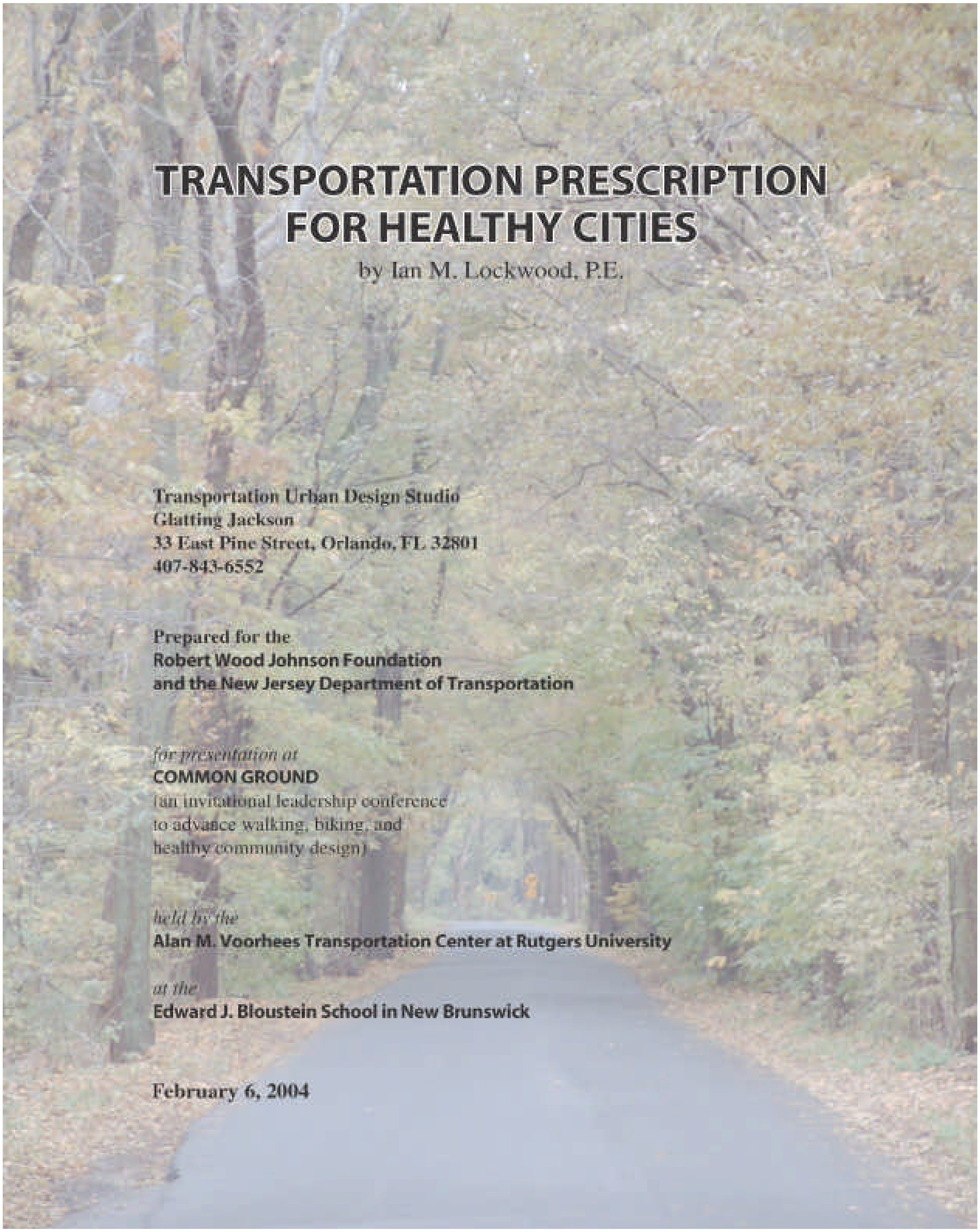

TRANSPORTATION PRESCRIPTION FOR HEALTHY CITIES

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TABLE OF CONTENTS

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1. INTRODUCTION

There is an old joke, "Battling congestion by widening roads is like solving obesity by buying bigger clothes." Who would have thought that these subjects were so related? Plenty of people are recognizing that America's increasing obesity rates and associated diseases are partially related to urban design and transportation. The awareness of these patterns is growing and the problems are becoming increasingly difficult to ignore. Hopefully, our society will reach its tipping point soon so that we will have a broad mandate for transportation reform and for building healthier cities.

In the meantime, organizations, that are ahead of the curve, like the Center for Disease Control, the Robert Wood Johnson Foundation, and the New Jersey Department of Transportation, need to continue their leadership roles in affecting positive change.

The purpose of this paper is to shed light on healthy and unhealthy patterns from a transportation perspective. It will outline the fundamentals of healthy cities, describe some case studies and design ideas, and suggest ways of approaching policy decisions and setting design direction for projects.

The Robert Wood Johnson Foundation, the City of Lambertville, and the New Jersey Department of Transportation are involved with the author on health-related transportation projects in the City of Lambertville. The first completed part of this effort was the traffic calming plan. It is discussed in Section 9.1. The other parts, which are in progress, will be incorporated in the next version of this paper. So, examples from other cities will be used to demonstrate the salient points.

2. PATTERN RECOGNITION

2.1 Simple to Complex Patterns

Most of us have some ability to recognize good proportions, good line, and good design as soon as we see it. For example, when we look at the images in *Figure 2.1*, we can agree that there is a beautiful flower, that the dam is monumental and invokes a sense of strength and permanence, that the proportions of the human body that Leonardo De Vinci drew make sense to us, that the courtyard feels warm and welcoming, that the shell is the right shape, and that the dancer has the right line.

Figure 2.1: Images that Look Good

It is through a combination of natural ability, experience, and training that we can appreciate these subjects even though we may not be an expert in any of their fields. Let's call this ability, "pattern recognition." The idea is that we have experienced enough flowers, dams, structures, people, courtyards, shells, and dancers that, when we are confronted with a new subject, we can determine if it is pleasing, correct, or not.

Figure 2.2: Anything wrong?

In *Figure 2.2,* we can discern the problem, namely the slope of the drive way. Obviously, it would be very difficult to drive a car in or out of the garage or even park on the driveway.

Figure 2.3: Anything wrong?

Similarly, in *Figure 2.3,* we can see an inconsistency in the architecture. The newer brown house detracts from the street due to the lack of windows, front door, and porch. We recognized these patterns in seconds.

Figure 2.4 shows an entire city. The issues, concerns, and problems facing cities are often the result of long histories, evolving values, and layers of factors varying from block structure to social issues, to funding issues, to political issues, to topography, to climate, to you name it.

Figure2.4: Anything wrong?

Cities are complicated places. What looks like a simple problem on the surface may be a symptom of a much larger problem.

Problems can also be related to a number of contributing factors that may not be readily apparent. However, through our ability of pattern recognition and with a bit of training, the patterns become clearer and the solutions become more apparent.

2.2. The Transect (a helpful tool to see patterns in the built environment)

From a design perspective, a tool that is growing in popularity for helping to discern what is right and wrong for cities is called the “transect.” The transect is simply a cross-section of the built environment ranging on a scale from urban to rural. For example, referring to the bottom of *Figure 2.5,* in urban areas we would expect the heights of buildings to be taller in urban areas and then become lower as we move to rural areas.

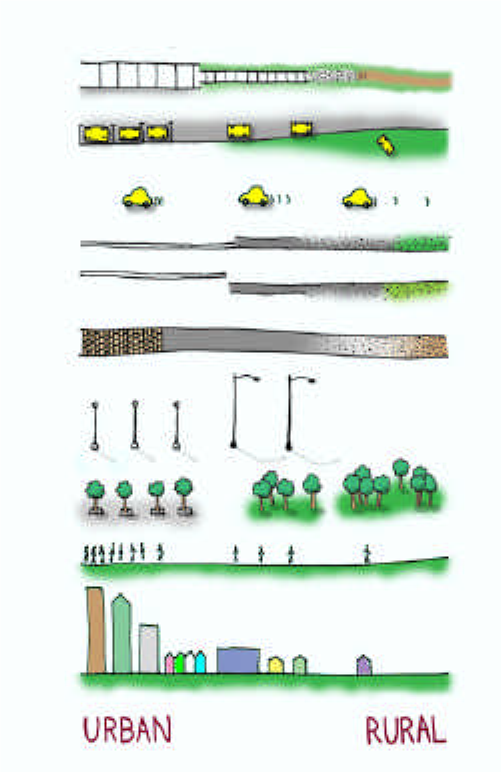

Figure 2.5: The Transect

Moving up *Figure 2.5*, the density of people in urban areas would be higher than those in rural areas. The transect for trees would involve regularly spaced trees in grates in urban areas, to less formal spacings and no grates, to natural forest in rural areas. Streetlights range from pedestrian scale lights that are evenly spaced, to high mast street lights, to no lights, as one goes from urban to rural.

Paving materials would range from bricks, to asphalt, to gravel, moving from urban to rural. Edge treatments would range from vertical curbs, to paved shoulders, to gravel shoulders, to grass shoulders, to natural edges. The speeds of motor vehicles, in urban areas, would be slow and then become faster in rural areas. On-street parking would be formal and marked in urban areas, less formal and unmarked, and then off-street in rural areas. Sidewalk widths would be wide in urban areas, narrow, then become nonexistent as we head into rural areas.

Consequently, if we were designing a street in an urban area, it would involve taller buildings up to the street, more people, trees in grates, pedestrian-scale lighting, higher valued paving materials, curbs, slow moving motor vehicles, on-street parking, and wide sidewalks.

So we can use the transect to help determine if one aspect or another of the built environment suits the place or context. For example, streets without lights would not suit an urban street though it would be perfectly suitable to not have lights in a rural area. Gravel roads would not be suitable in an urban environment, while brick streets would be out of context in rural areas.

Though these examples may seem simple, the transect starts to show its power when there are more complex problems in cities or when there are conflicting values. This will become evident later when we get into some transportation issues more deeply. The bottom line is that the transect helps train us to recognize patterns and helps us to determine how well design elements suit their contexts, urban or otherwise.

2.3 Troubling Patterns in Cities

Troubling patterns are becoming increasingly evident in cities these days. For example, there are plenty of schools in cities across the United States where, forty years ago, most of the children would walk or cycle to school. Today, they are chauffeured by their parents. Typically, these schools were not designed with pick up and drop off facilities. This results in queuing problems and other motor vehicle traffic problems being normal, daily, occurrences around schools, exacerbating the perceptions of there being too much traffic.

Figure 2.6: Problem Solved?

Other related patterns are becoming evident too. Obesity rates of adults and children are increasing and so are related diseases such as diabetes and heart disease. Meanwhile, new residential subdivisions do not connect to other subdivisions or other land uses due to their dead end street networks. Is there a cause and effect here? Is there more to it?

As we know, cities have complex interrelationships involving various design aspects, social aspects, financial aspects, and so forth. To prove an indisputable, scientific, correlation between every cause and effect is infeasible due to the variety of cities, the huge number of variables, and the sheer volume of data and analysis that would have to happen.

There are some correlations that have been proven, which can be very helpful, but they do not answer all the questions and they are often the subject of debate. Consequently, in the real world of mayors, governors, other civic leaders, and policy makers, they have to make decisions and set direction on a myriad of issues without all the data. Furthermore, they cannot work on everything at once and have to pick their battles. Combined with conflicting advice and limited time, how can they possibly make good decisions? The following analogy suggests that they may actually be better off without the detailed information. They can make better decisions through their pattern recognition abilities.

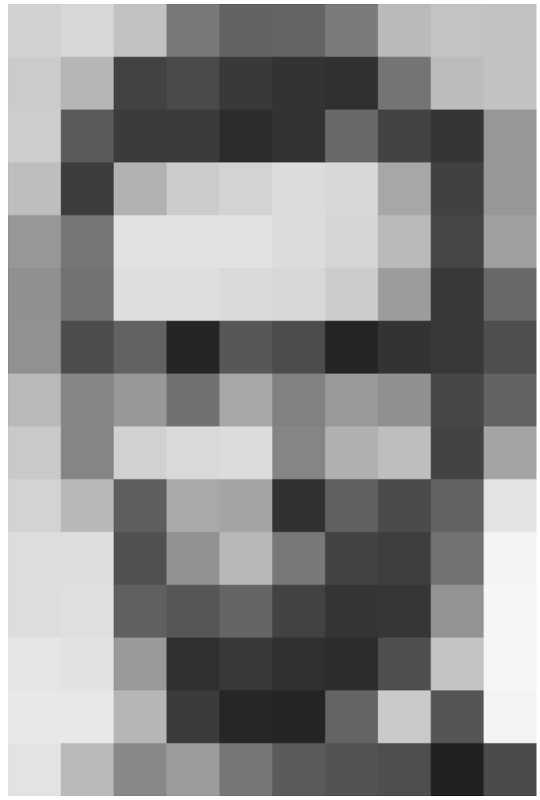

Figure 2.7: A Mosaic of Tiles

Figure 2.7 shows a mosaic of white, grey, and black tiles. Detailed, scientific, analysis of the molecular composition of the tiles, calculating the probability of two white tiles being side by side, measuring the light emitted from each tile, and other detailed information does not help understand what is going on. In fact, the detail can be distracting. It is better to step back from the mosaic, and even blur our vision to get rid of the detail. *Figure 2.8*, which is the same set of tiles, but just blurred, actually shows a clearer picture. The specialized analyses do not contribute to the understanding of how the tiles relate to one another (i.e., the big picture).

Figure 2.8: Mosaic of Tiles Blurred

A city is somewhat like a mosaic of tiles. Each tile can be analyzed forever but to no avail. It is much better for decision makers to first understand the city's big picture and then focus on a particular project, a series of initiatives, or their top three priorities, and then do the right thing.

The level of service model for motor vehicle users is like a tile in the mosaic. Unfortunately, many cities focused on that tile for decades while making decisions, damaging the cities' big pictures.

In *Figure 2.9*, there are a number of images. The pattern is fairly clear. At the top left, the blocks are too big, which contributes to circuitous routing, motor vehicle dependence, and unwalkable environments. At the top right, the car is too big, leading to air quality problems, excessive energy consumption, and safety problems. In the middle right, the street is too big, fast, and ugly; leading to a hostile pedestrian environment, excessive speeds, divided communities, automobile-oriented land uses, and large impervious surfaces. The bottom right fire apparatus is too big, leading to lobbying by fire chiefs for excessively large corner radii, alley widths, and street widths, which lead to less safe and less pleasant streets. The bottom left truck is too big, leading to overly large driveway widths and dangerous conditions for other street users. The center portions of food are too big, leading to over eating. The middle left people are too big leading to health problems. Clearly, other pictures could be added such as big box retailers, highway interchanges, large surface parking lots in front of buildings, etc.

Figure 2.9: Find the Pattern

Though the pursuits of big trucks, fire fighting equipment, stores, motor vehicles, etc. can be supported from the limited perspectives of special interest groups, the public interest involves pursuing healthy cities. The pictures are all related and the patterns are clear. Motor vehicle-oriented cities are less healthy than walkable cities.

In the February, 2004, issue of the health magazine, *Men's Fitness*, there was a study about cities and obesity. It listed America's fattest cities and America's leanest cities. The fattest city was Detroit, bouncing out the long time fattest city, Houston.

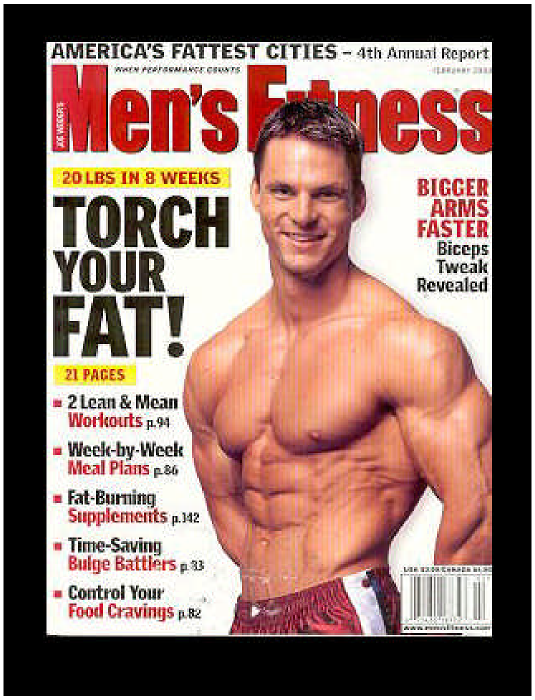

Figure 2.10: Fattest City Survey

The Mayor of Detroit, Mayor Kilpatrick, responded to the article by saying, "It is probably something to do with culture…we are not a walking city…" because Detroit is "the automobile capital of the world." The Mayor obviously had the ability to recognize this pattern. He recognized that the root of obesity in Detroit had something to do with three things; culture, the lack of walking, and automobile dependence.

These are the sorts of patterns that mayors can easily recognize and do something about. However, they need the related professional communities to stop focusing on their specialties (i.e., their own tiles), change their ways, work with each other and other groups, and improve the big picture. The motor vehicle dependency and walkability issues fall mainly on the shoulders of the planning and the engineering communities. However, developers, lobby groups, and others are involved too.

3. THE CONVENTIONAL TRANSPORTATION CULTURE AND LANGUAGE

3.1 Motor Vehicle Bias and Culture

To be fair, Detroit's automobile dependency happened over several decades and was greatly influenced by the "conventional transportation culture." A lot of that culture was developed in the early days of motor vehicle-oriented transportation planning, particularly following World War II. It directly affected government policies, funding, organizational structures, markets, and the built environment; which all directly affects most aspects of daily life.

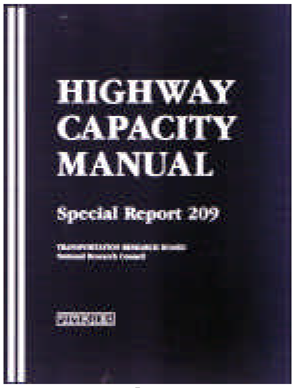

Figure 3.1: Highway Capacity Manual

Let's explore the cultural side further. Probably the most influential document for promoting and perpetuating the conventional transportation culture was the *Highway Capacity Manual*. The *Highway Capacity Manual* was first published in 1965. The research, the language, and the values that went into it were honed during the 1940s, 50s and early 60s. Though, it was sold as a technical document, it contained value sets, language choices, and policy directions; reflecting the time period when it was developed. These cultural biases remained intact through subsequent editions.

3.2 Transportation Language

Language is important because it is related to thought. For example, the native languages from arctic regions contain many different words for snow, meaning everything from its ability to build shelter to its ability to slide a sleigh across. Clearly, snow plays a huge role in people's lives in the arctic and, consequently, they developed ways of thinking and communicating about snow that simply do not apply to people from warmer climates.

Figure 3.2: Language and Thought

Languages from warmer climates do not have equivalent words for snow. Similarly, English has many words for money, which is culturally important. Words such as cash, credit, debit, mortgage, equity, etc. mean something to us but have no translation in arctic languages because money was historically not important to people of arctic regions.

Language can show a bias, create a bias, and perpetuate a bias. Recall the gender wars of the 1970s, during which women were excluded from various fields. The gender bias was reflected in our language (e.g., policeman, fireman, man-hours, man power, chairman, etc.)

Figure 3.3: Perpetuating Biases

Today, we all know, accept, and use objective language (e.g., police officer, fire fighter, human resources, chair, etc.) During the transition, there were great arguments about being politically correct. Yet, it was not about being politically correct; it was about being inclusive and objective. Today, women chair meetings, become police officers, and so forth because there is no longer a gender-biased culture perpetuated by language. Language, policies, attitudes, and practices were changed.

3.2.1 Improvement

Similarly, the transportation engineering profession inherited a language from an era that was very pro-motor vehicle. For example, in *Figure3.4*, the engineer said, "Once your street is improved, the curb will be right here." By definition, an improvement is a good thing. However, the lady clearly does not share the engineer's perspective nor would someone who valued the tree.

Figure 3.4: Improved or Widened?

The engineer, by using the word, "improved," showed his bias toward the benefactors of the widening, motor vehicle users, and showed his bias against the urban forest and the homeowner. Had the engineer said, "Once your street is widened, the curb will be right here," he would not have shown a bias. Unfortunately, once he said, "improved," he had lost his credibility.

3.2.2 Upgrade

Transportation engineers use "upgrade" when they propose, for example, to change a collector street into an arterial street. Who can argue with an upgrade? By definition, it is better. Clearly, there is a bias toward streets that are further along on the conventional "hierarchy" of streets, from local to collector, to arterial, to highway.

Figure 3.5: Upgraded or Changed?

"Upgrade" means arterials are better than collectors. Yet, there are many perspectives that would disagree with that assertion (e.g., homeowners and pedestrians) and using "upgrade" shows a bias against them. Again, there are objective substitutes such as "changed to" or "redesignated as."

3.2.3 Level of Service

Another example would be the typical use of "level of service." Level of service for whom?

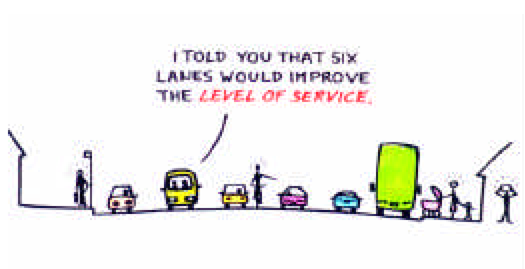

Figure 3.6: L.O.S. for Whom?

There is a habit in the engineering profession to assume that everybody knows and accepts that "for motor vehicles users," is understood. Yet, there are cyclists, pedestrians, homeowners, business owners and so forth, whose interests are being ignored. Furthermore, when transportation professionals use "level of service" as the sole measure of effectiveness for a street, there is a further bias.

3.2.4 Accident

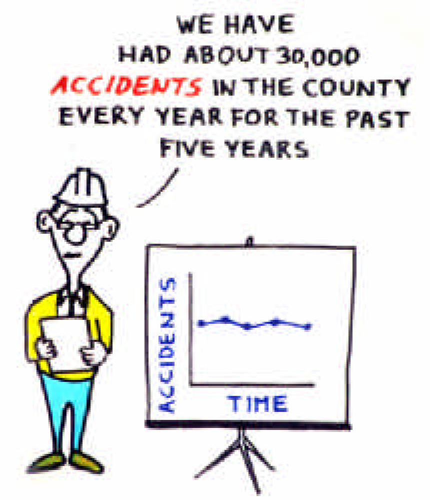

Figure 3.7: Accident or Collision?

"Accident," implies something unlucky that happens by chance. "Accident," downplays the severity of motor vehicle collisions. People are responsible for the tens of thousands of people that die in North American every year due to collisions and for the many times that who are injured. There are huge sums of money lost in property damage each year to collisions.

If we began calling collisions, "collisions," perhaps we would take this huge health and safety issue more seriously. To place this situation into perspective, on September 11, 2001, hijackers killed about 3,000 people in the United States. The government juggled government programs and organizations, changed security procedures, altered personal freedoms, and went to war, ostensibly, to make people safer from repeat incidents. Yet, during every month of every year, about 3,000 people are killed in collisions and many more are injured in America. Yet, because the carnage happens incrementally and at the hands of motor vehicle drivers, it is culturally acceptable.

3.2.5 Efficient

The word, "efficient," is likely the most misused word in the conventional transportation vocabulary. In most comprehensive plans, there is a statement to the effect that the city, county, or state wants to make their streets "more efficient and safer."

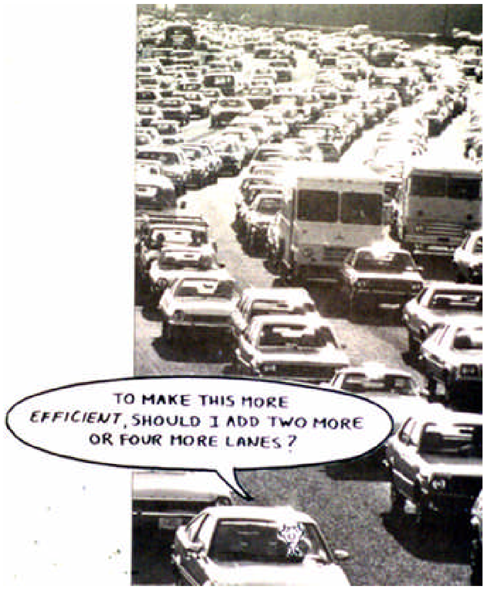

Figure 3.8: Efficient or Fast?

We all agree on "safer," but the "more efficient" is typically a euphemism for "faster." This has to do with the conventional "efficiency myth" that supports the wider road strategy to battle congestion and pollution. The myth begins with the assumption that a single car, motoring along, free of congestion, burns less fuel and pollutes less than a single car in a congested environment. So far, this part seems reasonable. The next assertion is that a stream of cars moving along free of congestion burns less fuel and causes less pollution than a stream of cars in a congested environment. Again, this is plausible.

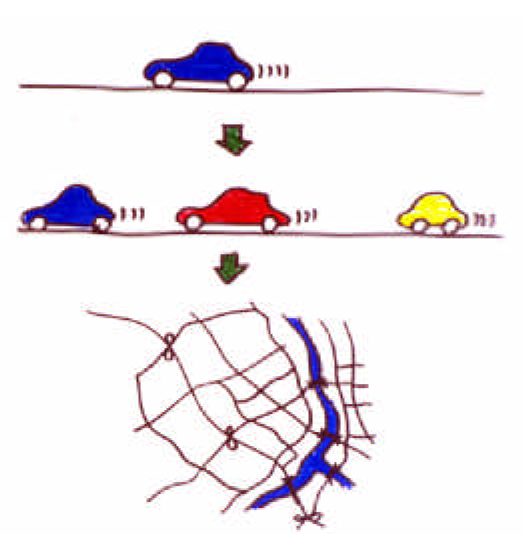

Figure 3.9: The Efficiency Myth

Then, it claims that a whole city street network of cars, moving along, free of congestion, burns less fuel and pollutes less than a congested network. This part is wishful thinking because it is too simplistic for the real world. The second and third order of consequences of a road widening strategy (i.e., changes in behavior, increases in trip lengths, land uses changes, etc.) more than undoes any reductions in fuel consumption and pollution. *Figures 3.10* and *3.11* show the first, second, and third order consequences of widening streets and accepting congestion.

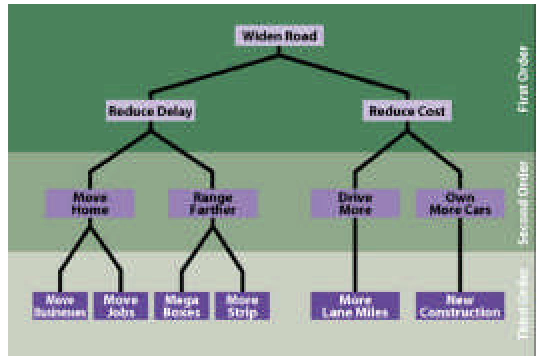

Figure 3.10: Widen Road

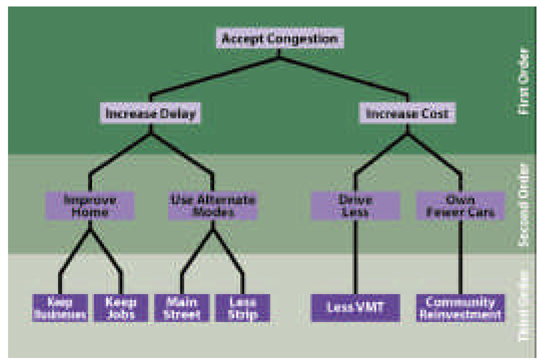

Figure 3.11: Accept Congestion

It takes pattern recognition abilities to expose the efficiency myth. Anybody can do this by looking at the energy consumption and land consumption per capita of various cities. Cities that pursue motor vehicle mobility (i.e., high motor vehicle speeds and high levels of service for motor vehicle users) tend to be the most inefficient. Houston, Detroit, and Los Angeles are good examples of highly inefficient cities (and fat cities too).

Cities that pursue other things use less energy and land per capita; cities like Chicago and New York. Cities like Toronto, Sydney, and Brisbane are even more efficient. Many European cities like Amsterdam, London, Berlin, Frankfort and Copenhagen are still more efficient. The most efficient cities in terms of land and energy consumption are Asian cities such as Tokyo, Singapore, Hong Kong. Consequently, the popular myth that pursuing high levels of service for motor vehicle users reduces energy consumption and land consumption is just that, a myth. Those pursuits actually have resulted in the most inefficient places in the world. Again, what seemed helpful, at the level of an individual tile (e.g., cars using a congested street), was damaging at the level of the big picture.

It is interesting that American cities weren't inherently inefficient. They became inefficient over a 60-year period through public policy, public projects, and public subsidies geared toward the construction of highways and the pursuit of motor vehicle mobility. The conventional transportation model began in earnest as a result of the 1939 World's Fair. The General Motor's exhibit, Futurama, touted a vision of driving anywhere, any time, in your own personal automobile. Cities had no idea that they would end up with high costs, automobile dependence, barriers to pedestrians, barriers to social activity, safety problems, large energy needs, respiratory problems, obesity, and related diseases.

Perhaps one of the key problems with the conventional transportation model is its financial cost. Inefficient cities find that they never have enough money to widen their way out of congestion. States that help cities fund the conventional model are finding that they are financially short. Virginia, Pennsylvania, California, and New Jersey, for example, are feeling the financial squeeze. The cities that invest in projects other than roads and are still more efficient will be financially more competitive than the cities that pursued high levels of service and mobility for motor vehicles. More efficient cities will be able to foster healthy exchange and will have a higher quality of life. Consequently, people, with choice, will gravitate to cities with higher qualities of life.

So, in some ways, the long-term prosperity of cities is tied to efficient approaches to transportation planning, which involves a multitude of modes. Efficiency involves congestion; the most efficient cities have congestion. It involves land use and land use mix. It involves density and it involves investing in things that make cities great. It does not involve the narrow pursuit of high levels of service for motor vehicle users, couched in biased language.

3.3 Time to Update the Transportation Language and Culture

On one hand, we have biased language and, the other hand, we have objective substitutes. If objective language were always used, biases would be more apparent and easier to correct.

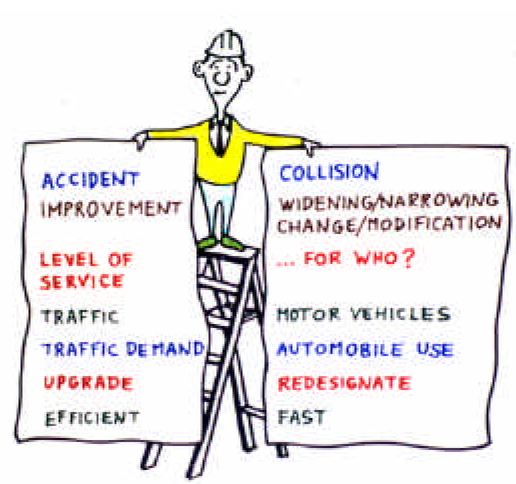

Figure 3.12: Objective Substitutes

Biased language affects the way we think. It erodes the credibility of the transportation profession. The profession needs to update its language so that it is, and appears to be, objective. It has already begun with some cities adopting transportation language policies, requiring their employees to use objective language.

Over time, the culture will change and we will be better positioned to objectively deal with motor vehicle-dependence and the related problems.

4. TRANSPORTATION AND CITIES

Though "cities" are discussed herein, the discussion also applies to villages, towns, and other urban places. Not listing them every time "city" is mentioned was not to exclude them, but to reduce the number of lengthy sentences.

4.1 The Purpose of Cities

Fundamentally, we need to ask ourselves, "Why do cities exist?" From a transportation perspective, one could argue that cities exist to minimize travel, to bring people together for purposes of exchange; the exchange of goods and services, social contact, justice, entertainment, and so on. Exchange is very related to access. People need to be able to access each other in order for exchange to occur. The pursuit of mobility is typically anti-access. The pursuit of mobility attempts to speed up motor vehicles. It cocoons people in their motor vehicles, spreads cities out, reduces density, increases land consumption, and reduces exchange. Consequently, the pursuit of mobility is anti-city. The pursuit of access and exchange is pro-city.

Assume for this discussion, that there are two types of physical exchange between people; planned exchanges and unplanned exchanges. An example of a planned exchange would be purchasing a bottle of sunscreen at the drug store. We would drive to the drug store, pick up the sunscreen, and drive home. A single planned exchange would be accomplished.

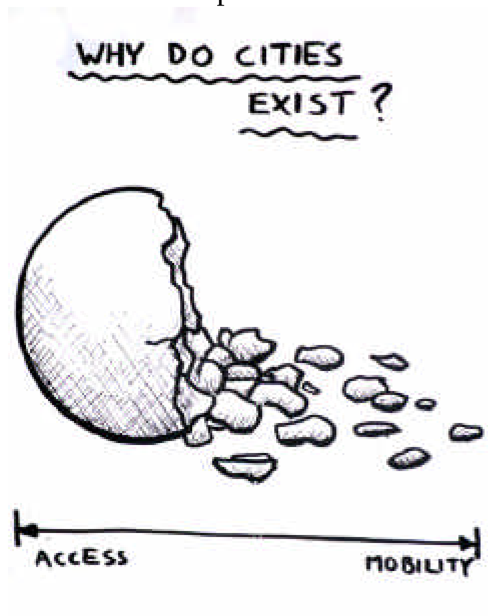

Figure 4.1: Cities Minimize Travel

Assume now that we lived in a walkable city. On the walk to and from the drug store, one might chat with a neighbor, wave to the butcher across the street, watch some kids play ball on the green, say "hello" to another pedestrian, pop into a gift shop to buy a gift for a friend, ponder a piece of public art, watch the brick layer deftly repair a wall. We have accomplished one planned exchange and seven unplanned exchanges. An argument could be made that the quality of the city is related to the sum of its unplanned exchanges.

It is interesting that motor vehicle-oriented places discourage unplanned exchanges through their design (e.g., homogeneous land uses, long trip lengths, few routing choices, low densities, garages at the fronts of houses, dead end streets, gated entrances, etc.) Consequently, people try to compensate through play-dates for the kids, arranged meetings, home entertainment systems, and plenty of driving.

4.2 Freedom and Choice

Some conventional thinkers equate motor vehicle use with freedom and choice. Their idea is that motor vehicles provide choices as to where to reside, what to do, and when to do it. Clearly, motor vehicles can be very handy, but when the urban design changes to such an extreme that motor vehicles become prosthetics, the notion of freedom and choice vanishes. People have no choice; they could not function effectively without motor vehicles. Furthermore, in these environments, people, who do not drive or who cannot drive motor vehicles, cannot function effectively (e.g., the young, some physically disabled, and the economically challenged) and, thus, their choices are diminished on several fronts (e.g., employment, recreation, social contact, etc.)

Consider, for a moment, the time in people's lives when they have the most freedom; when they have the most choice regarding what to do. It is likely during their vacation time. Many Americans seek rural and natural experiences while on vacation. Many also seek urban places where they can experience unplanned exchanges. It is during their precious vacation time, with increased freedom to choose, when people willingly walk, ride bicycles, and ride public transit. We seek urbanism in quaint villages, towns, cities, theme parks (which mimic urbanism on the inside), and aboard cruise ships (floating cities). But very few people choose to travel to motor vehicle-oriented, suburban, environments for their vacation.

When Americans visit Paris, for example, we immediately take to all forms of public transit, cabs, and walking. It does not take a generation to adapt our behavior; we adjust immediately to suit the place. So as individuals and small groups, we seek urbanism and adapt immediately to it.

Figure 4.2: Boulevard des Capueines

The obvious question then becomes, "Why are we not building more urban places for ourselves?" There are multiple answers, many of which are touched on in this paper. Additional answers include: i) motor vehicle-oriented places provide large, one-time, profits to tract-home developers and road builders and ongoing profits for energy companies, rubber companies, big box retailers, and motor vehicle companies; ii) resilient and favorable public policy structures were established to support motor vehicle interests and suburban development interests; iii) huge public subsidies are available for motor vehicle infrastructure and related health care; iv) appreciation of urban design is low and policy makers do not know what is possible; v) millions of people over a few generations have grown up in motor vehicle-dominated cities and do not know any other way; and vi) the responsibility for cities has been divided into a multitude of specialties and levels of jurisdictions, each being incapable of changing the big picture alone.

4.3 Transportation Technology and Shaping Cities

Recognizing patterns in cities can be helped by understanding how transportation technology has shaped cities in the past. Hundreds of years ago, cities developed on the shores of rivers, typically at the intersections of other rivers or oceans. The development did not go far inland because the main mode of transportation was the boat (*Figure 4.3a*). Elevator technology allowed cities to rise above three to five stories, which was how high people were willing to climb stairs (*Figure 4.3b*).

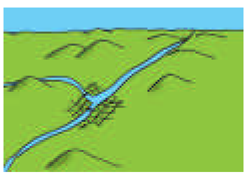
Figure 4.3a

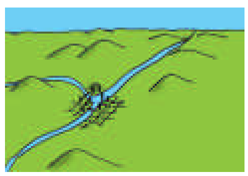
Figure 4.3b

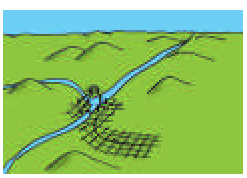
Figure 4.3c

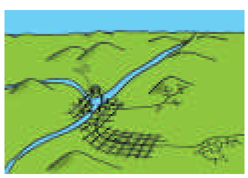
Figure 4.3d

When trolleys came along, cities could develop along trolley lines. As a result, trolley-based neighborhoods developed around many cities (*Figure 4.3c*). Then, when the private motor vehicle came along, cities could expand to wherever a road could be built (*Figure 4.4d*).

The discipline of transportation and land use planning changed with the private motor vehicle. With all other transportation technologies (i.e., boats, elevators, trolleys, etc.), the transportation planner had to respect that the pedestrian was the common denominator. People walked to the trolley lines, elevators, and boats. Only with the motor vehicle could the pedestrian mode be ignored. The motor vehicle became the common denominator for newer developments and retrofitting existing built areas.

Considering the numerous cities around the world, extremes for accommodating the motor vehicle can be found. At one end, Houston and Detroit became highly motor vehicle-oriented. Yet, many other places with motor vehicles did not; they remained relatively pedestrian-oriented and efficient. So, it is not correct to blame the motor vehicle for incredibly inefficient cities with their related diseases and so forth. The fault lies with a few generations of planners, engineers, special interest groups, policy makers, and civic leaders who pursued and allowed the motor vehicle-orientation to prevail.

4.4 Grasshopper Planning and Modeling

"Grasshopper planning" begins with the birth of a grasshopper in the spring. The grass is low. By summer, the grass is higher and the grasshopper is bigger. By autumn, the grasshopper is an adult and the grass is high and the grasshopper decides to do some planning.

The grasshopper plots his food supply over time on a graph and approximates a trajectory into the future. He estimates that he will have even more grass in the winter and he will be even bigger. Yet, what really happens is that winter comes along, the food supply is diminished, and the grasshopper is killed. The moral of the story is that the grasshopper did not take into account a "limiting factor," which, in his case, was the changing weather.

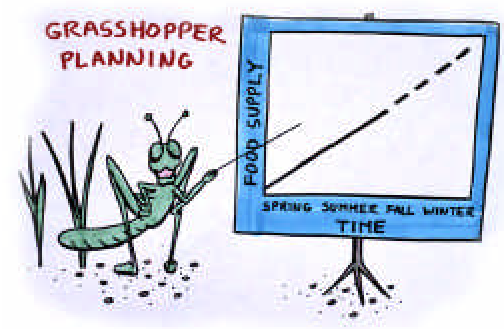

Figure 4.4: Grasshopper Planning

Conventional transportation engineers do the same thing. They plot motor vehicle use over time and input various assumptions and approximate the trajectory into the future.

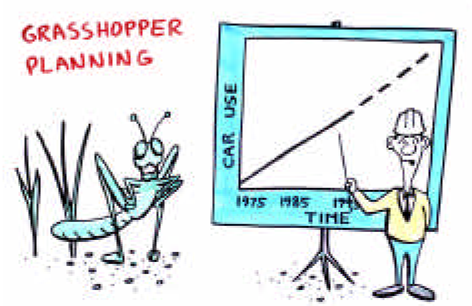

Figure 4.5 Grasshopper Planning

They misinterpret the upward trajectory as a mandate to widen roads, when it should be interpreted as a mandate to change enough factors in order for the trajectory to flatten or decline. Limiting factors regarding the public welfare (e.g., deaths and injuries from collisions, pollution, land consumption, energy use, disease, etc.) should have prevailed earlier in many cities, but they missed the big picture. Sadly, the limiting factor that shows the most promise to stop grasshopper planning is the lack of enough money to continue it.

The habit of grasshopper planning is hard to break because the profession has become really good at it. It is now computerized using mathematical models with specialized assumptions and inputs.

Figure 4.6: Black Box Modeling

The models are practically unintelligible to policy makers and the public, resulting in the black box syndrome. It is now the model that tells policy makers to widen roads or there will be terrible congestion twenty to twenty-five years from now.

The fact is cities are very complex places and the models are relatively simplistic. It is analogous to wetlands, which are also complex places. Biologists try to model wetlands, but they are too complicated. So, the biologist picks an indicator species to model, typically a frog. The idea is that, if the frog is doing well, then the wetland is doing well. If the frog is doing poorly, then something is likely wrong with the wetland and they can investigate further.

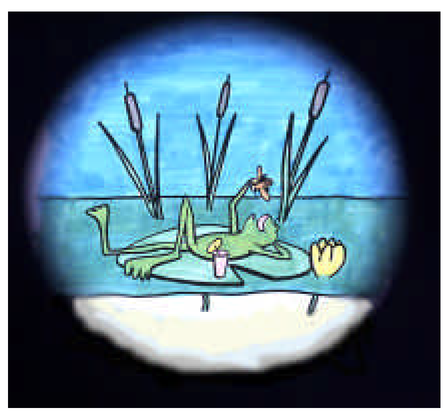

Figure 4.7: Indicator Species

The engineer profession picked motor vehicles as the indicator species for the city. The assumption was, if the motor vehicles were going well (i.e., high levels of service, high speeds, etc.), then the city was healthy. The problem was that the wrong indicator species was picked. It would be analogous to picking Purple Loose Strife (Lythrum Salicaria) to model wetlands. The correct choice would have been the pedestrian. The proof of this poor choice is evident in the relative health of various cities.

However, the motor vehicle modeling abilities do not have to be discarded. They can be redirected to help determine if enough other factors get changed in order to reduce motor vehicle use and its harmful effects. Other factors could include land use density, land use mix, tolls, design speeds, parking supply and costs, related taxes, etc. The idea would be to link public funding to those efforts that are part of the solution. For example, public investment would not be used to subsidize motor vehicle-oriented projects or infrastructure alone. Public money would only flow to smart projects. Federal and state funding would not go to cities, counties, or other places that did not reform and enforce their land use and transportation plans to cap or lower vehicle miles traveled, fuel consumption, etc.

4.5 High Levels of Service for Motor Vehicles and Successful Cities

High levels of service for motor vehicle users do not result in successful cities. For example, West Palm Beach, Florida, in the 1980s, had high levels of service for motor vehicle users. For decades, the city pursued and allowed multi-lane and one-way streets. Traffic signals were synchronized, street trees were eliminated, sidewalks were narrowed and placed tight to the curb (i.e., vehicle recovery zones), speed limits were high, and on-street parking was removed.

Fig. 4.8: West Palm Beach, circa 1980

Like most cities, the streets made up the majority of West Palm Beach's public realm. They were terrible places (i.e., ugly, hostile to pedestrians, and unfriendly to business). People with choice left the downtown and the older neighborhoods with their money and influence for the suburbs. They left behind people with less choice. Neglect ensued. The city declined and became motor vehicle-dependent, requiring the roads to be even faster and wider. Many of the buildings were razed for surface parking lots, further harming the urban fabric and street environment. Drug dealing, prostitution, vacant buildings, and other problems prevailed. The city went broke, bottoming out with six thousand dollars in reserves.

Like a reformed alcoholic, it was only after the city realized that its motor vehicle-dependency was damaging, did things change. The prevailing myth, that had to be shattered, was that fast roads to the suburbs would attract people and investment. For about ten years, the city systematically narrowed, calmed, beautified, and slowed its streets. They became pedestrian-friendly. Private investment and people with choice came back to the city.

The fall and rise of West Palm Beach had to do with the "transportation land use cycle" theory, which is that when land uses are changed, more trips are generated, more motor vehicles are used, and motor vehicle-carrying capacity is added to the streets. Consequently, land values increase, further changes to land uses occur, and the cycle continues. It boils down to the idea that motor vehicle-carrying capacity leads to investment and value.

There are limits. As motor vehicle-carrying capacity and design speeds increase, worse street environments occur, streets become more mobility-oriented, and access is denied. As access decreases, land values drop, and changes in land use occur, creating a worse environment. Consequently, there are less pedestrians, less cyclists, less children, less exchange, and less green space, which causes people to relocate out of that area. This is how the "quality of life cycle" declines and how cities decline. The cycles can be reversed as was done in West Palm Beach.

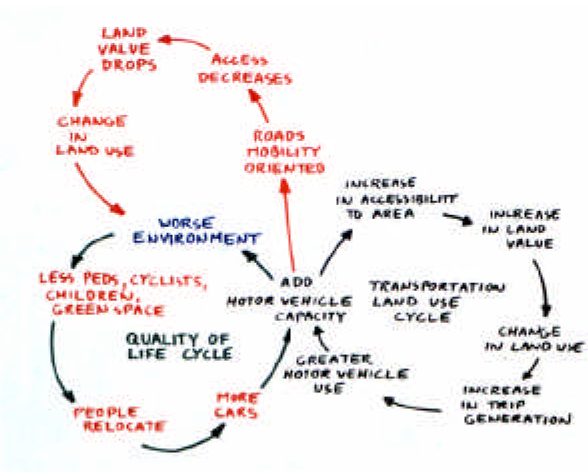

Figure 4.9: Quality of Life Cycle

As the pattern in cities are shaped, either positively or negatively, people are similarly shaped; their behaviors and investments reinforce the trend toward either motor vehicle-dependency or health and efficiency. Sir Winston Churchill said, "We shape our buildings, and afterwards our buildings shape us." The same applies to cities. We shape our cities and then they shape us.

Figure 4.10: Cities and People

4.6 <u>The Street Network</u>

Figures 4.11 and *4.12* show the same perspective of the City of Ottawa, circa 1850, and as it is today. When Ottawa was a lumber town, nobody would have anticipated a gothic building on the peninsula, a château built next to it, a castle-like museum built next to that, and a linear park built along the waterfront, complete with recreational paths. None of that was conceivable 150 years ago. Yet, the city changed dramatically

However, what hardly changed at all was its street network. The street network from 150 years ago is almost identical to the street network that exists today. We call this the "bones" of the city. The bones that were done well 150 years ago help the city today and all the bones that were done poorly hurt the city today.

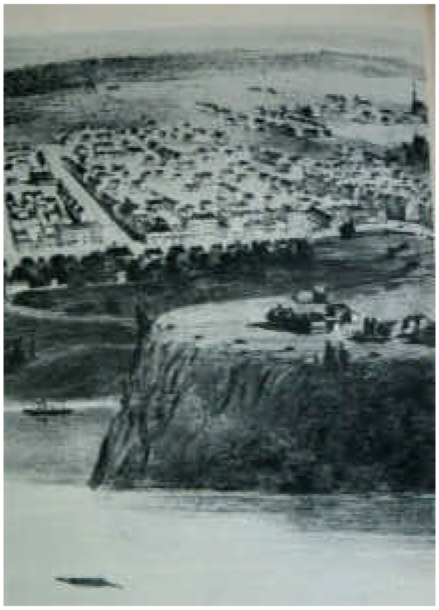

Figure 4.11: Ottawa, circa 1850

Figure 4.12: Ottawa, today

An examination of old maps indicates that the same situation exists for many cities. The original bones are mostly in place. For example, Lambertville's street network is almost identical to what it was in circa 1880 (*Figure 4.13*).

Figure 4.13: Lambertville, circa 1880

Though older, motor vehicle-oriented, cities inherit good bones, they tend to break or weaken them over the years (i.e., severing connections with highways, closing and abandoning streets, turning streets into highway ramps, etc.) while pedestrian-oriented cities tend to look after their bones. In other words, motor vehicle-oriented places tend to evolve their streets toward the conventional, dendritic, hierarchy of roads, and pedestrian-oriented cities do not.

We can tell a lot about something by its bones. The creature's bones in *Figure 4.14* tells non-experts that this was a land animal because of its feet, that it walked upright because of the relative size of its legs, and that it ate meat because of the shape of its teeth.

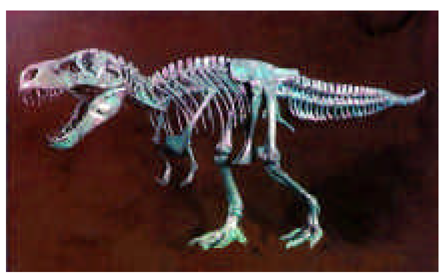

Figure 4.14: Bones

If you asked an expert on beauty, like Leonardo De Vinci, why people's faces are attractive, he would say it has to do with the underlying bone structure (i.e., the symmetry, setting of the eyes, cheekbones, and jaw line).

Figure 4.15: Bones and Beauty

Similarly, the beauty of cities has a lot to do with their bone structures. The two cities in *Figure 4.16* have contrasting X-rays. The city on the left has a healthy network of streets, multiple routing options, and good access to public spaces. It is walkable and the buildings are up to the street. The city on the right has a disconnected, dendritic, street pattern. It lacks routing options. It is vulnerable to collisions due to its lack of redundancy. There are parking lots in front of the buildings. It is unwalkable and motor vehicle-oriented. It should come as no surprise that we are contrasting Savannah with Irvine.

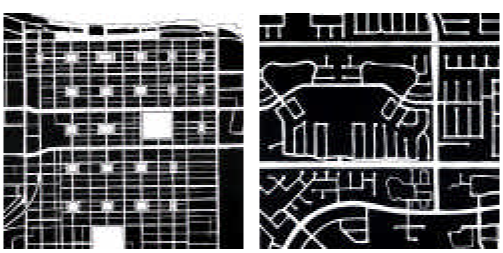

Figure 4.16: Contrasting Bones

Figure 4.17 shows the bone structure of Paris. One does not need a gridiron network of streets to be connected. Paris is highly connected and walkable, using rectilinear and radial patterned streets.

Figure 4.17: Connected but not Grid

The power of the network is poorly understood and represents one of the largest challenges in steering cities toward efficiency and sustainability. As motor vehicle lanes are added to streets, there are diminishing returns from a motor vehicle-carrying perspective, as is illustrated in *Figure 4.18*.

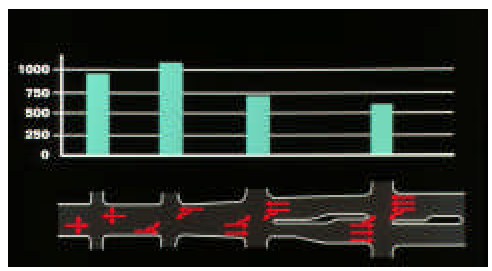

Figure 4.18: Motor Vehicle-Carrying Capacity per Lane

Consequently, the network in *Figure 4.19* carries more motor vehicles than the sparse hierarchy. For example, three, parallel, two-lane streets can carry more motor vehicles than one six-lane road. The fourteen intersections can clearly out-process the three intersections in the sparse hierarchy.

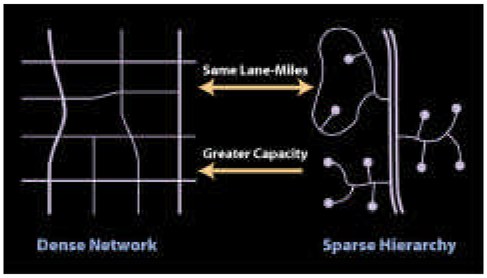

Figure 4.19: Contrasting Networks

4.7 <u>Motor Vehicle Speed</u>

From a conventional, motor vehicle-oriented perspective, the network will have higher motor vehicle-carrying capacities than the sparse hierarchy, which would lead us to conclude that part of the problem does not relate to a simple preoccupation with moving more and more motor vehicles. It has to do with a more insidious preoccupation, speed. The sparse hierarchy lends itself to the notion that motor vehicle users should drive faster on the bigger roads than they should on the smaller roads (i.e., faster on collectors than on locals, faster on arterials than collectors, and faster on freeways than arterials.) Yet, as we witness during peak periods of motor vehicle use, twice a day, freeways are some of the slowest streets in cities.

The relationship between motor vehicle speed and capacity is an interesting one, and best discussed in older versions of the *Highway Capacity Manual.* They showed that the maximum motor vehicle-carrying capacity of most streets is somewhere around 25 to 30 miles per hour.

The types of streets that are appropriate in cities are those with lower speeds. According to the *Highway Capacity Manual*, there is not a downside from a motor vehicle-carrying perspective. Streets with lower speeds also tend to be safer because, for example, stopping distances shorten, fields of view widen, and the amount of damage decreases, lowering the rates of deaths and injuries.

Figure 4.20 shows a very busy street which carries a lot of traffic, though no motor vehicles. It is interesting that the travel speeds on this big street are about the same as the travel speeds on smaller streets (i.e., the speed of a walking horse) in their day.

Figure 4.20: Big Friendly Street

Low speeds historically allowed retail and residential land uses to thrive along big, busy, streets. They succeeded because there were good pedestrian environments and access. The big streets were consistent with their place on the transect, discussed earlier. It is a very modern idea that the big streets should also be fast streets. High speeds damage the pedestrian environment, damage the viability of retail and residential land uses, and violate the transect.

4.8 <u>Network and Block Structure Shape Land Uses</u>

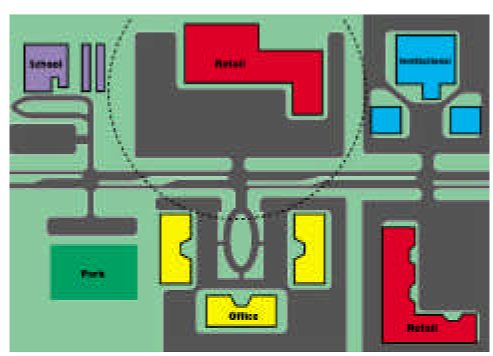

Figure 4.21: Dendritic Network

The sparse hierarchy in *Figure 4.21* allows for large parcels with driveways off of the big street. The block structure, created by the network, in *Figure 4.22*, encourages buildings to be placed up to the street, improving the pedestrian environment. It also has multiple routing options for motor vehicle users, cyclists, pedestrians, and transit. Because of the multi-parallel routes, all of the streets can be built at a pedestrian scale. In *Figure 4.21*, the street tends to be at a motor vehicle scale.

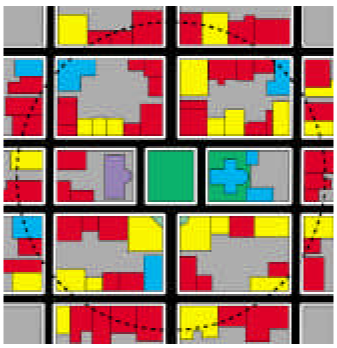

Figure 4.22: Connected Network

4.9 Network and Block Structure Affect Trip Lengths and Trip Quality

Figures 4.23 and *4.24* show the assignment of trips between the various land uses. Notice, in Figure 4.23, all of the trips are beholden to the big road and are longer, while, in Figure 4.24, there are multiple routing options and the trips are shorter.

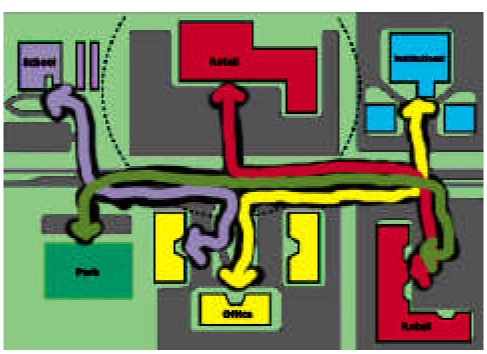

Figure 4.23: Trip Assignment (longer, and using the big road)

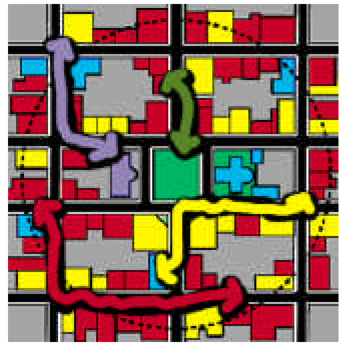

Figure 4.24: Trip Assignment (shorter using multiple routes)

The streets in a connected network can be designed to be conducive to walking, cycling, and transit. Conversely, the trips on the dendritic network are more likely to be conducted by motor vehicle than those on the connected network. All else being equal, the urban form with the connected network will be less motor vehicle-dependant and healthier than that with the dendritic network.

4.10 Road Rage

Highways with high motor vehicle-carrying capacities and high design speeds are regularly congested to the point of slow speeds. In these situations, drivers get mixed signals. The design of the road tells drivers that they should be going fast; their powerful vehicles can easily go fast; the surroundings are dull, repetitive, and look better at fast speeds. Drivers only have one routing option. Meanwhile, the other motor vehicles will not let them go fast. Driver's expectations and desires are not met, they are stuck with no alternatives, so they get stressed and the smallest of incidents can incite anger and, sometimes, dangerous behaviors.

Figure 4.25: Jam on Boring Highway

Boulevards, avenues, and networks can have high motor vehicle-carrying capacities too. During times of congestion, drivers do not expect to be going fast and the surroundings are pleasant at slow speeds. They have routing options. Driver's expectations and desires become better aligned with their environment and they are less likely to get upset.

4.11 <u>Transit</u>

We have observed the pattern relating the pursuit of speed and mobility for motor vehicle users as being damaging to cities by spreading them out, reducing connections, lowering exchange, consuming large quantities of land and energy, increasing trip lengths, contributing to congestion, increasing automobile dependency, lowering transit effectiveness, contributing to a variety of diseases, lowering social contact, and violating the transect.

The opposite makes sense too. The pursuit of slower speeds would benefit cities by allowing them to become more compact, increasing connections, increasing exchange, consuming less land and energy, shortening trip lengths, reducing congestion, decreasing automobile dependency, increasing transit effectiveness, contributing to better health, increasing social contact, and respecting the transect. This makes even more sense when we consider the pursuit of network, pedestrian-oriented design, mixed land uses, respecting the transect, placing buildings up to the street, and the aforementioned recommendations.

Take public transit effectiveness for example. All else being equal (e.g., same time of day, same route, etc.), the relative travel time between taking public transit and taking our private motor vehicle has an influence on our mode choice. Obviously, if the streets were faster, then the travel times for both modes would drop and, if the streets were slower, then the travel times would increase.

Conventional thinking would suggest that speeding up roads would encourage us to use transit. However, the travel time of public transit relative to the private motor vehicle actually becomes worse and, consequently, we would be more likely to not choose public transit.

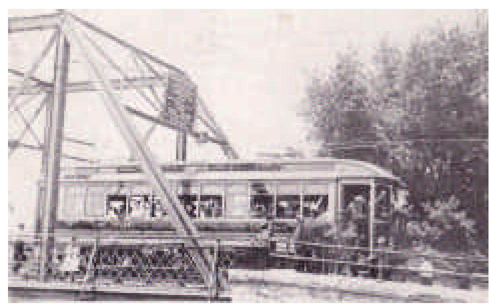

Figure 4.26: Former Trolley Service in Lambertville

The reason is simple. Assume that a typical motor vehicle trip involves walking time at both ends, called w_1, and driving time, called d_1, and when added together results in the trip time (w_1+d_1). The total time for the equivalent transit trip involves walking at both ends, some waiting time, perhaps some transfer time, time along the way associated with stops, and the driving time. Let's lump all the non-driving time together, called w_2, and then the total trip time would be (w_2+d_1). The relative travel time between public transit and motor vehicle would then be $(w_2+d_1)/(w_1+d_1)$, which increases as the driving time decreases.

Presently, assume that w_1 is four minutes and w_2 is 16 minutes, and d_1 is 20 minutes. Relative to one's motor vehicle, it would take 1.5 times longer (50% longer) to take public transport. However, if the driving time were lowered by four minutes to 16 minutes, then public transport would take 1.6 times longer (60% longer) than one's private motor vehicle, an increase of 10%. Furthermore, if the driving time were increased by four minutes to 24 minutes, then public transport would take only 1.25 times longer than private motor vehicle, a decrease of 25%.

By combining slower streets with better pedestrian environments, closer trip ends, connected networks, etc., the prognosis for increased walking and transit use would be favorable. More importantly, cities would become more efficient in terms of energy consumption and land consumption and better on a number of fronts. The bottom line is that the pursuit of multifaceted places will result in cities that will out perform cities that pursue conventional transportation solutions. From a theoretical perspective, this makes sense. By observing real cities, this is evident.

4.12 Learning from Failure

There are cities that are still promoting big highways through them. For example, the Florida Department of Transportation is working with the City of Orlando to widen Interstate 4.

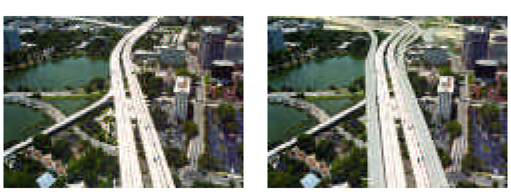

Figure 4.27: Proposed I-4 Widening

The City of Columbus, Ohio is expanding its interstate system in its downtown. Many more cities have unfunded highway expansions in their long range plans. Obviously, there are cities that are guided by urbanism and the transect and others that follow conventional models.

Figure 4.28 illustrates obvious examples of the ability of engineers to learn from failure. The examples involve root barriers next to sidewalks to reduce heaving, ship hull designs to reduce sinkings, foundation designs to reduce leaning, roof designs to reduce collapses, and crush zones in motor vehicles to reduce trauma. In all these cases, failure was acknowledged and changes were made for the better.

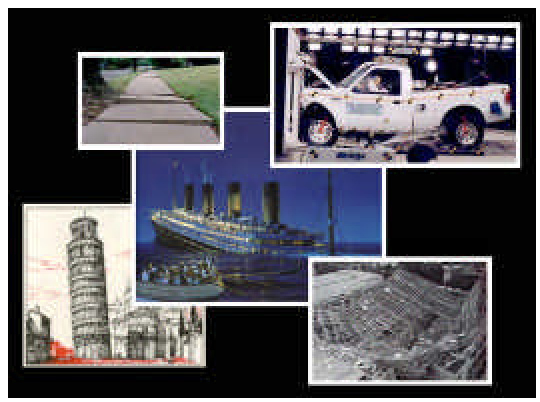

Figure 4.28 Learning from Failure

In mobility-oriented cities, the big streets typically fail twice a day, every day. Radio shows expand their periodic weather updates and time checks with traffic reports. The failure of the conventional transportation model has been evident since at least the early 1960s with clear explanations from people like Jane Jacobs. The failure becomes increasingly evident every decade as congestion gets worse, people become obese, pollution increases, etc.

The transportation engineering profession defines failure on streets in terms of motor vehicle delay at intersections and volume to capacity ratios of motor vehicles. Part of the problem is that transportation engineers chose the word "failure" which implies that something is broken when there is congestion. There are plenty of examples of really nice streets in various cities that are congested with motor vehicles that are not broken. Attempts to fix these streets, conventionally, would harm the streets and their environs.

Conventional motor vehicle performance measures are technically useful at the individual street and intersection level but they need to be i) compared to the performance of other street and city attributes and ii) they should not be the basis for broad transportation policy.

The patterns lead to the conclusion that conventional transportation strategies are solving the wrong problem. The patterns indicate that transportation strategies should really be part of a broader strategy to create great places and great cities, not battling congestion.

4.13 Context Should Lead, not Follow

The Transportation Research Board recently sponsored the development of a guidebook (*Project 2519*) for assessing the social and economic effects of transportation projects.

The authors did an excellent job of measuring several effects of road widenings on the social and economic fabric of cities. Undoubtedly, the book will make a positive contribution. However, the underlying assumption was that transportation projects were somehow fixed and not negotiable, while the negative effects only had to be minimized.

This starting point reflects the conventional approach to good design, which is as follows. Somehow a transportation decision gets made (e.g., add two more motor vehicle lanes or some other conventional purpose or need) and then the intent is to do what can be done to mitigate any damage. It is no wonder that early context-sensitive design efforts got the reputation in conventional circles of just adding time and cost to projects. They missed the point.

Good design is not about getting really good at doing the wrong thing. Good design is not about mitigating after the fact. It is about building better places. It is about building better cities. It is about allowing the context to direct what projects happen and how they are designed. It does not mean motor vehicle issues are ignored or that anything else is necessarily ignored. It means that projects are approached, first, from their ability to contribute to the big picture. It means that the dog wags the tail. This allows cities that want to be healthier socially and economically to use projects, transportation or otherwise, to get there.

5. THE PREREQUISITES FOR HEALTHY CITIES

5.1 Vision

Vision is the ability is to see the city fifty to one hundred years from now, and being able to make decisions and affect change today that will ultimately result in the type of city envisioned for the long run. Politically, it helps if the changes make perceivable differences within a term of office and can be added to over time.

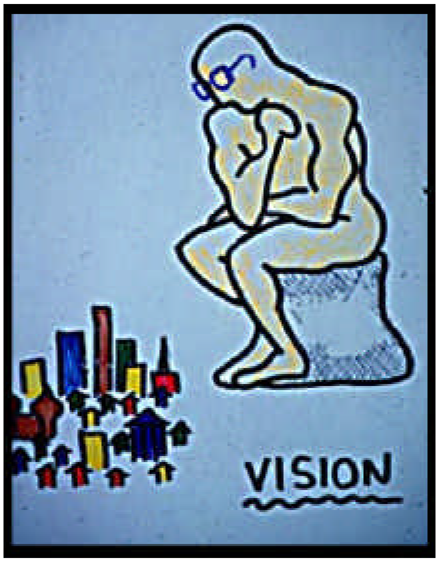

Figure 5.1: Vision

Part of this vision has to do with how we define "capacity" of the streets. Conventionally, the capacity of the streets has been defined as the maximum number of motor vehicles that can pass by a point along the street during an hour. However, we know that streets have the capacity to be beautiful, to host social activity, to provide recreational facilities, and to nurture businesses and homes. They have the capacity to be contributing parts of the public realm on many levels.

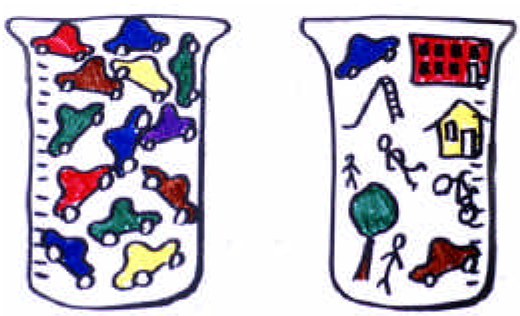

Figure 5.2: Capacity of Streets

Using our pattern recognition skills, it is very easy to look at *Figure 5.3* and conclude that this city has good bones but has shown no vision. The city is clearly motor vehicle-oriented and hostile to pedestrians.

Coincidently, this city, Houston, is the third fattest city in America according to *Men's Fitness*.

Figure 5.3: Good Bones, No Vision

Our ability to recognize good and bad design is exploited even in Hollywood movies. *Figures 5.4* and *5.5* show two cities used in Stars Wars. The city, in *Figure 5.4*, is obviously the home of the evil empire. We can tell just by looking at it.

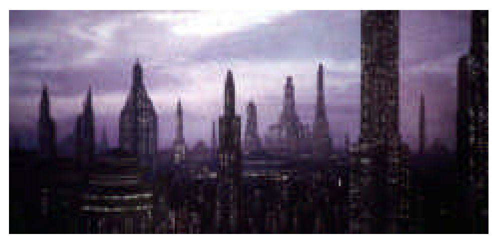

Figure 5.4: The Evil City

Figure 5.5: The Friendly City

The city in *Figure 5.5* is the home to the friendly empire with nice public open spaces, public buildings placed on the most prominent sites, good building scale and massing, a good street network, and public art. It's all there.

5.2 Get the Bones Right

Figures 5.6 to *5.9*, are examples of nicely designed urban places in four cities with different climates, populations, building massing, architecture, and street designs.

Figure 5.6: Boston

Figure 5.7: Seaside

Figure 5.8: South Beach

Figure 5.9: Victoria

Our pattern recognition abilities tell us that these are all nice, walkable, pleasant, and safe. We appreciate the good design immediately. However, the prerequisite to good design is good bones; these places could not be so nice if the network were not good. Houston, on the other hand, had poor design and was ugly but, because it has good bones, it has potential.

If a city could visit an urban design doctor, the first thing that the doctor would do is take an X-ray of the city's bones. Fundamentally improving the health of a city or part of a city begins with dealing with its underlying bone structure. The doctor will also look at the subsequent layers; the land uses, history, goals, objectives, resources, time tables, and so forth. Once the doctor understands the big picture and the relationships, the doctor will then write a prescription for change, involving policies, funding, design, staging, etc. The following examples, will examine the power of the network in different circumstances

5.2.1 Adding Bones in Suburbia

Part of suburban Georgia, just outside of Atlanta, is called the Crabapple Area. The concepts for the Crabapple Area were developed by Glatting Jackson and the Atlanta-based firm, the Sizemore Group. The Crabapple Area was a rural area. The intersection of three farm roads became the heart of the rural community because that was where exchange was easiest. Local retail, community buildings, and some residential buildings were built there. It was also the site of the annual fair.

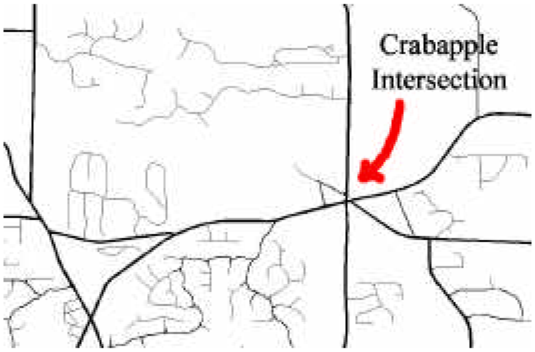

Figure 5.10: Intersection of Farm Roads

In recent decades, dead end, suburban, subdivisions replaced about half of the area's farms. The subdivision streets do not connect to one another; they simply load traffic onto the old farm roads and contribute nothing positive to the network.

Many of the farm roads were changed into suburban commuter routes to Atlanta, detracting from the rural character of the area. Luckily, the Crabapple intersection escaped widening because two historic buildings held the corners. Despite the constraints, the Georgia Department of Transportation managed to maximize the motor vehicle-orientation of the streets and intersection. The porch was removed from one of the buildings to provide a larger corner radius. The corner radius in front of the other building grew to the point where pedestrians, leaving the building, literally stepped into the intersection.

Predictably, the intersection and area became hostile to pedestrians, congestion occurred, and local people had difficulty chauffeuring their children to school and conducting other motor vehicle trips.

Working with the community on a solution, widenings were considered and ruled out because of the historic buildings. Bypass options were considered and ruled out because: i) they would attract commercial uses that would be out of scale and character with the area; ii) they would be too expensive to be feasible; and iii) the commercial viability of the historic Crabapple core would be diminished.

Figure 5.11: One of Many Bypass Options

The no-growth and slow growth options were considered and rejected because nobody was willing or able to buy up development rights.

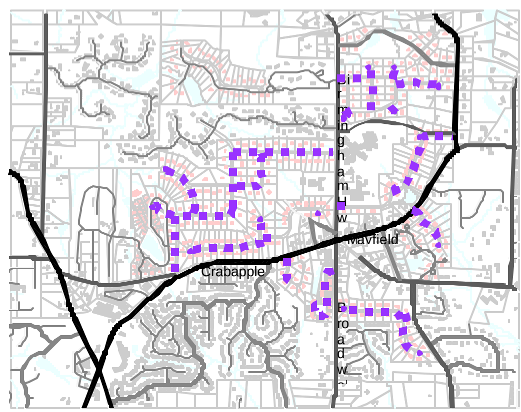

Figure 5.12: Do Nothing Option

The do nothing option was considered and rejected because developers were going to fill in the remaining farms with more dead end subdivisions, exacerbating the problems.

Once the conventional solutions were exhausted, people were willing to consider a network solution. Simple connections were proposed near and afar to create a more refined regional street network, reducing trip lengths and reducing pressure on the Crabapple intersection. A village-scaled network of streets and blocks were proposed in the remaining available land in the intersection's vicinity.

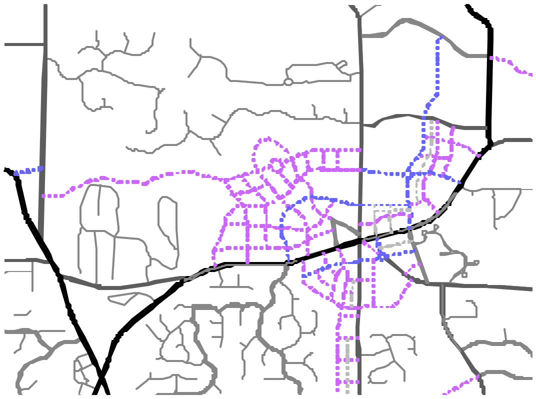

Figure 5.13: Village-Scaled Network Near Intersection

The idea was to approximate the design of a traditional town as if it had been developed perhaps 100 years ago. The network of streets provided several routing options and more intersections to process the motor vehicle traffic, far outperforming the single intersection.

Each street was designed to be context-sensitive and, hence, not detract from the character of the area. Lastly, the original intersection could be restored to be pedestrian-friendly and reassert itself as the community's center. The porch could be replaced on the historic building.

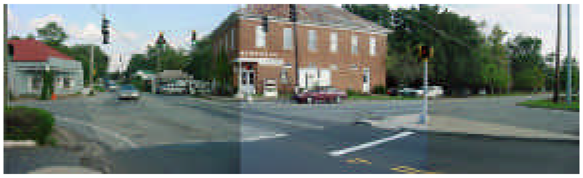

Figure 5.14: Intersection Today

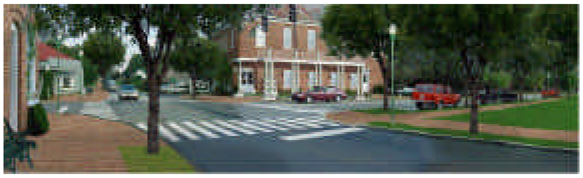

Figure 5.15: Future Intersection

5.2.2 Suburban Mall Break Up

A suburban mall was built at the intersection of two state roads in Winter Park, Florida. The mall was a conventional big box surrounded by surface parking. The mall declined to the point when only one store remained open.

Reinvigorating the area involved building a network of streets through the mall site, to create an urban block structure. The big box was dismantled and new buildings were built up to the streets. Surface parking was provided behind the buildings. The site was designed to accommodate market changes (i.e., additional buildings could be built along the streets and structured parking provided within the blocks).

Figure 5.16: Conventional Mall

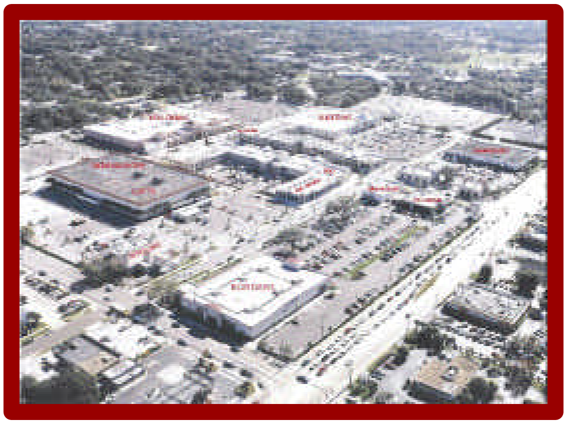

Figure 5.17: Street Network Added

Figure 5.18: Buildings Up to Streets

Flexibility and market resilience were provided by the project's good bones and design. Parts of site can be modified, as needed over time, building on the previous investments in the site.

It is now one of the most successful retail developments in central Florida and it is attracting residential land uses. One of the parking lots will soon be lined with townhouses and apartments with a parking structure in the belly. The site is known as "Winter Park Village."

5.2.3 Breaking Up the Super Block

A super block is a block which is too big for an urban context. Typically, the ratio of access to buildable area is too low resulting in the construction of ad hoc private driveways and roads to provide internal access. Super blocks cause circuitous routing and provide few routing options, which typically results in motor vehicle-oriented streets and concentrations of traffic at the corners and at the edges.

A single use such as a mall can create a super block, or a combination of different land uses as is shown in *Figure 5.19*. The super block, which is north of Winter Park Village, has motor vehicle dealerships, school bus storage areas, a few houses, and warehouses.

Figure 5.19: Super Block

The area will never meet its potential if it stays a super block. It is proposed that the super block will be redeveloped with an urban block structure with buildings up to the streets and a public park.

Providing the additional street network, as shown in *Figure 5.20*, will allow the adjacent state roads to function better from a motor vehicle perspective as well as from pedestrian and bicycle perspectives. The network allows for multiple routing options and a better business environment.

Figure 5.20: New Streets and Blocks

Multiple streets will provide a rich pedestrian environment; carry their share of traffic, be nicely designed, and be connected to homes, businesses, and the park.

6. STREET DESIGN

6.1 Framework Streets and Non-Framework Streets

Given the correlation between healthy cities, healthy street networks, and healthy people, a discussion of healthy street design is important. So, how should the streets be designed? It depends on many factors (e.g., the type of street, the context, etc.) some of which will be discussed herein. Streets in cities can be divided into two types: framework streets and non-framework streets. Framework streets are generally those that are long in length and serve as major emergency routes. Non-framework streets include the rest of the streets.

6.1.1 Framework Streets

The key to the good design of a framework street is its cross-section (e.g., the number of lanes, the width of the lanes, the material choices, the edge treatments, the on-street parking, street trees, sidewalks, lighting, etc.) Through the clever design of the cross section, the street can reflect and contribute to its context (e.g., the area's history, the topography, the climate, the land uses along the sides, the community's goals and objectives, etc.) A good cross-section can encourage desirable behaviors and feelings (e.g., desired speeds for motor vehicles, social contact and exchange for pedestrians, a feeling of safety, identity, etc.)

6.1.2 Non-Framework Streets

The design of non-framework streets can also involve various cross-section measures. Good cross-sections are most easily achieved during the streets' initial construction. However, because so many non-framework streets lack good cross sections, rebuilding them all would be financially infeasible for most cities. Rebuilding is feasible when other work is happening on the street such as major sewer repairs, repaving, or adjacent redevelopment. Even where good cross-sections are used, they can still be insufficient to achieve the desired effect on the speeds of motorists.

The design of non-framework streets can employ a myriad of "periodic" traffic calming measures (e.g., mini traffic circles, narrowings, pinch points, speed humps, tight corner radii, cushions, etc.), examples of which are shown in *Figures 6.1* through *6.6*. The most desirable situation is to use both periodic measures and cross-section changes.

The benefit of considering periodic measures alone, when retrofitting existing streets, is that we can invoke desirable behaviors and attitudes relatively inexpensively. In other words, motor vehicles can be slowed, the pedestrian environments can be enhanced, and a sense of territory and ownership can be created. These retrofit projects require the measures to be spaced at regular intervals to discourage motorists from speeding up between the measures.

Figure 6.1: Raised Pedestrian Crossing

Figure 6.2
Mini-Traffic Circle

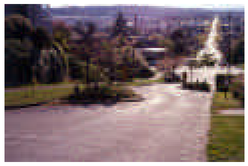

Figure 6.3
Chicane

Figure 6.4
Narrowings

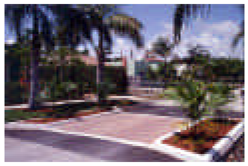

Figure 6.5
Pinch Point & Hump

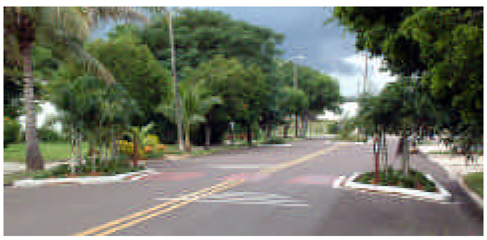

Figure 6.6: Narrowings & Cushions

Typically, the smart approach to laying out traffic calming plans is to determine the appropriate measures for obvious places (e.g., key intersections; pedestrian generators like schools, community centers, and parks; entrance locations, etc.) and then fill in between with measures at the correct spacing. The correct spacing is a function of the desired motor vehicle speed (i.e., the lower the speed, the shorter the spacing). Typically, 20 miles per hour is used in residential areas.

A rule of thumb is that no more than eight to twelve periodic measures be used in sequence through a traffic calmed area. This helps avoid backlash problems from drivers who might otherwise complain about having an excessive number of measures. It also provides guidance for selecting a good network of framework streets.

Figure 6.7: Ambulance on Call

The rule of thumb also helps from a policy perspective with emergency services providers. They are naturally concerned about response times. The deepest property in a traffic calmed area would be only four to six measures from a framework street. The average property would be about three measures from a framework street. In most places, this provides a good balance between response times and quality of life and street safety.

For the record, traffic calming measures of either type (i.e., cross-section measures or periodic measures) are different than traffic control devices. The latter are communication devices such as signs, signals, and pavement markings. Traffic calming measures involve changes to the physical design of the street or intersection.

6.2 Route Modification and One-Way Streets

Route modifications are not recommended. These include street closures, partial closures, turn prohibitions, and one-way streets. Typically, when route modifications are employed there are winners and losers. Some stakeholders benefit by the changes and some are harmed.

Figure 6.8: Median Denies Access

When route modifications are employed, trip lengths increase and speeds of motor vehicles often increase (i.e., all else being equal, one-way streets encourage higher speeds than two-way streets).

Figure 6.9: Fast One-Way Street

Route modifications diminish the street network by removing routing options and reducing access. All else being equal, if the average trip length increased by 15% due to route modifications, then the average motorist would drive through 15% more intersections, effectively increasing traffic volumes at the average intersection by 15%. Therefore, they increase traffic volumes overall even though the number of trips do not change. Consequently, they increase energy consumption and pollution.

Some jurisdictions incorrectly consider route modifications as a type of traffic calming measure. This is technically incorrect because they are not traffic calming measures. Traffic calming involves design changes that effect behavior, keeping the network intact, while route modification removes routing options.

Typically, the application of route modifications in a city is a good indicator of i) an incomplete knowledge of traffic calming; ii) inadequate traffic calming funding; or iii) much larger problems involving the street network and urban design.

Figure 6.10: Narrow One-Way Street with On-Street Parking

The only general exception to the above would be on very narrow streets where on-street parking was highly desired; making them one-way could be acceptable. Otherwise, in general, one-way streets are not recommended. Conventional one-way streets, designed to minimize delays to motorists, are not recommended. Minimizing motorist delay is not adequate justification to diminish the place and the city.

6.3 Underutilized Cross-Section Elements

There are several cross-section elements that are well understood and do not need mentioning. However, some are highly underutilized.

6.3.1 Street Trees

Street trees are under-utilized particularly on busy streets. The presence of street trees provides a sense of enclosure, shade, protection for pedestrians, beauty, and environmental benefits (e.g., the reduction in heat generation, helping air quality, etc.)

Figure 6.11: Nice Street Trees in a Tight Right-of-Way

6.3.2 On-Street Parking

On-street parking insulates pedestrians from motorists. It also provides access to homes and businesses. It is a good use of space because the street provides access to the parking spaces (i.e., no land needed for parking aisles and driveways).

6.3.3 Angled On-Street Parking

Head-in angle parking is familiar to most motorists along with its primary benefit (i.e., larger parking supply) and its primary safety problem (i.e., blindly backing out into a travel lane).

Figure 6.12: Head-In Angle Parking

Figure 6.13: Back-In Angle Parking

Back-in angle parking provides the same parking supply but is safer. The parked motor vehicle's trunk can be loaded and unloaded from the sidewalk instead of from the travel lane. When the doors are opened, the occupants, particularly children, are channeled towards the sidewalk instead of into the travel lane. It is easier to park when compared to parallel parking. The most important safety advantage is the driver's ability to see when pulling out of the parking stall into the travel lane.

Figure 6.14: Good Visibility

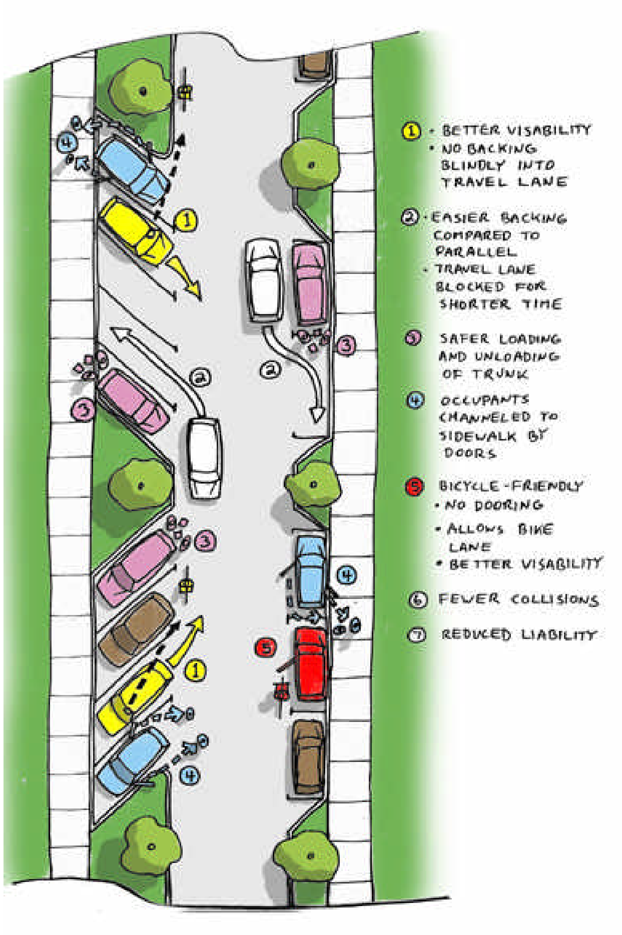

Figure 6.15: Summary of Advantages

Back-in angle parking has been popular in places like Seattle and Washington, D.C., for years. It is used on busy arterial streets and enjoys a superior safety record when compared to head-in angle parking. It can be used in the same cross-section as on-street bicycle lanes.

It is expected that a growing number of cities will convert their head-in parking to back-in parking as awareness increases and as city attorneys recognize the inevitable liability exposure that will be associated with head-in angle parking.

6.3.4 Valley Gutter

A valley gutter is found between an on-street parking row and the outside travel lane. It is two-feet wide and made of concrete. It has a shallow, V-shaped, channel to guide water to catch basins located in the valley gutter. The parking area slopes toward the valley gutter to drain. From a cross-section perspective, one foot of the valley gutter is considered part of the parking row, and the other foot is considered part of the travel lane.

Figure 6.16: Valley Gutter

The advantages of the valley gutter are numerous. Debris migrates to the gutter where it can be swept up more easily than if it were behind parked cars. In cold climates, catch basins are less likely to get blocked by ice and snow.

Valley gutters allow for a different surface material to be used than what was used for the travel lanes. The different material and valley gutter creates an optical narrowing, which helps discourage motor vehicle speeding, even when there are no parked cars present.

Valley gutters allow narrowings to be placed without having to locate a catch basin upstream of every narrowing. This provides the design freedom to add multiple narrowings. The narrowings are also flexible because they can be shortened or lengthened without affecting the drainage. For example, if we wanted to add a bus stop on a narrowing, then the narrowing could be lengthened without affecting the drainage of the street.

Figure 6.17 shows a very narrow right-of-way for which a choice had to be made between on-street parking and street trees. However, through the use of the valley gutter, the on-street parking and the street trees were placed in the same row with pleasant results.

Figure 6.17: Narrow Right-of-Way

Figure 6.18 shows what streets look like without a valley gutter. A catch basin had to be placed upstream of each narrowing. This design is inflexible compared to the one with the valley gutter and does not look as good with or without cars parked. The street feels wider, which, all else being equal, will encourage more speeding.

Figure 6.18: Narrowings without Valley Gutter

6.3.5 Flush Median or Textured Left (or Duel Left) Turn Lane

Figures 6.19, *6.20*, and *6.21* show three examples of textured left turn lanes. Being able to turn left provides access, which is pro-city. Textured left-turn lanes give the impression of a median but do not suffer from their access disadvantages.

Figure 6.19: Arterial Road

Figure 6.20: Busy Residential Street

Figure 6.21: Downtown Setting

Figure 6.20 is in Toronto on a busy, two-lane, street which had been experiencing speeding problems. The inclusion of the textured median helped reduce the speeding and maintained complete access to the homes. The trees in the flush median prevent overtaking and increase the sense of enclosure. Emergency services can use the flush median to pass a stopped vehicle.

6.3.6 Roundabouts

Roundabouts are one of the most underutilized intersection designs. In many cases, roundabouts offer advantages over signalized intersections, including reduced collision rates, reduced severity of collisions, less pollution by motor vehicles, easier crossings for pedestrians, and improved aesthetics. Roundabouts do not require periodic signal timing adjustments. They do not stop operating when the power goes out.

Figure 6.22: Roundabout

From a cross-section perspective, roundabouts do not need turn lanes and multiple through lanes. Traffic signals need these lanes so that the "green time" can be utilized by as many motor vehicles as possible. Multiple lanes at signalized intersections lead to "lane continuity" issues mid-block.

In other words, the lanes needed by the traffic signals are kept in between the signals so that drivers do not have to merge and diverge between the signals, leading to multi-lane roads. If it were not for the signals, then the extra lanes would be unnecessary mid-block. Consequently, roundabouts can allow the removal of these lanes. This provides space for sidewalks, street trees, on-street parking, etc. The lane reductions also slow speeders and improve aesthetics.

6.3.7 Rosemary Street, West Palm Beach

Though Rosemary Street is not a cross-section element, it is an interesting study of cross-section elements. The street connects the city's main shopping street with a very large mixed-use infill development, called CityPlace. The street was ugly and fast. The idea was to calm the street and make it pedestrian-friendly. The goal was to create a better connection and encourage redevelopment and private investment.

Figure 6.23: Conventional Cross-Section

Figure 6.24: Festival Design (same perspective as Figure 6.23)

The street's on-street parking stalls, sidewalks, travel lanes, and cross walks were defined using different colors and textures of pavers; no vertical curbs and no paint were used. An oak tree was planted at the ends of every parking row and between every parking space. Eventually, the trees will form a canopy, creating an outdoor room and a comfortable walking and cycling environment, even in the summer heat of West Palm Beach.

Figure 6.25: Barrier-Free Corners

Another objective, that affected the cross-section, was to make the street a multi-purpose public space. The lack of curbs allowed the whole right-of-way to be a barrier-free space for special events. During events, people in wheel chairs or those pushing strollers can get around easily, unlike on a curbed street. The street design became known as the "festival design." From outside edge of sidewalk to outside edge of sidewalk, the street employed a gentle inverted crown (i.e., it drained to the middle like a parking lot).

Small touches included providing electricity to every tree pit for holiday lights, special event booths, concert stages, etc. All the underground utilities were replaced and the overhead utilities were placed underground. Appropriately sized utility stub-outs were brought to the property lines of every property that had redevelopment potential.

Naturally, when the design was proposed, conventional engineers voiced opposition to the cross-section. They warned of drainage problems, maintenance problems, and that motorists would park on the sidewalks. The truth was that the design was not what they were used to and it would create precedents on both design and context-sensitivity. After the street was built and open, it worked very well; motor vehicles were parked where they were supposed to, motorists drove at respectful speeds, the street was beautiful. Pedestrians enjoyed the walk and private investment followed.

From a transect perspective, the street provided more than what one would normally expect in such a setting: slower speeds, on-street parking, wide sidewalks, high quality materials, street trees at regular intervals, and the ability to accommodate special events in a barrier-free environment.

6.3.8 Get the Buildings up to the Street (a key component of street design)

One of the most important aspects of street design is the location of the buildings along the street. In fact, the street environment extends from building face to building face, across the street. The building facades contribute to the public realm.

Figure 6.26: Buildings Hold the Street

Many cities require buildings to be built up to the street. This is a very positive requirement because it improves the pedestrian environment, the transit environment, natural surveillance, and other urban attributes.

Figure 6.27: Buildings Do Not Hold the Street

Even developers, whose suburban prototype buildings are located behind parking lots and drive-throughs, have learned to adapt to urban environments. *Figures 6.28* to *6.32* show various buildings up to the street. Self-storage facilities often look like a series of garages. Grocery stores are often at the back of large surface parking lots. These figures demonstrate that practically any building and land use can be built up to the street, contributing to the street and the public realm.

Figure 6.28: Fast Food

The lesson here is that just building good streetscapes and nice sidewalks, using pleasant materials and so forth is not enough. It is really important to have the buildings hold the streets.

Figure 6.29: Grocery Store

Figure 6.30: Restaurant

Figure 6.31: Self-Storage Facility

Figure 6.32: Mixed Uses

Figures 6.33 and *6.34* show developments that turn their backs on the street and harm the pedestrian environment. This kind of poor design should be simply prohibited in cities. *Figure 6.35* shows that with minor alterations, the development in *Figure 6.34* can address the street.

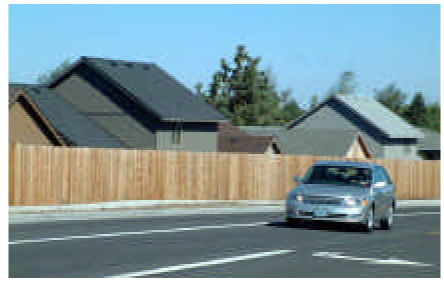

Figure 6.33: Back Turned on Street

Figure 6.34: Back Turned on Street

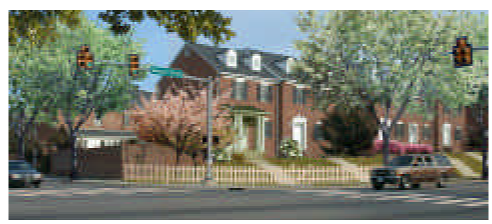

Figure 6.35 Front Turned to Street

7. ROAD DIETS (ARTERIAL ROAD CALMING)

Road diets usually involve framework streets. They always involve cross-section changes that increase the design significance of non-motorized street users. Frequently, they involve narrower, fewer, or narrower and fewer travel lanes.

7.1 Orlando Avenue, Winter Park

Orlando Avenue, in Winter Park, Florida, is also known as State Road 17/92. The current, conventional, motor vehicle-oriented road has five wide lanes, high speeds, a poor pedestrian environment, a poor business environment, and terrible aesthetics. The proposed project addresses these issues by narrowing the lanes, widening the sidewalks, providing street trees, and consolidating many of the duplicate driveways.

Because of the large spacing between signalized intersections, several pedestrian refuges will be added to the street. They will be short landscaped medians. Pedestrians will be able to cross half the street at a time, which will be a lot easier and safer than today's situation. One of the outcomes of this project will be a less divided community.

Figure 7.1: Hostile & Ugly 17/92

Figure 7.2: Post-Diet 17/92

Through our pattern recognition abilities, we can see that Orlando Avenue will change from a suburban strip design to a more urban design. Consequently, we can be confident that more pedestrians will use these spaces, more people will cross the street, customers will be happier, businesses will do better, building owners will be more willing to locate their buildings up to the street, and so forth.

The bottom line is that the street will contribute more to the place and to the city than it does now; a refreshing change to past modifications that were only designed to move more and more motor vehicles faster and faster.

7.2 Fair Oaks Avenue, South Pasadena

Fair Oaks Avenue in South Pasadena, California, is a five-lane road with on-street parking. Despite its name, there are few trees along Fair Oaks Avenue. Though it is the main commercial street, the design does little to contribute to the welfare of the adjacent businesses. The street is a barrier in the community, cutting off one side of the city from the other side.

The city, in cooperation with the California Department of Transportation, is reconstructing the street and incorporating a number of design changes, which will help the multi-modalism of the street. The street will employ a textured left-turn lane, valley gutters, bricked parking rows, and landscaped narrowings with trees.

An interesting component of this street design is that the left flange of the valley gutter is going to be widened to create a concrete bicycle lane. The concrete bicycle lane is very conspicuous because it contrasts with the bricked parking row and the asphalt driving surface.

Figure 7.3: Fair Oaks Avenue Today

Figure 7.4: Future Fair Oaks Avenue

The changes will provide slower speeds and enhanced the pedestrian and bicycle environments. Private investment will follow this project, increasing the tax base, and providing more opportunities for exchange.

7.3 North Flagler Drive, West Palm Beach

Formerly known as North Dixie Highway, in West Palm Beach, Florida, North Flagler Drive used to be a fast, four-lane, treeless, commuter route. It was temporarily narrowed with paint and then reconstructed with a linear park down the east side (i.e., next to the waterfront). As part of this road diet from four to two lanes, the lanes were shifted laterally at regular intervals to avoid what is known as the "gun barrel effect" (i.e., if a street is designed like a gun barrel, then drivers will drive like bullets).

Figure 7.5: Past View on North Flagler Drive

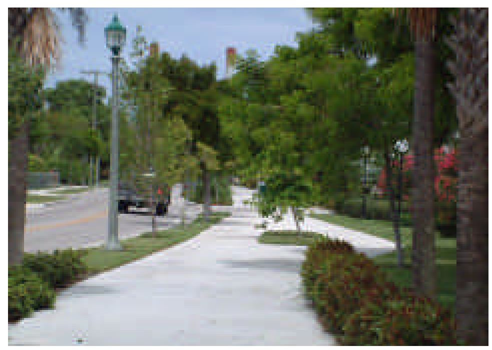

Figure 7.6: Current View

The neighborhoods in this area were rather challenged prior to the road diet, with boarded-up houses, frequent robberies, illegal drug activity, prostitution, and other problems. Coupled with the hostile street design, few people were willing to walk or cycle.

The intent of the road diet was to slow the motor vehicle speeds, connect the waterfront parks, provide a pleasant environment for walking and cycling, and add value and pride to the neighborhood. The results surpassed expectations. People began walking and cycling during construction. Property values rose, homes were restored, people with choice returned to the neighborhood, natural surveillance occurred, and people felt safer.

The ends of every intersecting street were narrowed, resulting in shorter crossing distances for pedestrians and places for street trees. The narrowings reinforce the parking regulations by preventing drivers from parking too close to the intersections, helping with sight distances so that pedestrians can cross more safely.

7.4 Riverside Drive, Los Angeles

Figure 7.7 shows the signalized intersection of Riverside Drive and San Fernando Road, in Los Angeles, California. The picture was taken from on top of the Riverside Drive's bridge over the Los Angeles River. Both streets were four lanes plus turn lanes. The California Department of Transportation was planning to replace the bridge for earthquake reasons. While they were at it, they proposed to add two more motor vehicle lanes, making it a six-lane bridge.

At the same time, an agency with the Santa Monica Mountains Conservancy was looking for park space for the large, underserved, minority community in the area. Unfortunately, the area was highly constrained, being at the confluence of three highways, two rail lines, and two rivers. Nevertheless, there was some land available around this intersection.

The analysis of the intersection showed that the traffic signals could easily be replaced with a one-lane modern roundabout. Consequently, the bridge, Riverside Drive, and San Fernando Road could be narrowed to two lanes.

Following the road diets, a great deal of public land would become available for parks in all four quadrants of this intersection. The cost savings on the bridge construction would pay for burying the overhead utilities, greatly enhancing the area's aesthetics.

Figure 7.7: View of the Intersection from the Bridge

Figure 7.8: Same View Following Project

The parkland, on either side of the bridgehead, would be connected under the bridge. The project would also represent the beginning of a parkway plan along this section of the Los Angeles River.

The bottom line was that the roundabout was key to a number of design choices that benefited the bridge, the intersection, the park, the community, and the budget.

7.5 Olive Avenue, West Palm Beach

Figure 7.9 shows a five-lane state-owned street. Olive Avenue, in West Palm Beach, Florida, cut this part of the city into two parts. It negatively affected property values and the ability to walk. The area to the east of this street had access to the waterfront and was more valuable and more walkable than the area to the west.

Figure 7.9: Olive Avenue, Before

Figure 7.10: Under Construction

Once Olive Avenue was narrowed to one lane in each direction, the pedestrian crossing distances were shortened, the western area had better access to the waterfront, quality of life rose, and property values increased.

Though this was considered a framework street, exceptions were made to the general rule that the periodic traffic calming measures not be used. There were two elementary schools on this street. At both schools, two intersections were raised to sidewalk height.

These “raised intersections” cause motor vehicles to go up a gentle ramp, cross the intersection, and then go down a ramp. Pedestrians cross on the level. The ramps make the pedestrian crossings at the schools conspicuous so that the drivers slow down and look for pedestrians. They also increase visibility of the pedestrians (i.e., kids are four to six inches taller so they can see and be seen better), and help people with mobility impairments cross the street on level ground (i.e., no ramps to deal with).

Figure 7.11: Raised Intersections at schools

Figure 7.12: Narrowings of Side Streets Prior to Tree Installation

The ends of every side street were narrowed as part of this road diet. The intent was to self-enforce the parking regulations, shorten the crossing distance for pedestrians, and provide places for street trees. Part of the justification of this road diet was to provide safe routes to schools, parks, and the waterfront.

8. HIGHWAY REPLACEMENT AND CALMING

8.1 Space and Territory

Typically the rights-of-way for streets make up the largest proportion of public space in cities, more than parks, civic buildings, etc. How to decide on the correct balance between the competing interests in terms of the design of this public space has been the major thrust of this paper. The following discussion does not recommend an exact priority nor weighting of the various interests but it provides an additional rationale regarding which way to lean.

Space and territory are very related. For example, at a small scale, we each have a personal space around us and, should someone enter it, they either i) had an existing "right of entry" (e.g., a significant other, spouse, son or daughter); ii) had an invitation to enter (e.g. through body language); or iii) they make us feel uncomfortable.

If a person were the only passenger on a bus, and a second passenger boards, the second passenger normally does not sit immediately beside the first because the first has established a little bit of "static territory" on the bench. It's only when the majority of the benches are occupied, will someone share the bench.

At a larger scale, the right of entry into static territory applies to homes. Visitors to homes typically wait for an invitation to come inside or they do not enter. Even entering the home's yard requires a reason such as making a delivery, collecting mail, or other "right of entry." If a stranger were simply loitering in the yard, the home's occupants would likely take some action to re-establish their territory. The same would apply if strangers were regularly cutting through the yard, due to the "right of passage" not being granted. Many residents mark their territories with landscaping and/or picket fences to reinforce their claim.

Figure 8.1: Marking Territory

On a larger scale, many residents feel a sense of ownership over the street in front of their homes. Though the street is public property, they feel that they should have a say regarding how the street is designed, maintained, and used (e.g. parking policy, driver behavior, etc.)

Figure 8.2: Entrance Feature

Groups of residents feel the same about their entire neighborhood. They claim a level of static territory and claim a say in a number of issues including who can drive through and at what speed, what are compatible land uses, what happens near their neighborhood, etc. Neighborhoods often erect entrance features at the entrance locations to mark their territory and signal to those entering that they are now in a special place and that they need to show respect.

Similarly, groups of business people claim static territory over business districts, centers, and along various corridors. They claim a say in street design, parking policy, delivery schedules, etc.

On a larger scale, the country decides who can enter, who cannot. The country has claimed the right to be very particular about who is granted the right of entry. They also mark their territory with border crossing, check points, etc. Countries even control who flies over their territory in an airplane or passes by in a boat offshore in order to protect their territory and demonstrate their sovereignty over it. Furthermore, countries require travelers to conduct themselves according to the country's rules while within their boundaries.

Like static territory, people on the move have a degree of "mobile territory" as well. It goes unnoticed when two pedestrians pass without conflict. However, if the paths were to intersect, normally one pedestrian gives way and, in many cases, the conflict is acknowledged with an "excuse me" or other response. Assume for a moment that, on a visit to a public beach, a couple sets up a little static territory and marks it with a beach blanket, chairs, and a cooler. Pedestrians walking down the beach will inevitably walk well around the little territory rather than walk through it. Similarly, assume that a queue had formed at a busy airport ticket counter such that the line of people extended across the hall. Each person in the queue would have a "static territory" established around them. Now a pedestrian walks down the hall and has to pass through the queue. Typically, the pedestrian will say "excuse me" while passing through the queue.

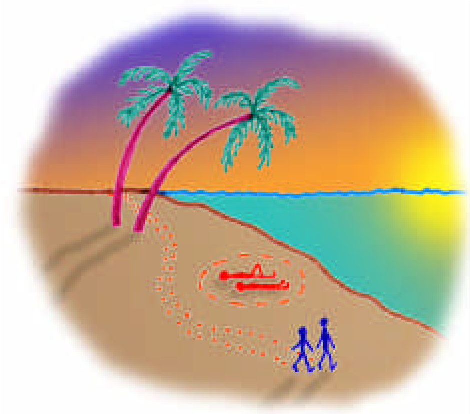

Figure 8.3: Static Territory Takes Priority over Mobile Territory

Both the beach case and airport hallway case demonstrate that static territory takes priority over mobile territory; even though pedestrians are allowed to walk anywhere on the beach and that hallways are intended for walking. The relative importance is even clearer with the yard of a home or with the country; static territory trumps mobile territory. Significant negative consequences could come to a traveler if they violate static territory without being granted the right of passage by the property owner or country. At the scale of the neighborhood, static territory is again more important than mobile territory. There are a myriad of neighborhood traffic calming projects that affect the behavior of drivers as they pass through the neighborhood. The measures are purposely designed to cause drivers to pass through on the neighborhood's terms.

At every scale, from the beach to the country, static territory takes priority over mobile territory. However, highways and arterial roads punch through towns and cities, dividing them in the name of speed and mobility. The conventional "hierarchy of roads" model is also used to justify conventional highway design in cities. This violates the accepted and normal expectations that static territory (i.e., the city) takes priority over the mobile territory (i.e., design for speed). The hierarchy of roads is at odds with our hierarchies of space and territory.

Figure 8.4: I-95 and I-395 through the Overtown Neighborhood, Miami

There are several more appropriate design responses than highways and fast arterial roads. They include i) main street designs; ii) boulevards; iii) avenues; iv) network solutions; v) public transit; vii) land use changes vi) combinations thereof. These solutions allow the "traffic functions" and the "city functions" to coexist in harmony.

8.2 <u>Rural Highways</u>

Route 50 is a rural highway in Virginia, west of Washington, D.C. It passes through three small towns, Aldie, Middleburg, and Upperville and through beautiful countryside. The area is very agricultural with a thriving equestrian industry. The towns are historic and built at a wonderful scale. They have functioning main street businesses, owned and operated by local people.

Unfortunately, the design of the main streets within the right-of-way resembles the highway between the towns. Motorists drive at their own comfort levels; the speed limit signs are ineffective; and police enforcement only works when the police are there. The hostile main streets split the towns in two and lower the quality of life and safety along the main streets.

Figure 8.5: Route 50's Rural Setting

Figure 8.6: Highway-Like Main Street

The Virginia Department of Transportation (VDOT) had visions of turning Route 50, between the towns, into four-lane divided highways and connecting them with bypasses around the towns. One of four-lane sections was already built west of Middleburg.

Figure 8.7: Four-Lane Section

The people from the area noticed that other towns in Virginia had similar changes made to them years earlier. Those changes resulted in sprawl development, worse congestion, national chain retail around the bypasses, declines along their main streets, loss of farmland, and loss of character.

The people had also heard the official forecasts that indicated motor vehicle use would almost double on the highway in twenty years so that VDOT had to widen the highway and build the bypasses or the congestion would be legendary. However, the people also noticed that motor vehicle use on the highway had been fairly steady for years and that the same forecasts that had been made every five years for that past fifteen years had not materialized.

The people recognized that unless they did something different, they were going to follow the same pattern that the other communities followed. First, the highways through the towns would become overly specialized for motor vehicle mobility and not access, bisecting the towns (that had already happened). Second, the bypasses and four-lane highway would be expensive (already started). Third, the bypasses would attract national chain retail, harm local businesses, and encourage sprawl.

Using their pattern recognition skills and dozens of community meetings, the people eventually concluded that the most context-sensitive approach was to traffic calm the main streets and restore the four-lane section back to two lanes. They had discovered that rural towns in Denmark had been building bypasses for years with similarly bad results, until their Ministry of Transportation ran out of highway money in the 1970s.

The Danes tried traffic calming the main streets instead, allowing the "town functions" and the "traffic functions" to coexist in harmony, avoiding the disadvantages of bypasses, and costing far less than the highway bypasses. The Danes were highly successful with this approach and, over the last thirty years, the technology spread throughout Denmark, Europe, and beyond, with the new successful pattern repeating itself thousands of times.

Figure 8.8: Transition Zone Between a Highway and Small-Town, Traffic-Calmed, Main Street in Germany

Plans were developed for the three Virginia towns, funding was acquired, and the VDOT ended up enthusiastically supporting the project and heading up the project management and design efforts.

The safety benefits alone were compelling. When motor vehicles slow down, their stopping distances shorten dramatically. Should there be a collision, far less property damage, fewer injuries, and fewer deaths occur. For example, if a pedestrian were struck at 31 miles per hour, there is a 37% chance that the pedestrian would be killed. At half that speed, the probability of killing the pedestrian drops tenfold, to under 4%.

Figure 8.9: Fields of Vision at 30, 25, 20 and 15 mph Respectively

The "field of vision" of drivers widens at slower speeds (i.e., when speeds are high, drivers focus on a dot-sized area far down the road and, as speeds drops, they focuses on larger areas toward the near and middle distances) and they are more likely to avoid collisions (i.e., more likely to notice a pedestrian walking out from between parked cars or notice a truck pulling out of the driveway, etc.) Drivers are also more likely to notice signs and displays in windows, which is very appealing to merchants. All else being equal, traffic calming results in about half the number of collisions and far fewer deaths and injuries than conventionally designed streets. Furthermore, the noise level and vibration levels will drop, which is also appealing, particularly in historic areas, where the buildings are older.

The overall plan for Route 50 was fairly simple. Between the towns, speed limits would be 50 miles per hour. At the edges of the towns, there would be transitions to 35 miles per hour. In the towns, the speeds would be 25 miles per hour or less and it would be self-enforced by traffic calming measures (i.e., mainly cross-section changes with some periodic measures).

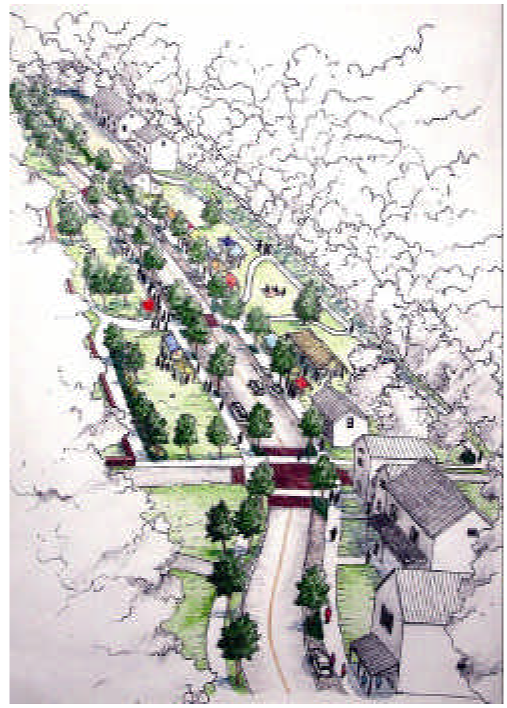

Figure 8.10: Aldie, Main Street Concept

The transect played an important design role in this process. Outside of the towns, the highway design was kept very rural, with a combination of grass and natural shoulders and pleasant vertical and horizontal curves. In the towns, the designs were urban and customized to suit the three distinct towns.

Figure 8.11: Middleburg's Main Street Today

Figure 8.12: Middleburg's Main Street Concept

The Route 50 project, likely the largest rural traffic calming project in the United States, is in its final design phase. The project has already had plenty of attention locally and nationally. Local support came from farmers, merchants, the hospitality industries (e.g., taverns, inns, etc.), churches, and the general community. National support came from Taxpayers for Common Sense, Renew America, Scenic America, the National Trust for Historic Preservation, and others. Cities, organizations, and people in over forty states requested information about the project.

8.3 <u>Highways in Larger Cities</u>

There are many examples of highways going through larger cities. These are gaining the attention of urban designers at ever-increasing levels. Similar patterns occur in large cities as are observed in small towns. Highways split cities even with expensive grade-separation efforts. The physical presence of the highway, noise, break in the urban fabric, motor vehicle-oriented ramps, associated street closures, one-way frontage roads, etc. contribute to the barrier effect.

It should come as no surprise, with our pattern recognition abilities, that cities are typically harmed along and across highway corridors. Highways violate the urban transect more than any other type of street. Highways are about limited access, high speeds, no pedestrians, and cities are about the opposite. Consequently, it should be expected that slum, blight, and decay typically accompany highways through cities. Highways disadvantage every urban land use. Lining highways with land uses that match the highways' scale and motor vehicle-orientation is not always feasible nor desirable (i.e., big box development, industrial areas, large shopping malls, stadiums, etc.)

Figure 8.13: Decline along Busy Highway

There is a growing trend in cities in North America to undo highways that cut through urban areas. Some of them are done willingly, like in Portland, and some of them are courtesy of Mother Nature, as in San Francisco. But, wherever these highways are removed, good things happen because the resulting streets are more in keeping with the context and the transect.

8.3.1 Mercer-Valley Pair, Seattle

A good example is coming to Seattle. The Mercer-Valley pair is located south of Lake Union. The conventional idea has always been to try and provide a highway connection along the Mercer-Valley pair connecting highways to the east and to the west. But as the corridor became more and more mobility-oriented and highway-like, access to the area declined and a larger obstacle to the waterfront was created.

Figure 8.14: Restored Network and Boulevard Replace Highway

Glatting Jackson worked with Urban Design Associates on a plan to undo the damage to Seattle. After considering many options, the best option was to replace the highway with an at-grade boulevard and reconnect the network. The benefits were numerous. They included creating several developable blocks that were previously undevelopable because of the ramps and highway facilities. The access to the waterfront was increased and made pedestrian-friendly through the conversion of the five-lane high speed road to a two-lane, slow, access-oriented street.

The motor vehicle performance measures did well because, instead of one big road and a few intersections doing the heavy lifting, the entire network of streets and many intersections could contribute. Reactivating the network will help the redevelopment of this dilapidated area. Each street can be designed to be pedestrian-friendly. This part of Seattle will become more valuable, repopulated with people and businesses, safer, and better looking.

8.3.2 Riverside Parkway, Chattanooga

Riverside Parkway, a limited access highway, in Chattanooga, Tennessee, cut the city off from its waterfront. The city really wanted to connect to the water. They knew that the highway had to change in order to accommodate that goal. The Tennessee Department of Transportation refused.

Figure 8.15: Waterfront Highway cuts off City.

Figure 8.16: Road Diet Concept

Figure 8.17: Construction Underway

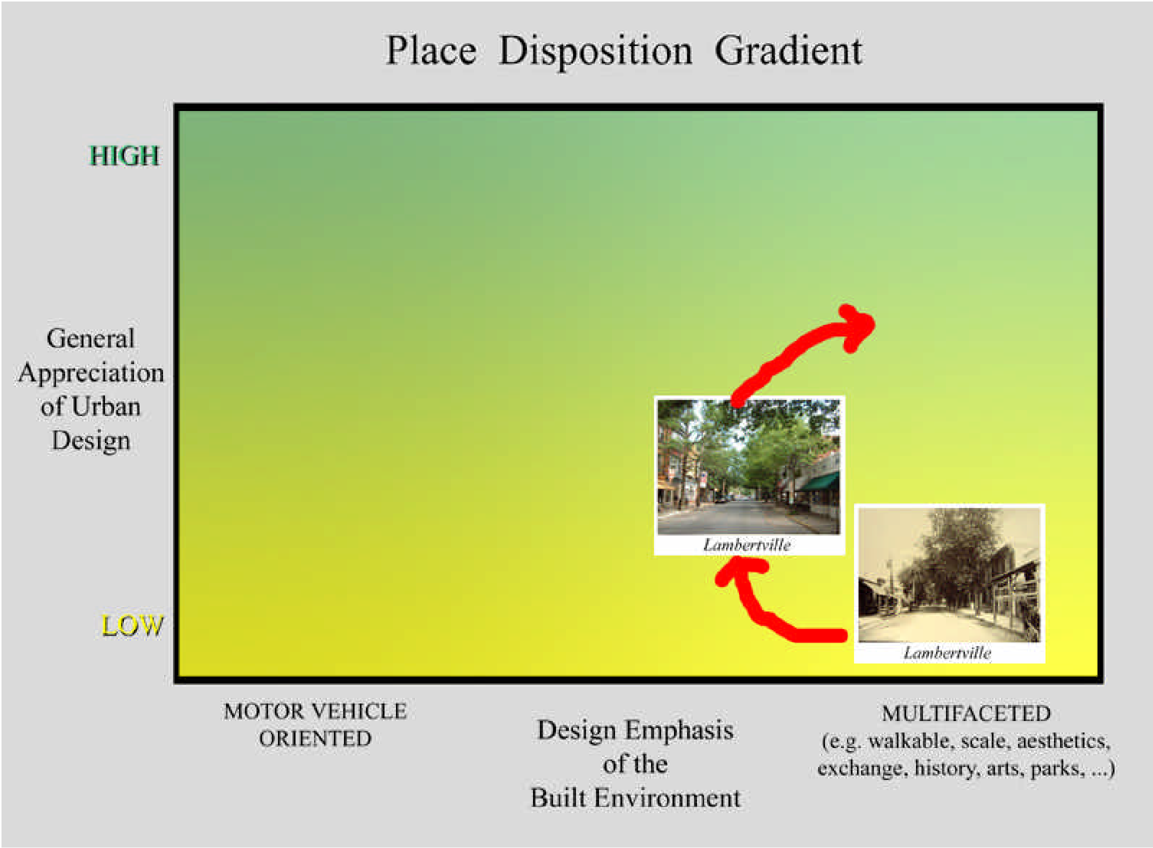

Figure 9.1: PDG for Lambertville

The city had to take over jurisdiction of the highway through political means and then rebuild it themselves. That project is under construction now. The highway which lowered property values, safety, and access for years along the waterfront is being replaced with a beautiful, connected, waterfront street. It will add value, redevelopment opportunities, and recreational opportunities.

9. THE PLACE DISPOSITION GRADIENT

9.1 Lambertville, New Jersey

To help understand this redirecting of energy and resources, the "place disposition gradient" is helpful. It allows us to understand where a city sits in terms of its design emphasis on the built environment (ranging from being motor vehicle-oriented to being multifaceted) and a city's general appreciation of urban design.

Figure 9.1 shows the place disposition gradient for Lambertville, New Jersey. The city began in the bottom, right-hand, corner of the gradient. Lambertville was built well before motor vehicles were invented so it naturally was multifaceted. It had little appreciation of urban design because that was just the way things were done then. The city has a network of streets, all the buildings address the streets, houses have porches, and commercial buildings have front doors and display windows along the sidewalks, all designed to maximize exchange. Today most of the streets are still very sociable despite motor vehicles being present.

However, Lambertville did not stay completely multi-faceted. Some of the streets were altered to be highly motor vehicle-oriented. Route 29, as shown in *Figure 9.2*, was built through the city. Its design was clearly mobility-oriented, violating the context and transect for Lambertville. The highway reduced access. It was too fast and it became a barrier between one side of the city and the other side.

Figure 9.2: Highway Bisects Lambertville

These problems were noticed by the people of Lambertville and they wanted change. Designs are now in progress at the New Jersey Department of Transportation. A rendering of one of the options being explored is shown in *Figure 9.3*. The idea of all the options being explored is to reconnect the city, increase access, increase walkability, provide on-street parking, reduce motor vehicle speeds, increase safety, and improve the aesthetics.

Figure 9.3: One Concept for Highway

Naturally, discussions with the community on the design will be ongoing to ensure that it meets their needs. Similar road diet efforts are underway on Lambertville's Main Street, another street under state jurisdiction which, years ago, was sped up and altered in violation of the context.

With regard to the non-state roads, which are the non-framework streets in Lambertville, the people were concerned about poor driver behavior which detracted from their quality of life and their feeling of safety on the streets. Through a grant from the Robert Wood Johnson Foundation, the city prepared and adopted a traffic calming plan, which is shown in *Figure 9.4*. It is currently in the early design phases. The traffic calming measures will be constructed over the next couple of years which should greatly enhance the pedestrian environment and the quality of life in Lambertville.

Developing a traffic calming plan of this magnitude required a great deal of public participation. Several walkabouts in the neighborhoods were conducted to find out what the issues were and how to solve them. Several general public meetings were held as well. Public consultation will continue through the design and implementation phases to ensure that people's goals and objectives are met to the greatest extent possible.

Notice that all of the measures proposed affect behavior and not driver routing. The city has learned the importance of network and connectivity and does not want to diminish this through any route modification measures. Through Lambertville's planning work on their framework and non-framework streets, their appreciation of urban design has grown.

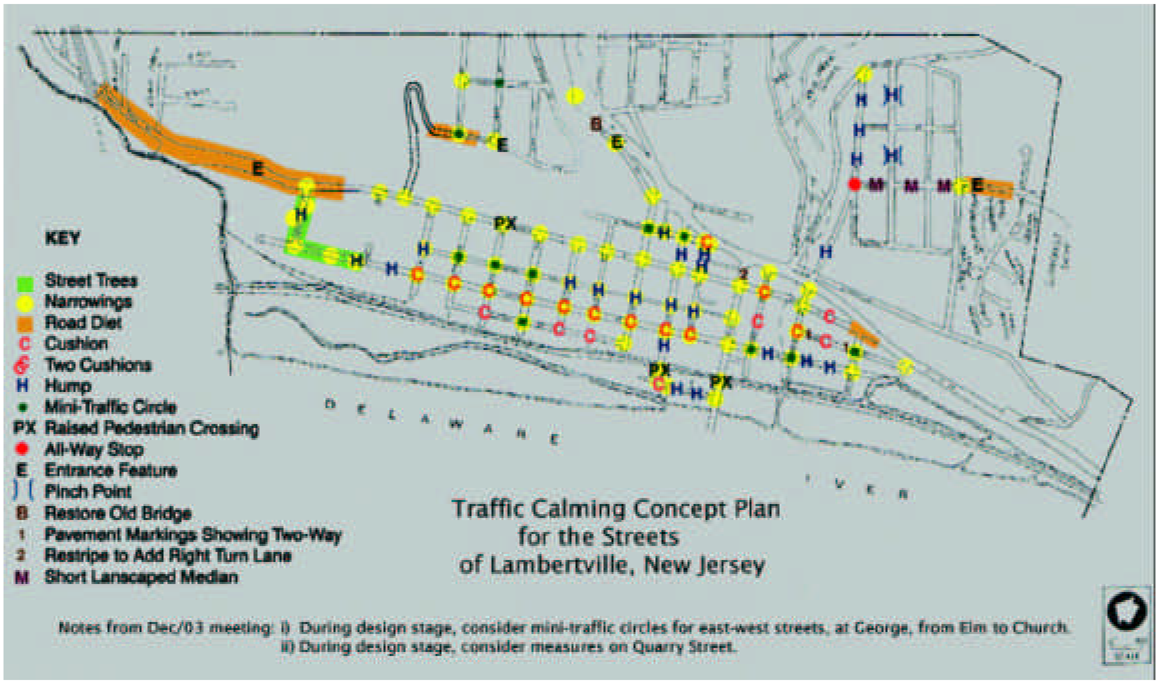

Figure 9.4: Lambertville's Traffic Calming Plan

On the place disposition gradient, the city had become more motor vehicle-oriented with the widenings, which would pull them to the left, but their appreciation of urban design has grown, so they will move up as well. Once the projects are built, the design emphasis of Lambertville's built environment will once again become more multi-faceted. At the same time, the general appreciation of urban design will grow some more, pushing the city upwards and to the right on the place disposition gradient. These changes on the place disposition gradient are outlined with the red lines in *Figure 9.1*.

9.2 <u>Other Cities</u>

Figure 9.5 shows that any city can be placed on the place disposition gradient. Copenhagen, for example, would be placed near the top right-hand corner. However, it did not just accidentally develop with a great appreciation of urban design and being a multi-faceted city. It went through an automobile era and it had to learn about urban design and work hard to become multi-faceted again, shown by the blue line in *Figure 9.5*.

Minneapolis is a very motor vehicle-oriented city with a fair appreciation of urban design. The trajectory with the city's Lake Street and I-35W projects indicates that they may well become even more motor vehicle-oriented in the future, continuing the direction of the brown line in *Figure 9.5*. Hopefully, the people there, who do appreciate urban design, will reshape those projects and cause the city to become more multi-faceted.

Every city can be put on the gradient (e.g., Los Angeles, Columbus, Orlando, Boston). Plus, each city got to its current location on the gradient for its own reasons. Each city

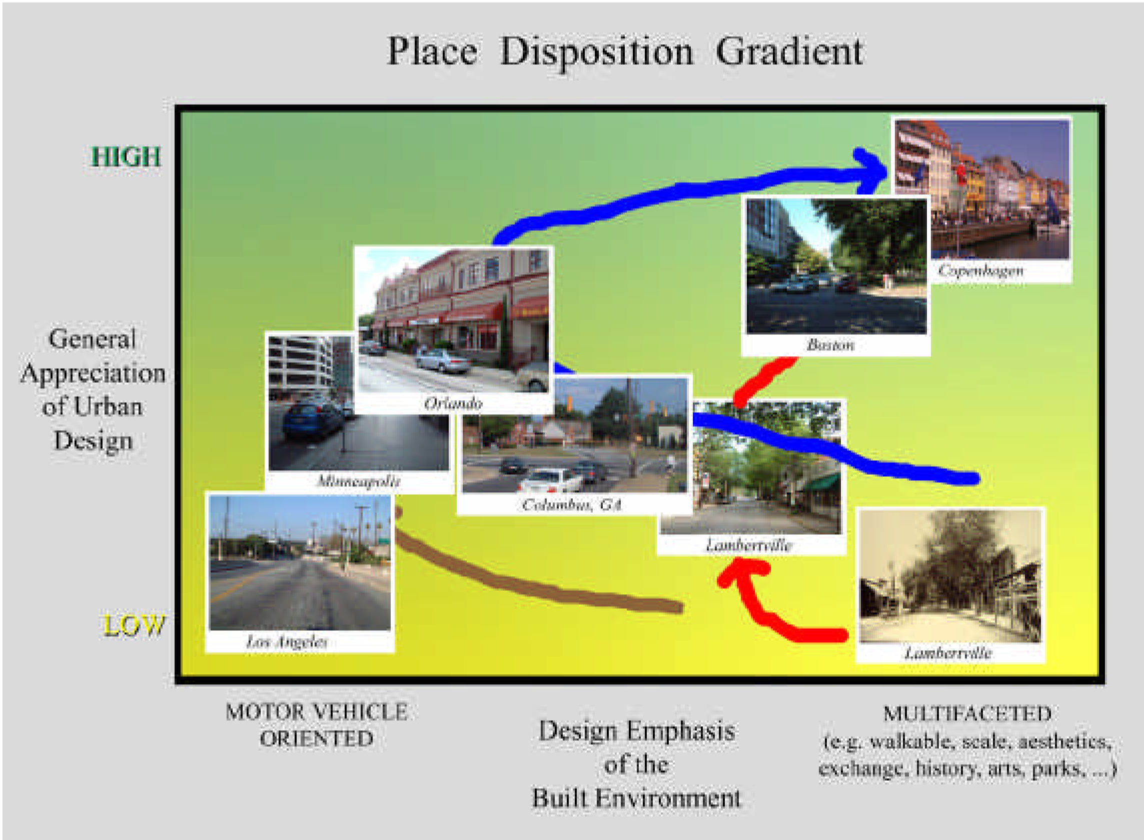

Figure 9.5: PDG for Various Cities

can also change its location depending on its public policies and projects. For example, Los Angeles is in the bottom, left, corner of the gradient. They are learning about urban design and will likely shift upwards and to the right over time.

9.3 The Gradient and Determining What is Important

An understanding of the place disposition gradient allows us to discuss the importance of conventional transportation values, like those found in the *Highway Capacity Manual.* In a place that has a low appreciation of urban design, the values in the *Highway Capacity Manual* will have a lot of importance.

Cities with a high appreciation of urban design will give conventional values little weight. A city, whose appreciation of urban design falls somewhere between high and low on the gradient, would give conventional values varying degrees of importance.

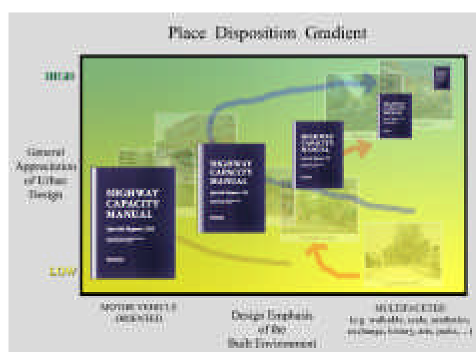

Figure 9.6: Importance of Conventional Values in Different Places

Imagine if there were a *City Capacity Manual* that outlined, in great detail, how to define and ensure the success of every facet of healthy urban design. The manual would solve any urban design puzzle with easy-to-use formulas and an optional software program. Such a book would have a great deal of importance in cities towards the top of the gradient. It would have very little weight at the bottom, and have varying degrees of importance in between.

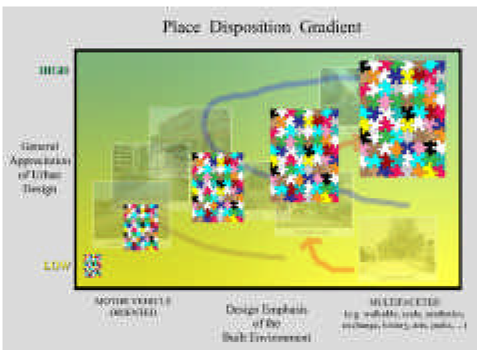

Figure 9.7: Importance of Other Facets of Urban Design in Different Places

10. CONCLUSION

The design emphasis of the built environment and the appreciation of urban design is just another way of looking at context. It divides the context into two parts: the physical context and the context of the people, their culture and their goals and objectives. One of the problems with conventional transportation engineering thinking is that every place is treated the same and that the motor vehicle-oriented values are paramount. With our powers of pattern recognition, we can see the damage this has done to multi-faceted places over time. We can also see multi-faceted places that did not succumb to conventional transportation thinking.

With a good understanding of the place disposition gradient, city policy makers and professionals can determine how much weight they want to assign to the various competing interests. The gradient can help them make good choices about repositioning parts of their city or their whole city on the gradient.

In most cities where Glatting Jackson works, the desire is to both increase the appreciation of urban design and push the design emphasis towards the multi-faceted end of the scale. However, there are some places that seem to be resigned to stay motor vehicle-oriented. That choice will be increasingly difficult to sustain as the limiting factors grow.

Most people in the United States live in cities. The health of these people and the health of the cities are related. The patterns about healthy cities are clear. Cities can be motor vehicle-oriented or they can be healthy. They can be somewhat motor vehicle-oriented and somewhat healthy. But, they cannot be motor vehicle-oriented and healthy.

We shape our cities and then they shape us. There are good examples of cities, projects and methods to learn from and apply. It is simply a matter of choosing what shape we want our cities to be in, getting everyone involved to pull in that direction, and then sustaining the effort.