HOUSTON'S TRAVEL RATE IMPROVEMENT PROGRAM

"TOOLBOX" OF IMPROVEMENT STRATEGIES

CHANGE THE URBAN SCHEME

Prepared for
Greater Houston Partnership

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April 2001

CHANGE THE URBAN SCHEME

Transportation systems and land use patterns are linked and influence each other. Modifying the way that shops, offices, homes, schools, medical facilities and other land uses are arranged have a significant effect on the traffic volume that is generated. The techniques listed in this section are usually much more effective at reducing the rate of vehicle use if several of them are enacted together.

Not many neighborhoods, office parks, etc. will be developed for auto-free characteristics—that is not the goal of these treatments. The idea is that some characteristics can be incorporated into new developments so that new economic development does not generate the same amount of traffic volume as existing developments.

The "tools" included in this category are:

- Arterial Street Access Management
- Light Rail
- Diverse Development Patterns
- Assessing the Transportation Impacts
- Parking Strategies
- Bicycle and Pedestrian Elements

Arterial Street Access Management

Description

Arterial access management increases mobility and safety by controlling the spacing, location, and design of driveways; medians and median openings; intersections; and traffic signals. Elements of access management include physically restricting left turns, restricting direct access driveways (in favor of shared driveways), separating obvious conflict areas, eliminating on-street parking, locating intersections at regular intervals, and constructing frontage roads to collect local business traffic and distribute it to nearby intersections.

Target Market

Implementation

Hurdles:	Local & Public
Level:	Target Markets
Sector:	Both
Locations:	Sites

Studies have shown a direct relationship between the number of driveways per mile with the number of accidents per mile. Better management of arterial access not only increases arterial and intersection capacity and reduces congestion and conflicting maneuvers, but also greatly increases safety. Some agencies incorporate access management issues into land use development policies. Regulations may include restrictions on driveway spacing, sight distance, and corner clearance; increasing minimum lot frontage along thoroughfares; minimizing commercial strip zoning and promoting mixed land use. An aspect commonly associated with access management strategies is the potential for negative impacts on some types of business. Businesses that depend on pass-by traffic, such as gas stations, convenience stores, and fast food stores, are most susceptible to decreased sales due to reductions in access. Studies by the Florida Department of Transportation have shown that the capacity of a four-lane arterial can be increased nearly 50% by providing access control measures (1).

Corner clearances are the minimum distances that driveways can be constructed either upstream or downstream of a nearby intersection. Inadequate corner clearance can result in operational, safety, and capacity problems such as higher accident rates, through movements being blocked by vehicles turning into or out of a driveway, backups from far side driveways into the intersection, insufficient weaving distances, and reduced intersection capacity. Colorado policy does not allow driveways within a 325-foot clearance zone from the intersection. More common practices are to require corner clearances in the 100 to 200 foot range. Mitigating actions where inadequate corner clearances exist include locating driveways at the farthest edge of the property from the intersection, consolidating driveways for multiple properties, closing driveways on the principal road and requiring access on the secondary road, and installing raised median barriers to prevent left turns into or out of the driveway.

Benefits and Costs

Traffic signal spacing on arterials has an impact on accident rates, delay, and travel speeds. Colorado and Florida require ½ mile signal spacing on principal arterials. Studies have shown that accident rates are approximately 40 percent higher when signals are spaced at ¼ mile intervals as opposed to ½ mile intervals. Closely or irregularly spaced signals effect the efficiency of progression on the arterial. Signals spaced at ¼ mile intervals can provide progression at speeds of 26 to 30 mph with 60 to 70 sec cycle lengths, whereas ½ mile signal spacing can provide progression at speeds of up to 45 mph with 80 to 120 sec cycle lengths. The spacing of driveways on arterials produces similar results—the closer the spacing the higher the accident rate and the slower the travel speed.

Turn restrictions are commonly implemented to reduce accident frequency at a location. Accidents at four intersections in San Francisco dropped 38 to 52 percent after turn restrictions were implemented. The use of a continuous raised median to restrict left turns between intersections in Wichita, Kansas resulted in a reduction in accidents of 43 to 69 percent (2). The cost of implementing left turn restrictions on two-way streets are approximately $400 per intersection. The cost of implementing continuous raised median strip to restrict left turns is approximately $2,000 per block (3). Channelization at intersections may be used to provide positive separation of conflicting movements, control the angle of conflicts, reduce excessive pavement areas, control speed, provide pedestrian refuge, protect turn bay storage areas, block prohibited movements, and protect traffic control devices.

Two-way left turn lanes and raised medians (to a greater extent) are median treatments that can reduce accident rates and increase vehicle speeds on undivided arterials. Two-way left turn lanes allow separation of left turns improving flow in the through lanes. Raised medians provide positive separation of opposing vehicle movements and eliminate left turns resulting in fewer conflicts, greater safety, and more uniform arterial speeds. As raised medians will transfer turning volumes to intersections and median breaks, adequate storage should be provided to keep turning vehicles from interfering with through operations. Costs for implementing a two-way left turn lane or raised median include the cost of providing an extra lane as well as approximately $25,000 per mile in incremental costs for two-way left turn lanes and an additional $210,000 per mile to convert two-way left turn lanes to raised medians. The conversion of a two way left turn lane to a raised median has been shown to provide a benefit/cost ratio of 4:1.

Implementation Issues

The spacing, location, and design of driveways; medians and median openings; intersections; and traffic signals as well as restricting left turns, separating obvious conflict areas, eliminating on-street parking, locating intersections at regular intervals, and constructing frontage roads to collect local business traffic and distribute it to nearby intersections are all governed through subdivision regulations, development standards and regulations, in some cases, street design standards. Writing, adopting, and enforcing such regulations and standards are public-sector functions.

1. Sokolow, G. Access Management and Its Role in Congestion Management, Florida Department of Transportation, presented at RA/International Conference Centre Amsterdam, The Netherlands, April 1992.

2. Traffic Engineering Handbook, Institute of Transportation Engineers, Washington D.C., 1992.

3. Transportation Control Measure Information Documents, Environmental Protection Agency, Washington D.C., 1991.

Light Rail

Implementation
Hurdles: Public
Level: Target Markets
Sector: Public
Locations: Routes

Description

Light rail systems are capable of operating either in exclusive rights of way or within shared rights of way on city streets. Light rail systems typically draw power from overhead wires, are driven manually, and can load passengers from low level platforms. Car and train sizes, operating headways, and passenger loading rates determine the capacity of a light rail system but it is typically less than heavy rail systems. Most light rail trains consist of a maximum of three cars when used on-street. Longer trains would interfere with street operations on short blocks, would require longer clearances to clear at-grade intersections, and require longer station platforms. Loading rates are a function of the number of doors, platform heights, and the fare collection process. Prepayment systems greatly reduce the amount of time required to handle fare collection in comparison with on-board payment, thus allowing for shorter headways. Headways of less than one minute can be achieved with on-street single car trains known as streetcars. In general, costs associated with development of light rail transit are approximately $20 to $30 million per mile (1)

The Dallas Area Rapid Transit (DART) light rail system is comprised of 20 miles of track linking 20 stations with one route extending north of downtown Dallas and two routes extending south of Dallas. Future plans call for an extension of the system on all routes to a total of 93 miles of light rail. Trip, day, and monthly passes are all purchased through ticket vending machines. Tickets are not collected on board, but uniformed fare inspectors make random checks. The light rail system operates seven days a week from 5:30 AM to 12:30 AM with five to ten minute headways during peak hours (6 to 9 AM and 3 to 6 PM) and 10 to 20 minute headways during off peak hours. Rail tickets may be used for free transfers to and from buses. Several projects are underway to create mixed-use facilities (commercial, residential, and entertainment complexes) out of what were abandoned buildings near the rail lines.

Target Market

A number of comparisons have been made between the characteristics associated with cities with light rail systems and those with commuter rail. Most of these differences can be explained by the differences in developments and travel markets that they serve. Commuter rail travel times are 50 percent greater and distances 200 percent longer than those with light rail. The average spacing of stations is approximately two miles for commuter rail and a half-mile for light rail. Approximately 90 percent of commuter rail stations have significant parking, while only one-third of light rail stations have significant parking. The population density within two miles of commuter rail station is 1.8 persons per acre, while the density around light rail stations is 4.5 persons per acre (2).

In locations where light rail is being implemented in lower density areas, it is important to have adequate support facilities such as park and ride lots and bus service to and from rail stations. Other policies and programs like the other tools in Change the Urban Scheme can help encourage population and employment growth in the areas immediately adjacent to rail stations. This is an important aspect as it helps generate walk trips to/from the rail stations which supports the rail ridership as well as the commercial activity.

Benefits and Cost

One of the characteristics of rail is that, subsequent to the initial investment, the rail line can accommodate significant increases in demand while maintaining premium level of service, with comparatively low incremental cost. For example, when the 7.5-mile METRORail opens, the initial operating plan of one-car trains every 6 minutes in the peak can carry about 2,000 people per hour in each direction, the equivalent of about two freeway lanes. By increasing frequency of one-car trains, METRORail will have a capacity of 4,000 per hour in each direction. By adding vehicles, METRORail can run two-car trains at 3 minute headways, providing capacity to carry 8,000 people per hour in each direction. The increase in capacity, which is the equivalent of expanding from two freeway lanes to eight freeway lanes, can be achieved within the same facility by lengthening trains and increasing frequency.

The METRORail light rail line is projected to have approximately 40,000 boardings per average weekday in 2020. METRORail estimated travel time from University of Houston/Downtown to Fannin South Park and Ride lot will be 29 minutes. By comparison, bus routes #15 and #8 take 45 minutes on a weekday schedule to travel the same corridor today. Systemwide travel time savings in 2020 is estimated at over 4,000 persons per day.

As presently viewed, trains will run every 6 minutes in peak times and 12 minutes during off peak times. Light rail will replace about 1,200 bus trips per day in the corridor. Pollutant emissions and fuel consumption will be reduced.

The cost of the 7.5 mile METRORail project is $300 million, or about $40 million per mile. This includes all engineering, right-of-way, design services during construction and project management, as well as construction. Care should be exercised in comparing costs/mile to ascertain what each cost does or does not include. (One should not assume all costs are comparable.)

METRORail is forecast to stimulate significant economic development in the corridor. Additional private sector development in the range of $470 million to $892 million is expected to occur within the corridor as a result of the METRORail. The City of Houston estimated that through 2020, the additional development around the light rail station areas will generate $219 million in additional property and consumer tax revenues.

Implementation Issues

Before rail in Houston could be extended beyond the 7.5 mile METRORail line, corridor studies will need to be conducted to determine preferred modes and alignments. If the corridor studies result in a rail system plan, METRO's Board of Directors has committed that METRO will seek voter approval. METRO will need to identify funding sources and a financing plan for any sizable rail system.

1. Henk, R., Poe, C., and Lomax, T. An Assessment of Strategies for Alleviating Urban Congestion, Report FHWA-TX-2-10-90/1-1252, Texas Transportation Institute, Texas A&M University, College Station, TX, November 1991.

2. Parsons Brinckerhoff Quade and Douglas. Transit and Urban Form, Transit Cooperative Research Program Report 16, Transportation Research Board, Washington D.C., August 1996.

Home/Work Patterns

Description

Implementation	
Hurdles:	Local & Public
Level:	Area
Sector:	Private
Locations:	All

Improvements to the transportation network without development strategies in place can often result in a cyclical process. The construction of a new facility or reconstruction of an existing facility to improve capacity increases accessibility to the area. This increase in accessibility leads to increased development and increased traffic demand. Without adequate development policy, strip development with closely spaced and poorly designed access creates numerous operational problems, resulting in increased congestion, delay, and accident potential. Further roadway improvements are then required to address the congestion developing as a result of the initial improvements. To avoid the unintended, but predictable, consequences it is necessary to change the traditional development scheme.

Target Market

Urban development strategies can seek to improve mobility, reduce vehicle travel, and reduce vehicle trips by promoting higher density development, mixed-use development, balanced development of housing in proximity to jobs to minimize long distance commutes, and incorporation of bicycle/pedestrian/transit friendly site designs into development plans. Mixed-use developments generally make walk/bicycle trips more feasible as housing, employment, and commercial centers are located in the same vicinity. Mixed-use development located within a five- to ten-minute walk of a transit facility can also support transit usage. Land-use plans could direct higher intensity development to locations well served by transit and provide access for pedestrians, bicyclists, and transit riders (1).

Benefits and Costs

Houston has recognized the benefits of targeting its development strategy. In 1992 the city implemented a Neighborhoods to Standard (NTS) program with the intent of stabilizing its older neighborhoods with an infusion of capital expenditures. The goal was to attract residents and businesses back to the inner city (2). The program focuses on improving the basic physical attributes of the neighborhood: upgrading water and wastewater service, overlaying asphalt on streets, maintaining roadside ditches, mowing right-of-ways, installing street lights and repairing traffic signs and signals.

With its initial success two complementary programs were added. The Parks and Recreation Department's Parks to Standard Program provides new jogging trails and playground equipment. The Department of Public Works and Engineering's Safe School Sidewalk Program constructs sidewalks adjacent to schools to allow children easier, safer access to schools. To date, approximately 112 of Houston's 600 neighborhoods have been completed (approximately 14 per year).

The results have been promising. In a select number of neighborhoods, property values have increased as much as 30% (3). Based on building permits and other records, the city estimates that approximately 5000 residents are returning annually to the older neighborhoods inside the

Loop, tax revenues have increased, crime is down and park attendance has increased. Houston funds the program through community development block grants, an expanded sales tax base through the city's Metropolitan Transit Authority and a series of bonds. City officials and residents view the related cost of the program relatively inexpensive given the higher cost of replacing existing infrastructure features. As a result of their efforts Houston earned the American City & County's 1996 Infrastructure Award.

A correlation exists between residential density and transit usage. The Denver Regional Transit District found that a minimum density of seven dwelling units per acre was necessary to support local bus routes operating at 30 minute headways. Transit usage was seen to triple with densities of 30 dwelling units per acre. At a density of 50 dwelling units per acre, transit usage exceeded automobile usage. Transit usage also increases significantly as employment density exceeds 50 employees per acre or in activity centers with more than 10,000 jobs (4).

A study and program known as Land Use-Transportation-Air Quality (LUTRAQ) was conducted in Washington County (suburban area of Portland, Oregon) in the early 1990s to assess the impact of urban design. Three development strategies that were seen to increase transit usage were: mixed-used development, development of sites near transit stations, and development of neighborhoods located on feeder bus lines (5). The LUTRAQ program provided for light rail, express bus service to activity centers, local feeder buses, bicycle and pedestrian improvements, and minor roadway improvements. In comparison with an alternative plan to accommodate growth solely through highway capacity increases, the LUTRAQ plan was estimated to reduce SOV work trips by approximately 22 percent; increase transit and non-motorized travel by 27 percent; reduce highway congestion by 18 percent; reduce vehicle hours of travel during the evening peak hour by 11 percent; reduce energy consumption by 8 percent; and reduce emissions (6 percent for hydrocarbons, 9 percent for nitrous oxides, and 6 percent in carbon monoxide) (6).

Implementation Issues

Programs like NTS and LUTRAQ require a partnership between the city and the community. The community provides an organizational liaison to facilitate communication with public officials and agrees to efforts such as hosting semi-monthly meetings. There are no public-sector implementation impediments present. The City of Houston, with the backing of neighborhood organizations, has begun to enforce building code violations. Private sector involvement is voluntary, but is particularly important in aspects such as redeveloping commercial areas.

There is also a significant role for these design elements and location decisions in the suburbs. While many of the studies and discussion have focused on the older neighborhoods, much of the growth will occur in areas outside these areas. If newer suburbs incorporate more of these principles, the transportation impact will be less. And if the already constructed areas change or redevelop, there are many retrofit possibilities that can improve the transportation situation without a significant amount of construction. The goal, in conceptual terms, would be to reduce the vehicle trips for some, but not all, of the person trips. Affecting those trips that could be made by other modes or at other times can reduce the peak impacts, while preserving the mobility and choice that travelers desire.

1. Harvey, G. Relation of Residential Density to VMT Per Resident: Oakland, Paper prepared for the Metropolitan Transportation Commission, Oakland, CA, 1990.

2. Neighborhoods to Standards, Mayor Bob Lanier's Transition Subcommittee, Houston, TX, June 1992.

3. Houston Neighborhoods Program Gets Top Honors, American City & Country, December, 1996.

4. Creating Livable Communities, Regional Transit District, Denver, CO, March 1996.

5. Making the Connection, A Summary of the LUTRAQ Project, 1000 Friends of Oregon, Portland, OR, February 1997.

6. An Evaluation of the Relationships Between Transit and Urban Form, Research Results Digest, Transportation Research Board, June 1995.

Assessing the Transportation Impacts

Implementation
Hurdles: Local & Public
Level: Area
Sector: Private
Locations: All

<u>*Description*</u>

Development strategies are used to characterize the spatial distribution and use of land. These patterns largely determine trip making patterns, volumes, and modal distributions. The wide availability of the automobile after World War I is largely responsible for changes in urban development patterns. Prior to the automobile, cities tended toward greater densities and less sprawl. The automobile provided higher travel speeds, convenience, and flexibility. The increase in mobility provided by the automobile contributed to an increase in separation of land use. The potential size of urban areas increased, while densities declined. As jobs and housing areas became further and further apart, average commute distances and travel times became longer and longer.

<u>*Target Market*</u>

This initiative is applicable with regard to any proposed development likely to generate transportation impacts. The transportation impact analysis can be made a part of any permitting procedure associated with development. In some areas, local officials require site designs of proposed developments to be analyzed specifically with respect to transit, pedestrian, and/or motor vehicle access. In addition, site design criteria may include elements such as office buildings located in close proximity to the street for easy pedestrian access (avoiding long walks across parking lots) or orienting building entrances towards parks, plazas, and pedestrian-oriented streets. Other design criteria that could be required include minimizing the walking distance between offices/homes and transit routes, small block sizes in business districts, sidewalks on one or both sides of the street, and bus stops with patron shelters. Street and intersection geometries can also be optimized for transit vehicles and on-street parking can be controlled in office parks to improve the competitive situation of carpools and transit.

<u>*Benefits and Costs*</u>

A study and program known as Land Use-Transportation-Air Quality (LUTRAQ) was conducted in Washington County (suburban area of Portland, Oregon) in the early 1990s to assess the impact of urban design. Three development strategies that were seen to increase transit usage were: mixed-used development, development of sites near transit stations, and development of neighborhoods located on feeder bus lines. The assessment of impacts included many of the analyses and evaluation measures that are needed to develop a full picture of the alternatives.

The LUTRAQ program provided for light rail, express bus service to activity centers, local feeder buses, bicycle and pedestrian improvements, and minor roadway improvements. In comparison with an alternative plan to accommodate growth solely through highway capacity increases, the LUTRAQ plan was estimated to reduce SOV work trips by approximately 22 percent; increase transit and non-motorized travel by 27 percent; reduce highway congestion by 18 percent; reduce vehicle hours of travel during the evening peak hour by 11 percent; reduce energy consumption by 8 percent; and reduce emissions (6 percent for hydrocarbons, 9 percent for nitrous oxides, and 6 percent in carbon monoxide) (<u>1</u>).

Implementation Issues

This initiative will require changes in the approach currently used to evaluate new developments. Local governments may need to adopt regulations that require transportation impact assessments regarding certain developments. The public sector, or the private sector as a part of an existing permitting process, can perform those assessments. There may be fees tied to the results, or incentives to reduce the impact on the transportation network during the most congested periods.

1. Making the Connection, A Summary of the LUTRAQ Project, 1000 Friends of Oregon, Parking Strategies. February 1997.

Parking Strategies

Description

Implementation
Hurdles: Public
Level: Area
Sector: Private
Locations: Businesses

A number of parking strategies have been conceived as potential means of reducing single occupant vehicle trips in congested activity centers and increasing transit and carpool ridership. In areas with high densities, parking fees are imposed and higher transit ridership than in lower density suburban areas where parking is typically free and transit ridership tends to be lower. The 1990 Nationwide Personal Transportation Study found that 87 percent of worktrips and 91 percent of all trips are made by automobile—parking issues are important (1).

Two strategies to increase carpool and transit usage aim to increase the price of parking through taxes based either on parking revenues or taxes based on the number of parking spaces provided regardless if a fee is charged. Both strategies could result in the cost of taxes being passed on to the consumer in the form of higher prices. Basing taxes on revenues would effect parking providers in high-density areas that realize revenue from parking. The impact of this strategy would vary depending on the level of transit service provided in affected areas and the amount of the tax. Too low of a tax would have little impact on modal shifts, while too high of a tax may cause only a short term modal shift to transit. But the high tax could, in the long term, encourage businesses to move to suburban areas where taxes would not apply, since parking is typically free. Taxes based on parking spaces would affect all business districts. However, implementation of such a tax would require new legislation in most places, unlike taxes based on revenue. A survey of 20 cities showed that ten cities impose taxes on parking revenue, but none of the cities imposed taxes on parking spaces (2).

Target Market

A strategy that can be used by employers that lease parking spaces and provide subsidized parking to employees is called cashing-out employer provided parking. Employers give employees the cash value of the parking benefit provided and employees are then free to use it however they want—for continued parking, for transit fares, etc. This strategy would primarily affect employers in the CBD, as that is where leased parking is typically located. This strategy is being implemented by individual employers in the Los Angeles area on a demonstration basis.

One set of strategies focuses on changes to zoning ordinances, by decreasing the minimum parking requirements, imposing maximum parking requirements, or issuing conditional use permits. Ordinances often specify minimum parking requirements to provide adequate parking during peak use. The result, however, is that an excess of parking often exists during non-peak periods. Reducing minimum parking requirements on developers would help bring parking supply closer to typical nonpeak needs. Another strategy is to impose parking maximums to limit the amount of parking provided by developers. Conditional use permits may be issued to allow a developer to provide less than the minimum parking requirements. The limitation of this strategy is that it would only affect new development or redevelopment – stable land use areas would not be influenced. Reducing minimum parking requirements has been implemented in Midtown Atlanta where the area is serviced by rail transit service.

Several transportation demand management strategies include satellite parking lots with shuttle service, preferential parking for carpoolers, and transit incentive programs. Satellite parking lots with shuttle service might be justified for a large employer or activity center where the cost of providing such a service is less than the cost associated with adding more on-site parking. Preferential parking involves employers providing spaces dedicated for carpool vehicles. In order to be effective, the spaces must be better than regular spaces with respect to location, security, price, or other amenities such as covered parking.

A strategy that seeks to improve the efficiency of parking operations and reduce parking related congestion is the implementation of advanced parking information systems. These systems provide drivers with real-time information on parking conditions at various parking facilities through on-street combination static/dynamic message signs. These systems direct motorists to facilities with available parking, reducing search time and unnecessary travel. Displays may be used to indicate the number of available spaces or whether the parking facility is open or full. The availability of parking spaces is determined through the use of vehicle detection systems that keep track of the number of vehicles entering and exiting the facility. Systems that may be used for vehicle detection include barrier contacts on entry/exit gates, inductive loops, ultrasonic, infra-red, microwave, laser, and machine vision sensor technologies. A telecommunications network is used to connect vehicle detection systems to a computer system, which is connected to dynamic message signs. Advanced parking information systems are common in European countries and Japan. Studies of these systems have shown decreases in illegal parking, decreases in on-street parking, and increases in off-street parking, decreases in search time, decreases in queue length and delay entering parking facilities, and more uniform use of off-street parking facilities.

Benefits and Costs

Parking incentives may be used by employers to encourage carpooling or vanpooling. Free or differential parking rates can be offered to high occupancy vehicles. An example of a parking incentive scheme is a schedule whereby an employer provides zero percent parking subsidy to employees in single occupant vehicles, 50 percent subsidy to two-person carpools, and 100 percent subsidy to carpools with three or more persons or vanpools. A study in the Washington, DC area showed a 20 to 40 percent increase in commuters that were willing to carpool where parking incentives were offered. A study of a Boston company incentive parking program showed a 34 percent increase in three person carpools when daily parking fees were eliminated for 3 person carpools. Incentive programs help employers maintain or reduce costs for leased parking or reduce the need for construction of additional parking spaces.

Implementation Issues

There are several implementation issues associated with parking strategies. If the strategy to be adopted is to assess parking taxes, the taxes (which would be passed on to consumers) must be high enough to cause commuters to consider switching transportation modes, while not high enough to cause businesses to move out of the area. Another public-sector strategy is to impose development standards that limit the number of parking spaces. Still another strategy might include preferential parking rates or special allocated spaces for vanpoolers or those ridesharing. All of the above-mentioned strategies would require policy/legislative action by the appropriate public body.

1. Vincent, M., Keyes, M., and Reed, M. NPTS Urban Travel Patterns: 1990 National Personal Transportation Survey, U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, 1994.

2. Bianco, M., Dueker, K., and Strathman, J. Parking Strategies to Attract Auto Users to Transit, Proceedings of the 77th Annual Meeting of the Transportation Research Board, Washington, D.C., 1998.

Bicycle and Pedestrian Elements

Implementation
Hurdles: Public
Level: Target Market
Sector: Public
Locations: Routes

<u>Description</u>

Urban designs should include components such as bicycle and pedestrian facilities, policies or elements that promote bicycling and walking. Bicycle and pedestrian facilities provide a non-motorized alternative to vehicular trips. These forms of transport have historically received little consideration by the transportation community; however, they are being increasingly seen as an important part of an overall program to reduce vehicle trips. Bike and walk trips serve three primary trip purposes: as a means to make a complete origin/destination trip, as a means to connect to other modes such as public transit for longer trips, and for circulation within an activity center. The costs associated with bicycle/walking facilities (trails, lanes, storage facilities) are relatively minor in comparison with facilities for other modes of travel. In addition to providing safe and convenient access to bike/walk facilities (secure bicycle storage, marked/lighted sidewalks), other strategies such as the provision of shower facilities, guaranteed ride home program for emergencies, etc. can support and encourage bike/walk transport.

<u>Target Market</u>

While bicycle and pedestrian facilities are commonly provided as parallel facilities along roadways, they may also be used to provide access across barriers where roadways do not. Examples include openings or paths to connect neighborhoods to other neighborhoods, cul-de-sacs to perimeter neighborhood streets, or neighborhoods to facilities along drainage channels or greenbelts, etc. These strategies may allow pedestrian and bicycle trips to be accomplished via much shorter distance trips than would be available by following existing roadways. These non-roadway connections make bicycle/walking trips more feasible and thus encourage non-motorized transport. Trees and landscaping can make these areas more accommodating in Houston's summer months, and lighting and open designs can increase the feeling of safety for nighttime use.

While bicycles do not make up a significant portion of total travel, they do effect operations on roadways and sidewalks. Bicyclists traveling on sidewalks interfere with pedestrians, while bicyclists on roadways are affected by cross section design, facility type, and facility operating speed. Bicycle accommodation on roadways can be categorized in one of five manners.

- With a shared lane, bicyclists are accommodated within a standard width traffic lane.
- With a wide outside lane, bicyclists are accommodated in a wider than normal outside lane, typically 14 foot wide or greater.
- Bicycle lanes officially designate a portion of the roadway cross-section using pavement markings and signing for exclusive use.
- Roadway shoulders may be used to accommodate bicyclists.

- A separate facility may be provided to physically separate bicyclists from the roadway traffic.

An education component is an important part of a bicycle facility improvement program. For bicycle facilities to be perceived as successful, they should attract bicycle riders, improve travel options, and not adversely impact vehicle congestion levels. In the early stages, bicycle volume may be low as travelers get accustomed to the idea and the system is developed as unconnected pieces. In later stages, bicycle volume may remain low relative to some vehicle user expectations. It is important to communicate what “success” looks like and emphasize the relatively small amount of road space dedicated to cycling. Plans that use separate paths and minor streets as the bicycle “backbone” can assist in the “share the road” concept between vehicles and bicycles.

Examples of bicycle facility development policies include using bikeways to provide links to serve transportation purposes, establishing a signed route network on streets suitable for bicycle use, and accommodating bicyclists on new facilities in bicycle or wide outer lanes. Off-street facilities on separate rights-of-way or separate but parallel bicycle and pedestrian off-road facilities may also be provided to reduce vehicle conflicts. Street construction using bicycle friendly elements, such as bicycle safe drainage inlet grates and smooth and swept street surfaces, also encourage bicycle use. Some agencies review accident records to determine if high accident locations can be retrofitted to improve safety,

Pedestrian facilities include sidewalks and street crossings. Sidewalks of four to six feet in width are considered appropriate in most cases with five feet being common. Widths of six feet or more may be justified on high speed/volume roadways or to handle high pedestrian volumes that occur in locations such as schools, libraries, parks, transportation terminals, high-rise buildings, event centers, parking facilities, and pedestrian overpasses. Pedestrian overpasses may be used in locations to safely handle high pedestrian volumes in the vicinity of high-speed roadways. Potential locations include near schools on major arterials, over freeways, and near park/recreational areas. The distance between the edge of the sidewalk and the edge of the roadway is referred to as a setback. Setbacks of a couple of feet are common to allow for placement of utilities, fences, traffic control devices, parking meters, mailboxes, provide a safety margin for children, and to reduce splashing of pedestrians. Larger setbacks of five to ten feet are more desirable for high volume/speed roadways to minimize pedestrian-vehicle conflicts. In locations where no setback is available, wider sidewalks of six to eight feet are preferable.

Sidewalk policies may include requirements that sidewalks be included in the design of new streets as well as street reconstruction or retrofitting sidewalks on one side or both sides of the roadway. Achieving “critical mass” necessary to create a walkable area usually includes providing continuity, safe roadway crossings and sidewalks connecting to transit stops and other major pedestrian trip generators. Curb cuts should be designed to meet or exceed the Americans with Disabilities Act and illumination may be provided for pedestrians walking at night.

Implementation Issues

Design standards for development, roadways, intersections, transit stops, and sidewalks that increase the number of bicycles and pedestrians are all public-sector policy functions. There are no implementation issues associated with such an initiative other than insuring those policies are in place and enforced. The cities and counties in the Houston region are pursuing a variety of bicycle treatment planning activities.