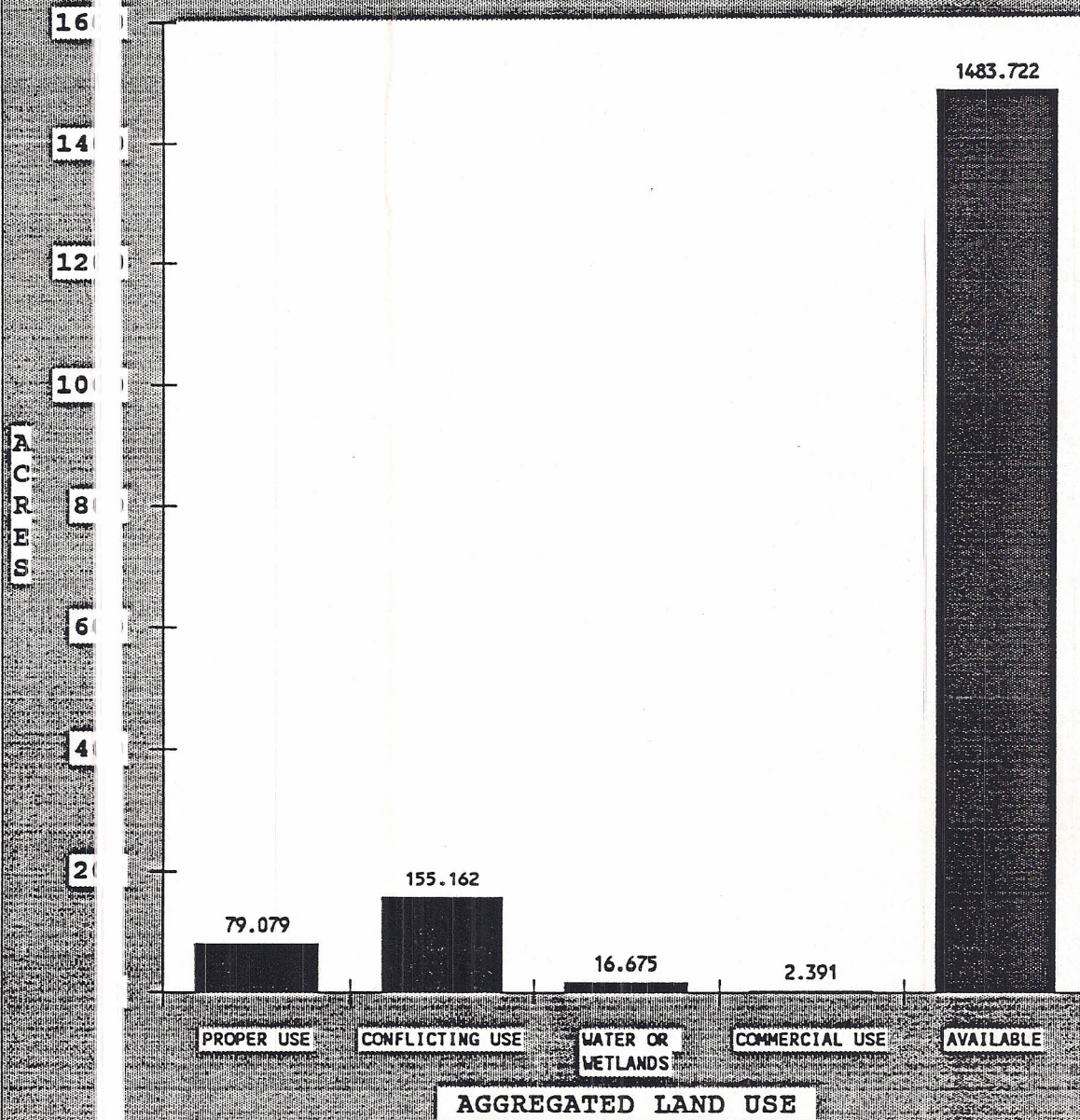
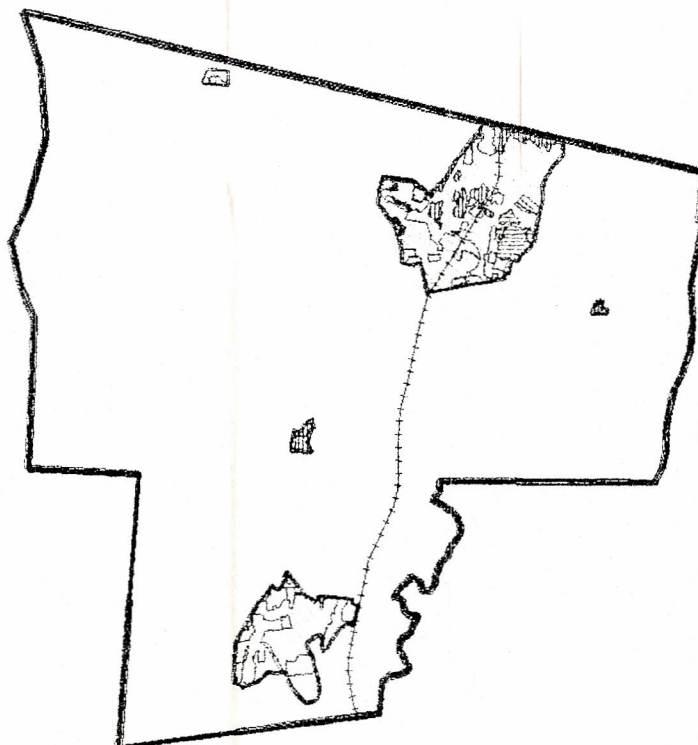


CHART # 4.22

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	SOUTHWICK AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	79 879	5%
CONFLICTING USE	155 162	9%
WATER OR WETLANDS	16 675	1%
COMMERCIAL USE	2 391	0%
AVAILABLE	1483 722	85%
TOTAL	1737 032	100%



- LEGEND
- PROPER USE / INDUSTRIAL USE
 - CONFLICTING USE (RESIDENTIAL ETC.)
 - WATER OR WETLANDS
 - COMMERCIAL
 - AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:250,000



DATA SOURCES:
LANDUSE: UNLAK Resource Mapping Unit from 1985 color infrared photography
ROADS: USGS-RMD LANDUSE REG.
DRAINAGE: USGS-RMD - MassGIS Project from 1:250,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

SOUTHWICK



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
SPRINGFIELD**

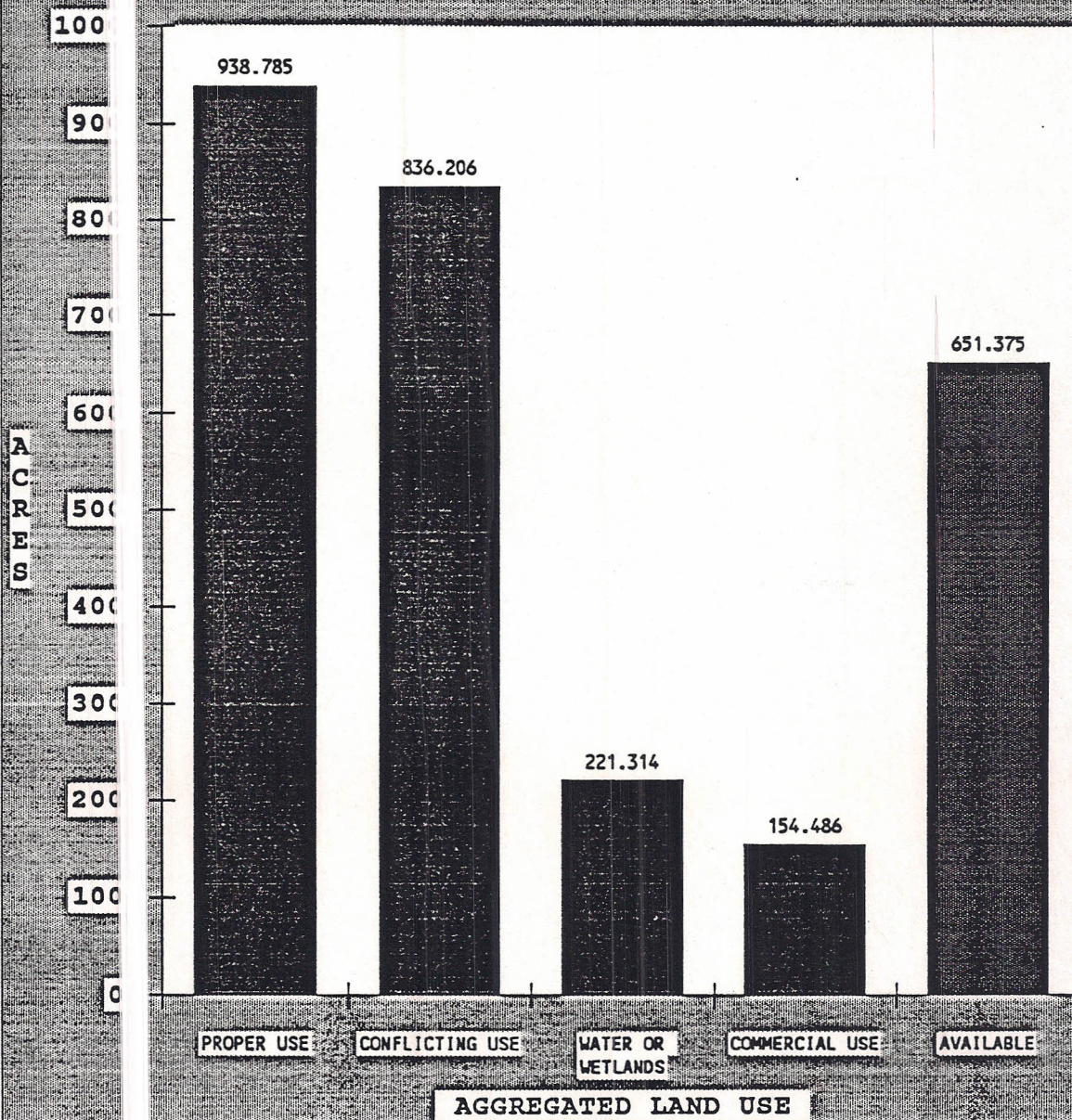
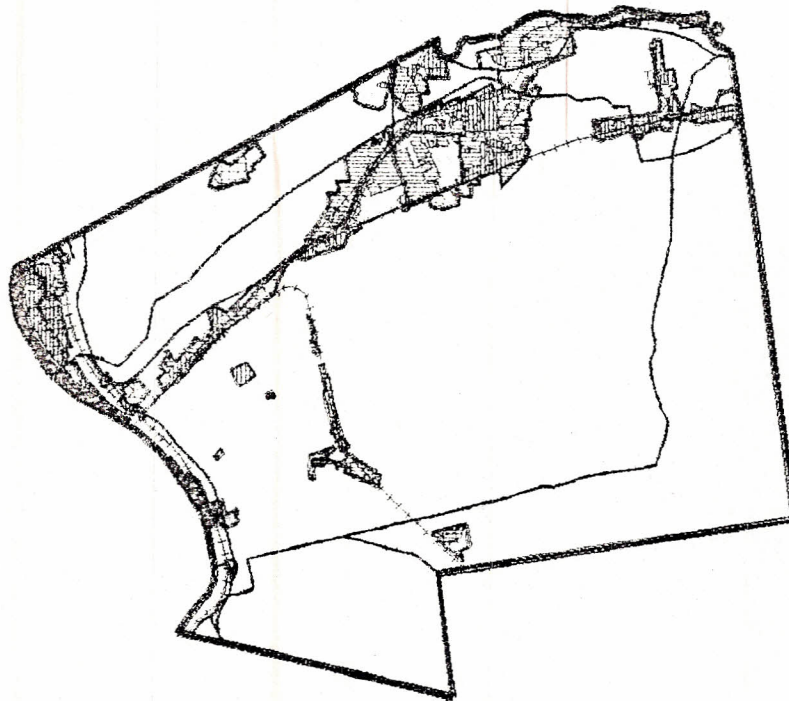







CHART # 4.23

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	SPRINGFIELD AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	938 785	24%
CONFLICTING USE	836 296	30%
WATER OR WETLANDS	221 314	8%
COMMERCIAL USE	154 488	6%
AVAILABLE	651 375	22%
TOTAL	2882 169	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES
LAND USES: UMMS Resource Mapping Unit from 1985 color infrared photography
ROADS: USGS-NHD 1:50,000 NGA
DRAINAGE: USGS-FRD - MassGIS Project from 1985 maps

CENTER FOR ECOLOGICAL
LANDS ZONED AND S

NO DEVELOPMENT
ABLE FOR INDUSTRY

SPRINGFIELD



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**LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
WESTFIELD**

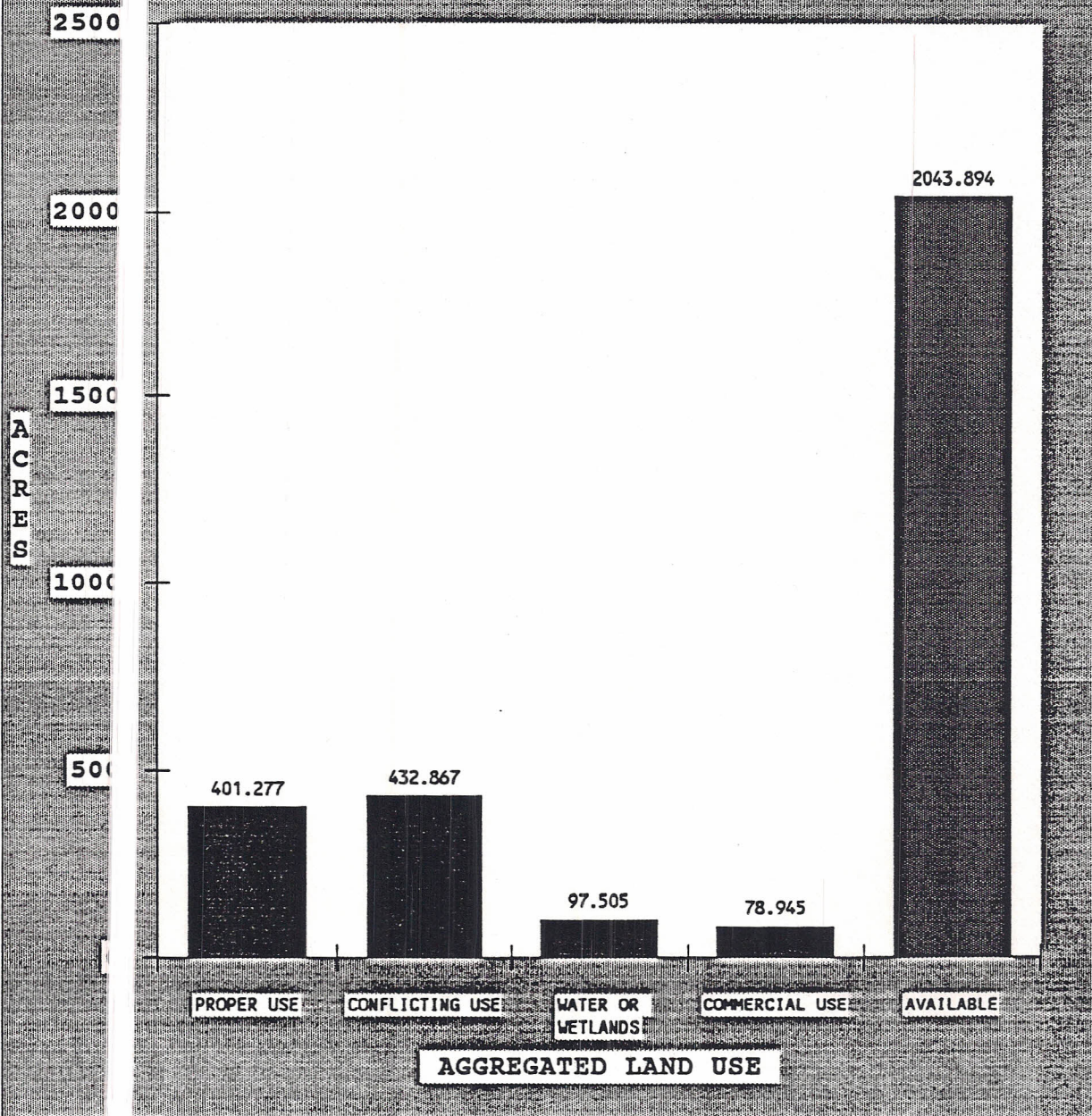
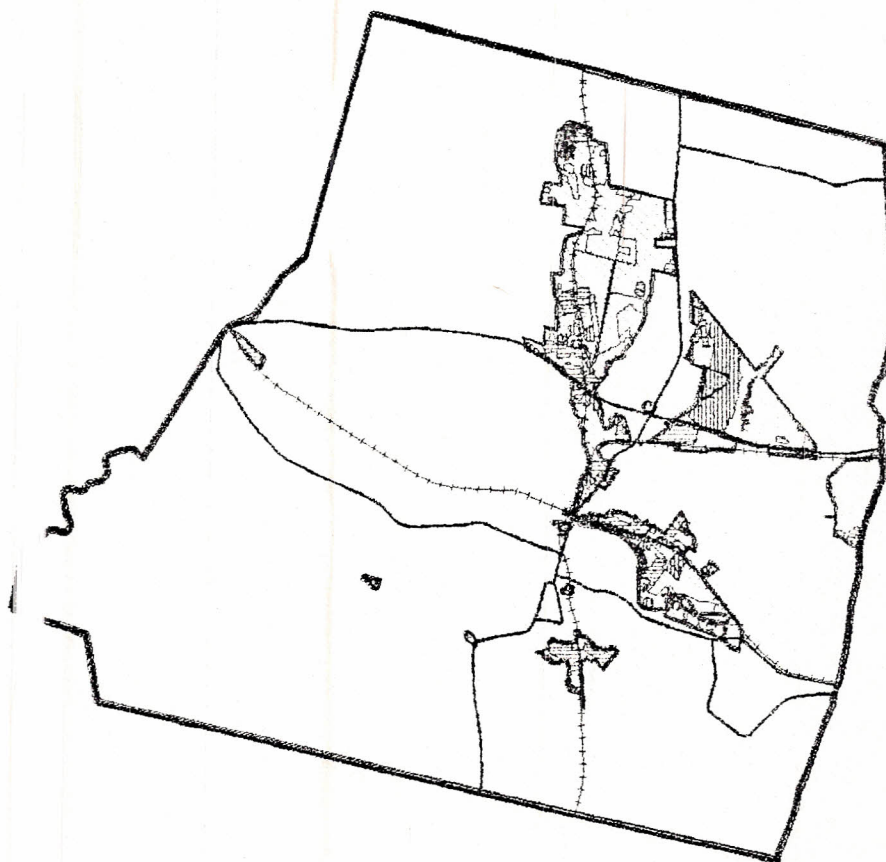







CHART # 4.24

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	WESTFIELD AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	401 277	13%
CONFLICTING USE	432 887	14%
WATER OR WETLANDS	97 505	3%
COMMERCIAL USE	78 945	3%
AVAILABLE	2043 894	67%
TOTAL	3054 487	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES
LANDUSE: DMAS Research Mapping Unit from
1985 color infrared photography
ROADS: 1:25000 AND 1:50000 D.G.S.
DRAINAGE: 1983-FED - MassGIS Project
from 1:25,000 manuscripts

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LANDS ZONED AND AVAILABLE FOR INDUSTRY

WESTFIELD



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
WHATELY

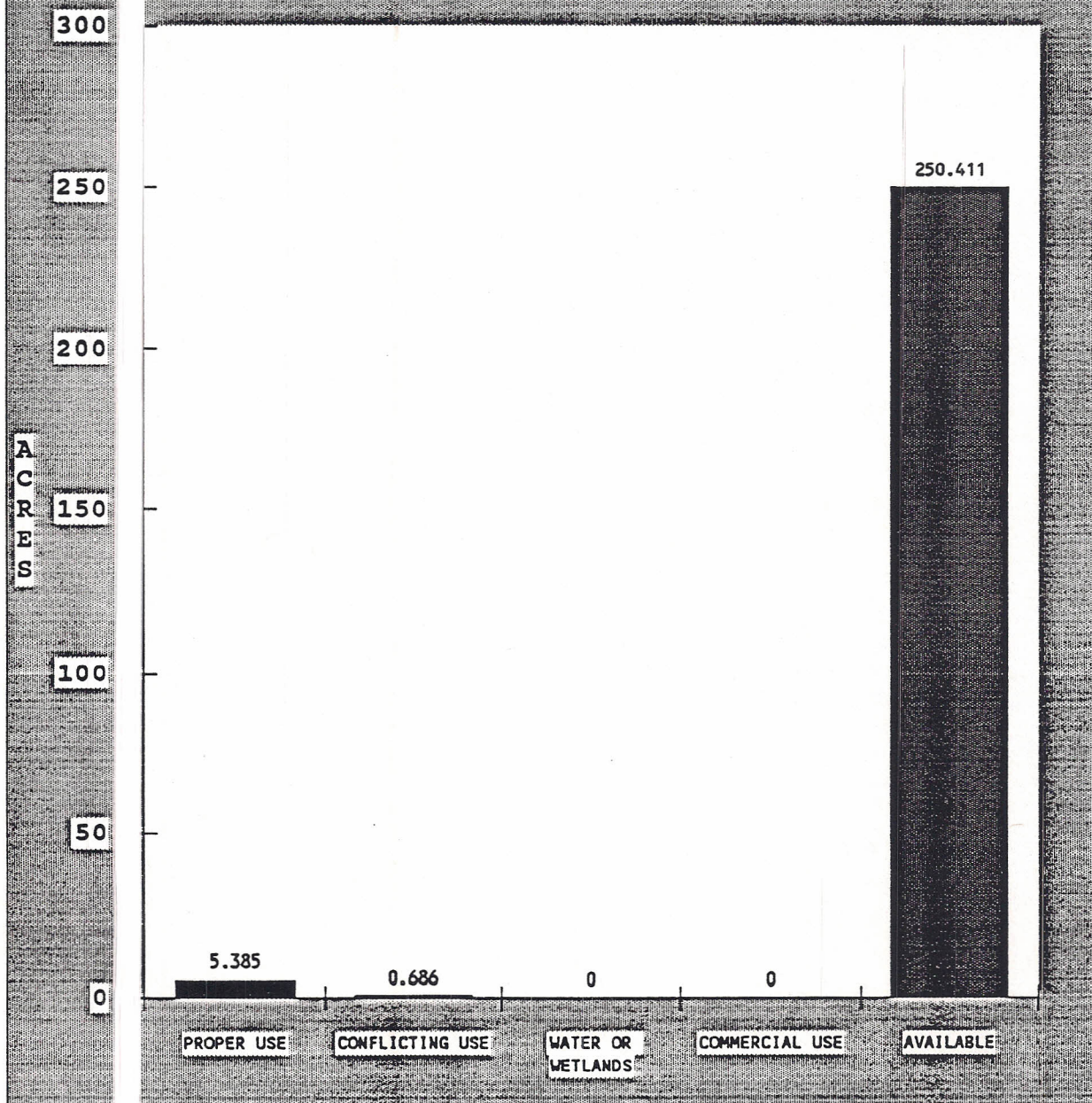
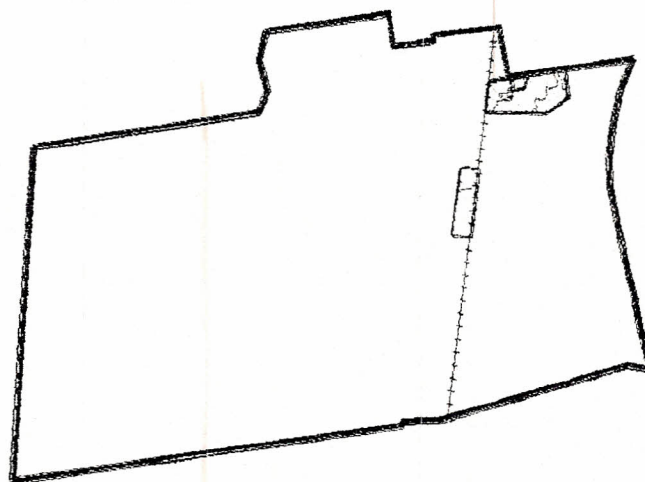







CHART # 4.25

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	WHATELY AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	5 385	2%
CONFLICTING USE	0 686	0%
AVAILABLE	258 411	98%
TOTAL	258 481	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25,000



DATA SOURCES:
LANDUSE: UMASS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-NOI 1:50,000 DITs
DRAINAGE: USGS-FRD - MasGIS Project
from 1:25,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

WHATELY



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
WILBRAHAM

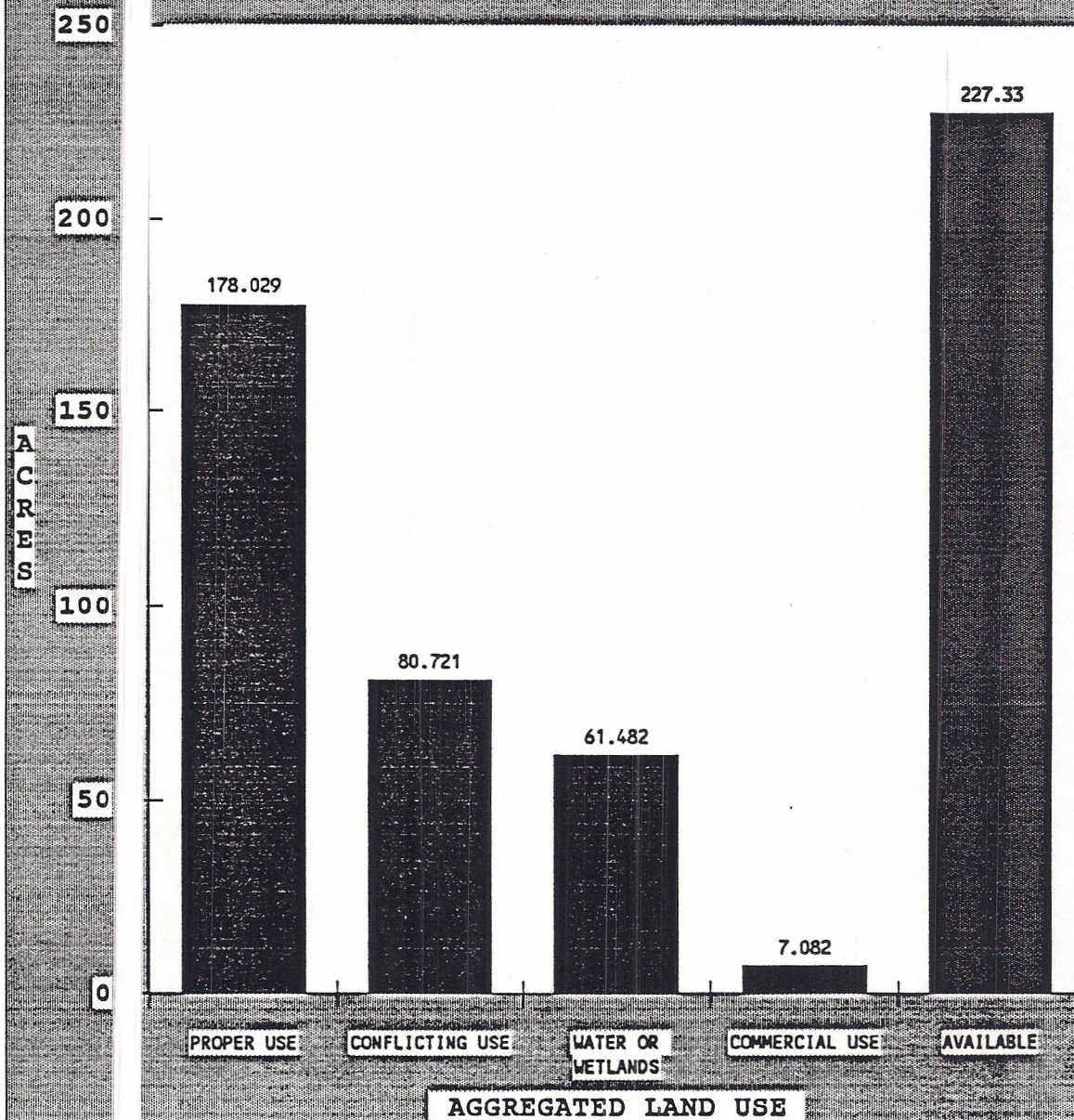
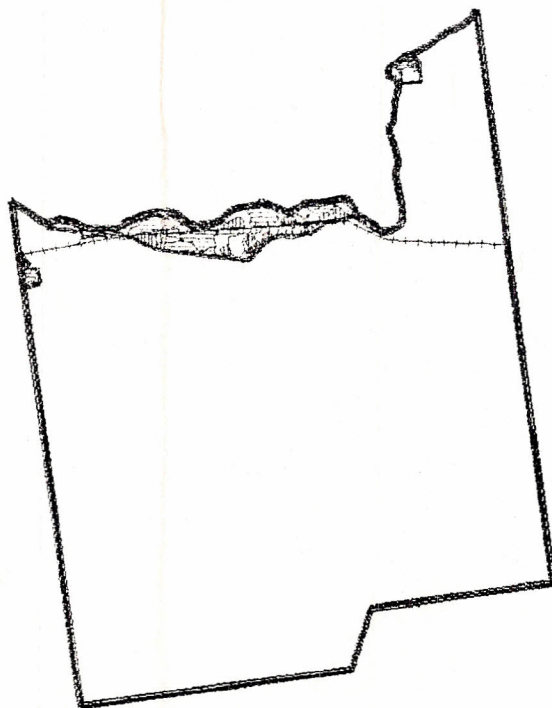







CHART # 4.26

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

AGGREGATED LAND USE	WILBRAHAM AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	178 029	32%
CONFLICTING USE	80 721	15%
WATER OR WETLAND	61 482	11%
COMMERCIAL USE	7 985	2%
AVAILABLE	227 330	40%
TOTAL	554 647	100%



- LEGEND
-  PROPER USE / INDUSTRIAL USE
 -  CONFLICTING USE (RESIDENTIAL ETC.)
 -  WATER OR WETLANDS
 -  COMMERCIAL
 -  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:25000



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-MD 1:25000 MGS
DRAINAGE: USGS-FED - WASHG Project
from 125000 manuscript

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LANDS ZONED AND SUITABLE FOR INDUSTRY

WILBRAHAM



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LAND USE BREAKDOWN
FOR
LAND ZONED INDUSTRIAL:
WEST SPRINGFIELD

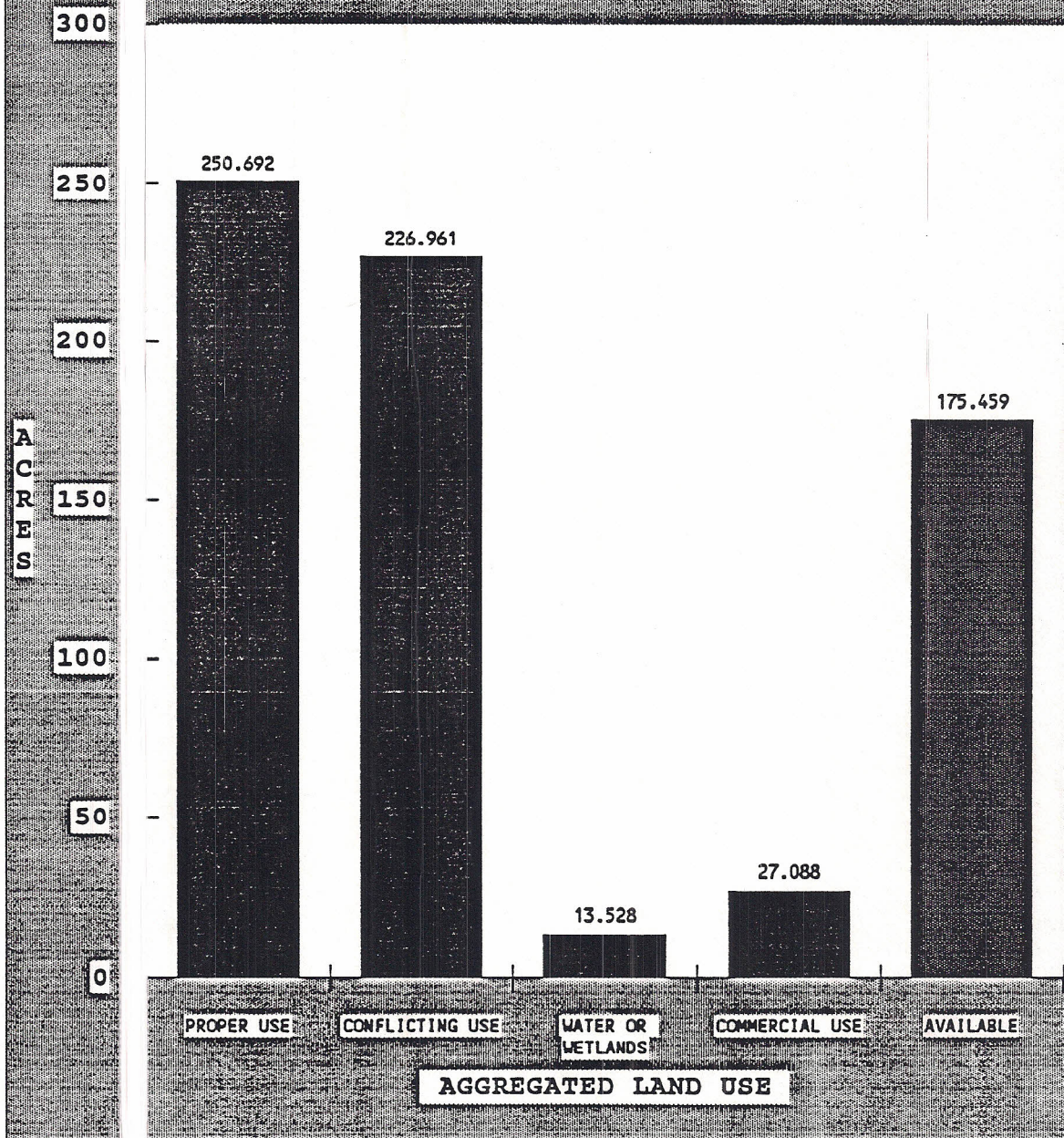
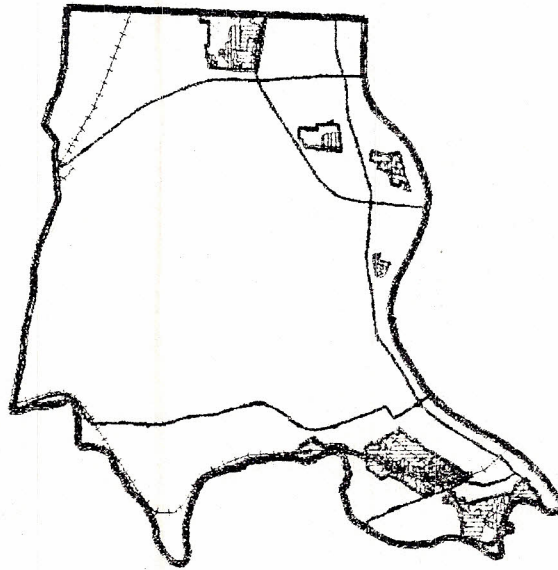







CHART # 4.27

AGGREGATED LAND USE WITHIN INDUSTRIAL ZONES

WEST SPRINGFIELD		
AGGREGATED LAND USE	AREA IN ACRES	PERCENT OF TOTAL
PROPER USE	250 892	36%
CONFLICTING USE	226 961	33%
WATER OR WETLANDS	13 528	2%
COMMERCIAL USE	27 088	4%
AVAILABLE	175 450	25%
TOTAL	693 732	100%



LEGEND

-  PROPER USE / INDUSTRIAL USE
-  CONFLICTING USE (RESIDENTIAL ETC.)
-  WATER OR WETLANDS
-  COMMERCIAL
-  AVAILABLE FOR DEVELOPMENT

ONE MILE
SCALE = 1:250,000



DATA SOURCES:
LANDUSE: USGS Resource Mapping Unit from
1985 color infrared photography
ROADS: USGS-ND 1:50,000 BLG
DRAINAGE: USGS-WPD - MassGIS Project
from 1:50,000 manuscripts

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LANDS ZONED AND SUITABLE FOR INDUSTRY

WEST SPRINGFIELD



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4. Application of Phase Two: Suitability

The area termed "available" for development does not take into account natural constraints to development such as wetlands or local constraints like "hostile neighbors". It is only lands zoned industrial that have not been built upon. The purpose of the second phase of the industrial suitability model is to look at the actual suitability of the land for industrial development.

PART 1 Area Size Assessment

Because this stage of the process requires additional data such as soil and slope, wetlands, and parcel data that has to be collected and digitized, time constraints limited the study to two towns. The two towns chosen were the town of Belchertown and Southampton. Southampton had much of the data needed already in digital form from a study done by UMASS Resource Mapping and Belchertown was a good comparison to Southampton. Most critical, they both contained an area over 100 acres that could be used for the assessment since it was decided to stay with the 100 acre minimum requirement.

PART 2 Physical Suitability

The land first was assessed by its natural factors to come up with a physical suitability rating for the site. These factors are discussed in the Methods chapter. The land was then categorized into one of three categories; *Suited for All Development*, *Suited for Light Development*, or *Not Suited for Development*. The results

for Belchertown showed only 28 of the 187.4 acres available for development were suited for all industry. Southampton had only 2.5 acres suited for all industry. Averaging the totals from both areas, nearly 29 percent of the available land over 100 acres is unsuitable for development due to natural factors and only 7.4 percent is suitable for all industry.

PART 3 Local Factors Suitability

The local factors assessment rated those elements within the control of local governments. Again this is discussed in detail in Section 3.2.2.3. The results of this analysis revealed only 7 acres in Belchertown suited for all industry. Southampton had zero land fitting that category. Again, averaging the combined results from these two towns reveals only 1.95 percent of the land suitable for all industry based on local factors although none was assessed as not suited. The results of these first two assessments are shown in Maps 4.31 and 4.32.

SUITABILITY 1 & SUITABILITY 2



LOCATION OF INDUSTRIAL
AREA IN BELCHERTOWN

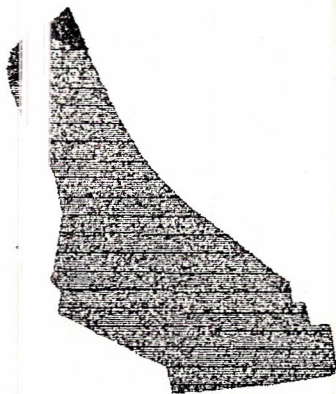
REDUCED FROM ORIGINAL

NATURAL FACTORS SUITABILITY ASSESSMENT



- SUITED FOR ALL INDUSTRY 28 ACRES
- ▨ SUITED FOR LIGHT INDUSTRY 145.4 ACRES
- NOT SUITED FOR INDUSTRY 14 ACRES

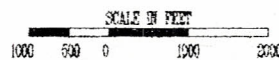
LOCAL FACTORS SUITABILITY ASSESSMENT



- SUITED FOR ALL INDUSTRY 7 ACRES
- ▨ SUITED FOR LIGHT INDUSTRY 180 ACRES
- UNSUITED FOR INDUSTRY

Suitability rating 1 is based on natural factors including: soils, slope wetlands, land use land cover and aquifers.

Suitability rating 2 is based on local control factors including: an average parcel size rating, existing sewer within 2000' and a potential conflict rating with neighbors.



DATA SOURCES:
LANDUSE: UMMS Resource Mapping Unit from 1985 color infrared photography
ROADS: USGS-MND 1:50,000 RLG's
DRAINAGE: USGS-WRI - MassGIS Project from 1:50,000 manuscripts

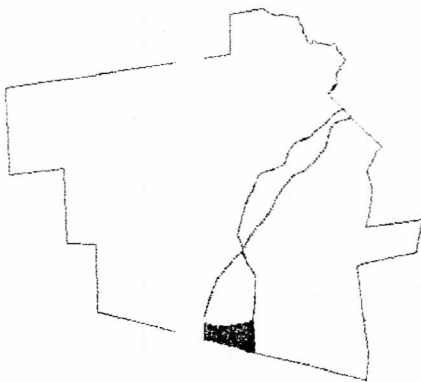
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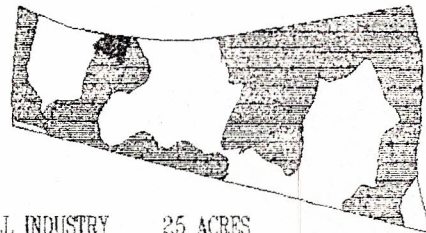
SUITABILITY 1 & SUITABILITY 2



LOCATION OF INDUSTRIAL
AREA IN SOUTHAMPTON

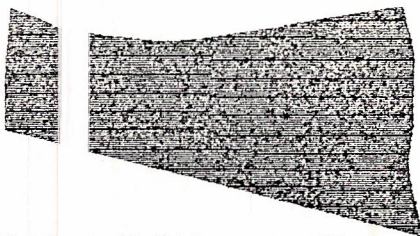
REDUCTION FROM ORIGINAL

NATURAL FACTORS SUITABILITY ASSESSMENT



- SUITED FOR ALL INDUSTRY 25 ACRES
- ▨ SUITED FOR LIGHT INDUSTRY 115.6 ACRES
- NOT SUITED FOR INDUSTRY 104.4 ACRES

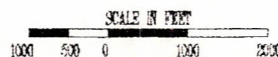
LOCAL FACTORS SUITABILITY ASSESSMENT



- SUITED FOR ALL INDUSTRY 0 ACRES
- ▨ SUITED FOR LIGHT INDUSTRY 222.6 ACRES
- UNSUITED FOR INDUSTRY 0 ACRES

Suitability rating 1 is based on natural factors including: soils, slope wetlands, land use land cover and aquifers.

Suitability rating 2 is based on local control factors including: an average parcel size rating, existing sewer within 2000' and a potential conflict rating with neighbors.



DATA SOURCES:
LANDUSE: UMass Resource Mapping Unit from 1985 color infrared photography
ROADS: USGS-NOI 1:100,000 DGS
DRAINAGE: USGS-NOI - Shaded Project from 1:25,000 manuscript

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LANDS ZONED AND SUITABLE FOR INDUSTRY

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PART 4 Overall Suitability Rating

The overall suitability rating combines the results from the first two ratings. The Belchertown rating resulted in 5.6 acres out of 186 acres in the study area left for all industrial development. Southampton still had zero prime land available out of 222 acres. Separating out the factors into the different categories gives a better picture of where the limitations to development are occurring. It is obvious with the case of Southampton that local factors are the major restraint with zero lands in the "all" category. The averaged results from Phase Two, Part 4, generalized to the 6 town study area, shows only 1.36 percent of the land area suitable for *All Industry* and 69.4 percent suitable for *Light Industry*.

The composite suitability assessment lands are then measured to see if they are within the road and rail buffers. These are the same buffers used in the identify stage. The results of this assessment are bleak. Belchertown ended up with only 2.3 acres suited for all industry in relation to rail access and 5.6 acres having access to major roads. This is out of 186 acres that were found available for industrial development. Southampton, having started with zero lands for all industry, resulted in a mere 0.9 acres suited for light industry within the rail buffer. The roads buffer had no limiting effect. The Southampton area started with 222 acres.

The averaged results, again generalized to the 26 towns of the Pioneer Valley with industrial zoning, show 1.36 percent of the area within the roads buffer suitable for *All Industry* and 0.56 percent of the area within the rails buffer suitable for *All Industry* . These results are shown in Maps 4.33 and 4.34.

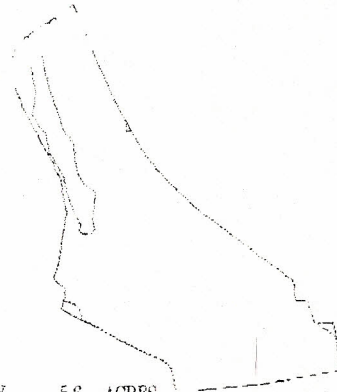
SUITABILITY 3 & PROXIMITY TO TRANSPORTATION



LOCATION OF INDUSTRIAL
AREA WITHIN BELCHERTOWN

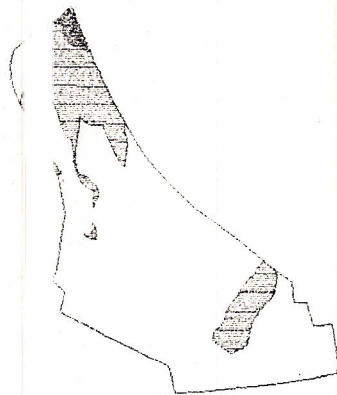
REDUCTION FROM ORIGINAL

COMPOSITE SUITABILITY ASSESSMENT COMBINED NATURAL & LOCAL FACTORS



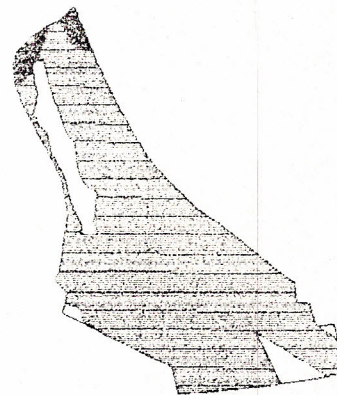
<input checked="" type="checkbox"/>	SUITED FOR ALL INDUSTRY	5.6 ACRES
<input checked="" type="checkbox"/>	SUITED FOR LIGHT INDUSTRY	163.0 ACRES
<input type="checkbox"/>	UNSUITED FOR INDUSTRY	13.6 ACRES

COMPOSITE SUITABILITY OF LAND WITHIN RAILROAD BUFFER



<input checked="" type="checkbox"/>	SUITED FOR ALL INDUSTRY	2.2 ACRES
<input checked="" type="checkbox"/>	SUITED FOR LIGHT INDUSTRY	33.6 ACRES
<input type="checkbox"/>	UNSUITED FOR INDUSTRY	151.8 ACRES

COMPOSITE SUITABILITY OF LAND WITHIN ROAD BUFFER



<input checked="" type="checkbox"/>	SUITED FOR ALL INDUSTRY	5.6 ACRES
<input checked="" type="checkbox"/>	SUITED FOR LIGHT INDUSTRY	163.9 ACRES
<input type="checkbox"/>	NOT SUITED FOR INDUSTRY	18.9 ACRES

SCALE IN FEET
1000 500 0 1000 2000



DATA SOURCES
LANDUSE: UMASS Resource Mapping Unit from 1981 color infrared photography
ROADS: USGS-TMD 1:50,000 DGS
DRAINAGE: USGS-WFO - MassGIS Project from 1:25,000 manuscripts

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