

appendix g:
south texas medical
center bicycle
master plan

South Texas Medical Center BICYCLE MASTER PLAN

Submitted to:

CITY OF SAN ANTONIO

Submitted by:

MEDICAL CENTER ALLIANCE
And
SAN ANTONIO MEDICAL FOUNDATION

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EXECUTIVE SUMMARY

The South Texas Medical Center (STMC), through the Medical Center Alliance (MCA), has been funding improvements to its physical infrastructure and working with the City of San Antonio to get them constructed since 2000. Approximately \$50mm has been invested by the MCA and COSA to date. The improvements are consistent with the recommendations in the 2000 STMC Master Plan and, by mutual agreement between the MCA and COSA, all improvements are reviewed and approved by both entities, in a spirit of joint decision-making. These constructed improvements deal largely with increasing both vehicular traffic efficiency and pedestrian safety within the medical center. The improvements are ongoing.

The Medical Center Alliance and the San Antonio Medical Foundation (SAMF) understand that the City of San Antonio – in conjunction with the Metropolitan Planning Organization (MPO) - is considering adding dedicated bicycle capability to three of the medical center’s primary roadways – Medical Drive, Wurzbach Road, and Floyd Curl Drive.

Accordingly, the MCA and SAMF have commissioned this study for introducing bicycle traffic to South Texas Medical Center. The study takes into account these unique factors regarding traffic at the STMC:

- 12 of its 15 major intersections are configured with right-hand turn lanes for vehicular traffic. Right-hand turn lanes present major safety considerations for vehicular/bike traffic.
- Many of the vehicular visitors to the STMC are elderly and/or seeking medical treatment. These people are not familiar with streets and intersections in this area and their attention is focused on finding an unfamiliar location.
- Approximately 25% of visitors are from out of town and not familiar with the STMC
- Width of the streets in the STMC is minimum
- It is anticipated that Bus Rapid Transit (with longer vehicles) will use Medical Drive as a major route. Service is planned beginning in 2012

With these facts taken into account, the following are details of the plan. It:

- relies upon an analysis of traffic data and application of traffic analysis with respect to potential on-street routes
- includes evaluation of all possible bicycle routing opportunities within the medical center



**SOUTH TEXAS MEDICAL CENTER
BIKE ROUTE STUDY**

**AERIAL
PHOTOGRAPH**

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- respects Medical, Wurzbach, and Floyd Curl as the medical center's most heavily-traveled streets
- emphasizes the unique special characteristics of the medical center in its formulation
- embraces the concept of connectivity, that is, multiple routes and linkages
- places dedicated bicycle routes on streets and off-street areas best-suited for them
- represents the right thing to do with respect to the ongoing construction of traffic improvements within the medical center
- satisfies the City's desire to provide bicycle routes within the medical center

The Plan proposes combining a variety of routes – both on-street and off-street - to create a network of linked bicycle paths. Among the features of the plan:

- assumed primary traffic generators and destinations within the medical center were taken into account when formulating the plan
- on-street routes are proposed only on those roadways best-suited to them
- off-street routes are proposed to separate bicycles from vehicular traffic
- off-street routes are proposed that take advantage of linear open space along drainage easements within the medical center
- proposed off-street routes also include consideration of key linkages across private property
- connectivity - a broad network of interconnected bicycle routes - is achieved
- a total of approximately 12 miles of linked bicycle routes may be achieved with this plan

A comprehensive map of the proposed network of bicycle paths may be found on Page 22 and is elaborated upon below in the body of this report.

The MCA/SAMF are committed to working closely with the City of San Antonio with regard to improvements in the South Texas Medical Center, evidenced by years of cooperative, jointly funded, public/private infrastructure improvement projects. They are also committed to helping to achieve the City's vision for bicycle traffic in the medical center, while respecting the improvements already in place and the safety of all of its tenants and visitors. Accordingly, this Plan is presented to the City of San Antonio in a positive spirit of cooperation. The Medical Center Alliance and the San Antonio Medical Foundation look forward to the City's adoption of the Plan, and to its ultimate implementation.

INTRODUCTION

Spurred by the publication of the *South Texas Medical Center Master Plan* in September 2000, the medical center – through the efforts of the Medical Center Alliance in concert with the City of San Antonio – has been undertaking improvements to its physical infrastructure. These improvements have been occurring continuously ever since. As of this writing, Phase 7 of improvements is under construction, while Phase 8 is scheduled to go to bid in the Fall of 2011.

The improvements are predicated on several goals:

- To improve vehicular traffic efficiency within the medical center
- To increase pedestrian safety within the medical center
- To improve wayfinding within the medical center

Since 2000, the following roadways and intersections have been improved:

Medical Drive / Ewing Halsell
Medical Drive / Floyd Curl Drive
Floyd Curl Drive / Louis Pasteur Drive
Medical Drive Mid-Block
Medical Drive / Wurzbach Road
Wurzbach Road / Floyd Curl Drive
Wurzbach Road / Merton Minter Drive
Wurzbach Road / Ewing Halsell
Ewing Halsell / Charles Katz and Sid Katz
Charles Katz / Floyd Curl Drive
Floyd Curl Drive / Hamilton Wolfe
Floyd Curl Drive at Huebner Road
Medical Drive / Babcock Road (currently under construction)
Ewing Halsell / Hamilton Wolfe (currently under design)

Almost all of the roadway and intersection improvements feature the addition of new right-turn lanes to improve traffic flow, and associated pedestrian sidewalks and other amenities. New wayfinding signage improves the ability of visitors to find their intended destinations. The projects do not include provision of separate bicycle facilities.

The City of San Antonio – in conjunction with the Metropolitan Planning organization - has expressed a desire to include the medical center in its planning for expansion of bicycle capability throughout the city. The routes proposed by COSA/MPO would add bicycle traffic to three existing roadways in the medical center: Medical Drive, Wurzbach Road, and Floyd Curl Drive. Coincidentally, these roads exhibit the highest volumes of traffic – and highest speed limits - of any of the medical center's roads, and their existing widths preclude simply adding bicycle lanes by re-striping, due to the impact on vehicular capacity.

The Medical Center Alliance and San Antonio Medical Foundation are not opposed to adding viable bicycle capability to the mix of transportation alternatives available to tenants and visitors in the South Texas Medical Center, but believe that the three identified roadways do not represent the best alternative for routes. This study was commissioned jointly by the MCA and SAMF in an effort to blend bicycle traffic into the mix of travel options in the medical center while respecting and maintaining the integrity of its re-developed infrastructure.

PROCESS

This Bicycle Master Plan derived from a process that gathered and evaluated data, and identified and weighed all possible alternatives. The final route selections are based on a combination of assessment criteria including available room for adding bike lanes; possible required acquisition of ROW; existing local conditions; adjacent land uses; traffic safety; impact on current traffic patterns and volumes; and connectivity.

DATA COLLECTION

The collected data helped to provide criteria by which the efficacy of proposed routes could be evaluated. Some of the data supporting the conclusions of this Bicycle Master Plan may be found in the Appendix. Specific data collected included:

- Traffic counts on potential “road diet” candidate streets. Ewing Halsell, Louis Pasteur, Floyd Curl Drive, Medical Drive, Hamilton Wolfe, and Wurzbach Road were evaluated for their ability to absorb reduced traffic lanes in favor of using part of the existing roadway for striping dedicated bike lanes.
- MPO Bicycle Corridors Map. This map depicts proposed bicycle routes throughout the city, and on Medical, Wurzbach, and Floyd Curl through the medical center. It also proposes bicycle routes on STMC’s peripheral streets – Fredericksburg, Huebner, and Babcock. All of these routes assume on-street bicycle travel.
- Street ROW data. Streets were evaluated on their ability to absorb bike lanes within their respective ROWs, or whether additional ROW would have to be acquired.
- Easement data. Drainage channels within the medical center were evaluated on their ability to accommodate bike routes along the tops of banks and whether additional easement width would have to be requested.

DEVELOPMENT OF ALTERNATIVES

Logical origins and destinations of bicycle traffic were identified. Possible route selections for linking these together were explored. On-the-ground verification of physical opportunities and constraints was conducted. All possible bike routes were mapped.

ASSESSMENT OF ALTERNATIVES

Without assigning any weight or priority to any given route, all of the mapped routes were evaluated against the assessment criteria. Combinations of alternate routes were assessed to provide the most comprehensive coverage, while respecting the assessment criteria.

FINAL ALTERNATIVE

The final master plan was created by combining the options that best responded to the assessment criteria and provided the optimum network of interconnected routes.

DEVELOPMENT AND ASSESSMENT OF ALTERNATIVES

In order to understand the need for bicycle travel within the medical center, possible origins and destinations were first considered. Generally speaking, the majority of bicycle travel within the medical center was seen as originating from the residential areas north of Hamilton Wolfe. The proposed VIA bus facility on Babcock at Medical was also viewed as a future contributing source for originating bicycle traffic. Logical destinations were deemed to be the institutions south of Hamilton Wolfe. These locations are all delineated on the preceding Generators and Destinations map. It was also deemed important to create as many connections to the periphery of the medical center - to Fredericksburg Road, for example - as possible, to extend the concept of connectivity.

From these assumptions, it was determined that no single linear route - for example, on Floyd Curl Drive - would provide sufficient connections between multiple origin and destination locations. This, in turn, suggested that the medical center would be better served by an interconnected network of routes, dispersed more evenly throughout the medical center's geography. It was not possible to estimate the potential volume of bicycle traffic, so all origins, destinations, and potential routes were treated with equal emphasis.

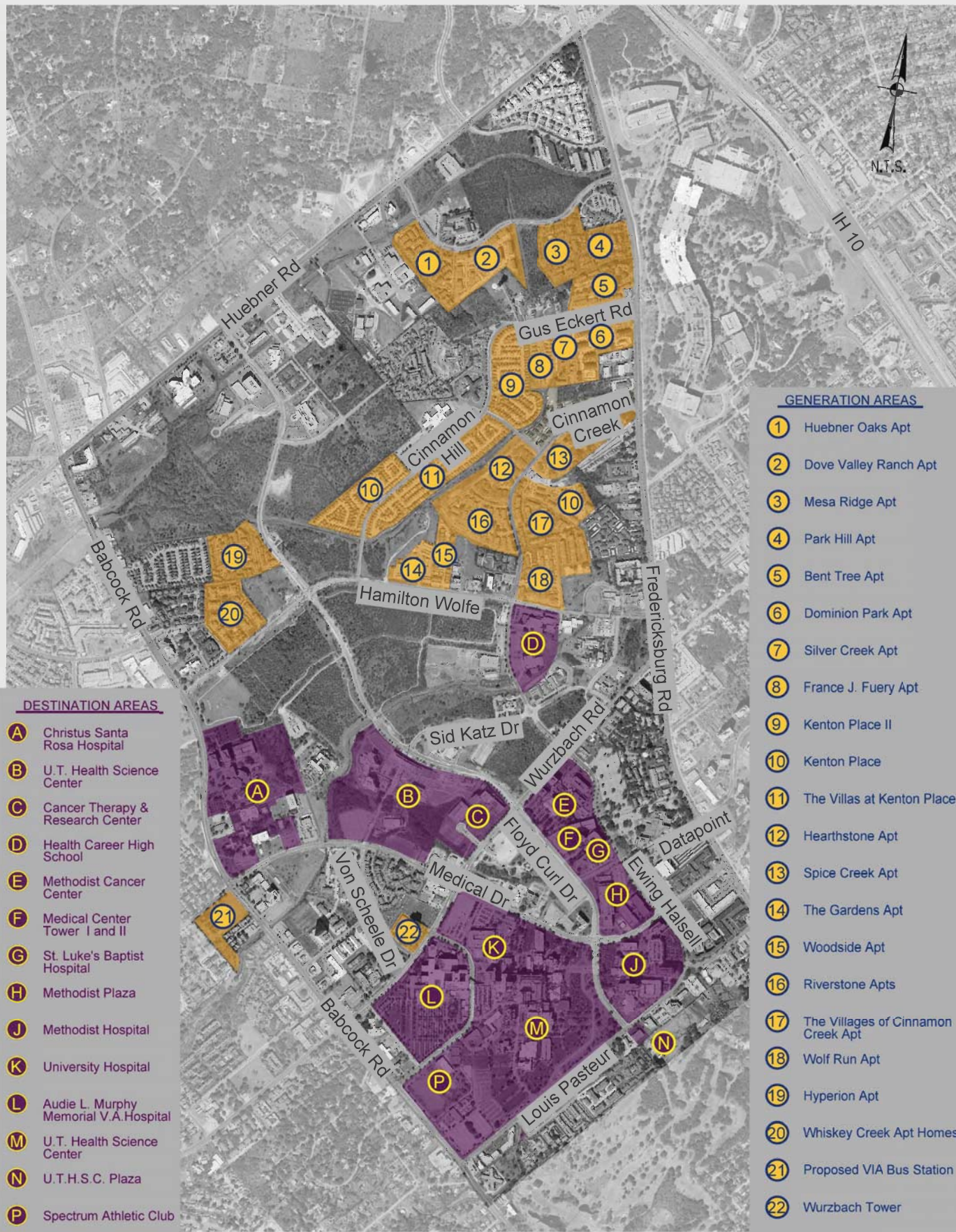
First, the on-street bike routes originally proposed by COSA/MPO were assessed. Then, all possible routes and bike path configurations - including the three originally-proposed on-street routes - were studied, both by mapping and on-site observations. Each alternative was weighed against the assessment criteria:

- traffic data analysis
- available room for adding bike lanes
- possible required acquisition of ROW
- existing local conditions
- adjacent land uses
- traffic safety
- impact on existing traffic patterns and volumes
- connectivity

The potential routes - and combinations of routes - were weighed on their own merits and either accepted or discarded. The assessments are summarized immediately below.

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- DESTINATION AREAS**
- A** Christus Santa Rosa Hospital
 - B** U.T. Health Science Center
 - C** Cancer Therapy & Research Center
 - D** Health Career High School
 - E** Methodist Cancer Center
 - F** Medical Center Tower I and II
 - G** St. Luke's Baptist Hospital
 - H** Methodist Plaza
 - J** Methodist Hospital
 - K** University Hospital
 - L** Audie L. Murphy Memorial V.A. Hospital
 - M** U.T. Health Science Center
 - N** U.T.H.S.C. Plaza
 - P** Spectrum Athletic Club

- GENERATION AREAS**
- 1** Huebner Oaks Apt
 - 2** Dove Valley Ranch Apt
 - 3** Mesa Ridge Apt
 - 4** Park Hill Apt
 - 5** Bent Tree Apt
 - 6** Dominion Park Apt
 - 7** Silver Creek Apt
 - 8** France J. Fuery Apt
 - 9** Kenton Place II
 - 10** Kenton Place
 - 11** The Villas at Kenton Place
 - 12** Hearthstone Apt
 - 13** Spice Creek Apt
 - 14** The Gardens Apt
 - 15** Woodside Apt
 - 16** Riverstone Apts
 - 17** The Villages of Cinnamon Creek Apt
 - 18** Wolf Run Apt
 - 19** Hyperion Apt
 - 20** Whiskey Creek Apt Homes
 - 21** Proposed VIA Bus Station
 - 22** Wurzbach Tower

SOUTH TEXAS MEDICAL CENTER
BIKE ROUTE STUDY

GENERATORS
AND
DESTINATIONS

STMC BIKE PLAN PROPOSED BY CITY OF SAN ANTONIO / METROPOLITAN PLANNING ORGANIZATION

Adding on-street bicycle traffic to Medical, Floyd Curl, and Wurzbach – as proposed by COAS/MPO – was studied to determine its efficacy. After evaluating this option thoroughly, it was determined that on-street bicycle traffic on these three roadways is not feasible from both a traffic efficiency and bicyclist safety perspective, and therefore not recommended for the medical center.

Medical Drive and Wurzbach Road: Taken together, these streets are not considered good candidates for on-street bicycling due to similar safety concerns manifested by each. Both are high-volume streets with no room between the existing curbs for a dedicated bike lane. Widening these streets would be prohibitively expensive due to ROW acquisition, utility relocations, and site retrofitting costs. Neither street is a candidate for road diet restriping due to the high volume of traffic each accommodates. Bicycle traffic on these streets remains possible – but only at the bicyclist’s risk – but is not recommended here.

Floyd Curl Drive: While large stretches of land along Floyd Curl remain undeveloped (and thus could more easily accommodate ROW expansion) traffic moves at such a high rate of speed here that on-street bicycle traffic is not recommended. Road diet is also not a viable option, because Floyd Curl serves a high volume of traffic.

Possible modifications of the roadway cross-sections on these three streets to accommodate bicycle traffic were evaluated using the *Synchro Version 7* traffic analysis tool. Two options were tested: (a) addition of a dedicated bike lane with concomitant reduction in widths of vehicular travel lanes, and (b) reduction in number of vehicular travel lanes (“road diet”) and addition of a dedicated bike lane. The results of the traffic modeling showed significant degradation in level of service and increased traffic travel times and congestion if either was adopted. (Refer to “Analysis of On-Street Bicycle Routes” in the Appendix for the full study.)

Adding dedicated bicycle capability to three of the medical center’s primary roadways – Medical Drive, Wurzbach Road, and Floyd Curl Drive - would:

- impact the three most heavily-traveled roadways in the medical center
- introduce an unacceptable level of risk for bicycle riders on those streets
- provide only for three linear bike routes through the medical center that do not directly serve identified potential bike travel Generators and Destinations
- slow traffic travel times through the medical center
- increase traffic congestion within the medical center
- increase the degree of difficulty of emergency vehicle movement on those three roadways

- compromise already-constructed roadway improvements in the medical center

Degradation in traffic level of service is directly contradictory to the intent of the constructed traffic infrastructure improvements accomplished over the past decade and is not recommended in the medical center.

STMC BIKE PLAN RECOMMENDED BY MEDICAL CENTER ALLIANCE / SAN ANTONIO MEDICAL FOUNDATION

After identifying and evaluating all of the possible routes and configurations of routes, the alternatives discussed below - taken together – will provide the most effective scenario for accommodating bicycle traffic within the medical center, and minimize or eliminate some of the problems associated with the COSA/MPO plan. In order to develop the largest number of interconnected options, medical center bicycle routes are envisioned as taking one of three possible formats:

- on-street
- off-street, but within the street ROW
- off-street beyond the street ROW

In combination, these configurations will yield the highest level of connectivity, while avoiding co-mingling of bicycle and vehicular traffic on Medical, Floyd Curl, and Wurzbach.

ON-STREET ROUTES

On-street routes would share roadway space with vehicles; these routes are delineated by red lines on the preceding map. On-street routes will be created by one of three actions:

- **Road Diet.** Road diet means reducing the number of vehicular travel lanes in an existing roadway (usually from 4 lanes to 2, with a shared middle turn lane) and restriping the pavement to create a 5-foot bike lane on each side of the road. Adding bike lanes to roads thus designated would not require acquisition of additional ROW. The proposed Ewing Halsell bike route is an example of this option.
- **Elimination of on-street parking.** The bike lane would be striped and located where parallel parking currently exists; existing vehicular travel lanes would remain unaffected. The proposed Von Scheele Drive route would be achieved by this option.
- **Signage.** Signage would alert all users to the presence of bicycles. No striped designated bike lane would be present. The proposed route on Fawn Meadow is an example of this option.

By utilizing one of the three actions, on-street bike lane routes are considered feasible on the following streets:

- **Ewing Halsell / Cinnamon Creek.** Due to its relatively low traffic volume, Ewing Halsell is conducive to a “road diet” reconfiguration, allowing establishment of a dedicated bike lane between the existing curbs in each direction. Although this would undoubtedly result in a reduction in level of service for vehicular traffic, this was deemed to be within acceptable limits in the interest of increasing connectivity for bicyclists. The Ewing Halsell route would extend from its intersection with Louis Pasteur to its intersection with Hamilton Wolfe. It would extend beyond Hamilton Wolfe through a residential area, utilizing Cinnamon Creek, allowing bike traffic to reach all the way to Fredericksburg Road.
- **Cinnamon Hill / Gus Eckert.** A parallel route to the one above through the residential subdivision would utilize Cinnamon Hill and Gus Eckert to connect Hamilton Wolfe to Fredericksburg. This would extend the influence of bicycle-friendly routes within the bigger boundary of the medical center, as well as providing service to one of the primary generators of bicycle use. Signage would alert all users to the possible presence of bicycles here. At the City’s option, a dedicated, striped bike lane could be added to this street.
- **Charles Katz and Sid Katz.** These two streets are essentially continuous. A bike route would be established by removing on-street parking from Sid Katz (and adding signage prohibiting it); Charles Katz is already designated for no on-street parking. The streets can then be striped for bike lanes. This would allow on-street bicycle traffic from Wurzbach to Floyd Curl (and thence across into the UTHSC Greehey Campus, utilizing a proposed private access route).

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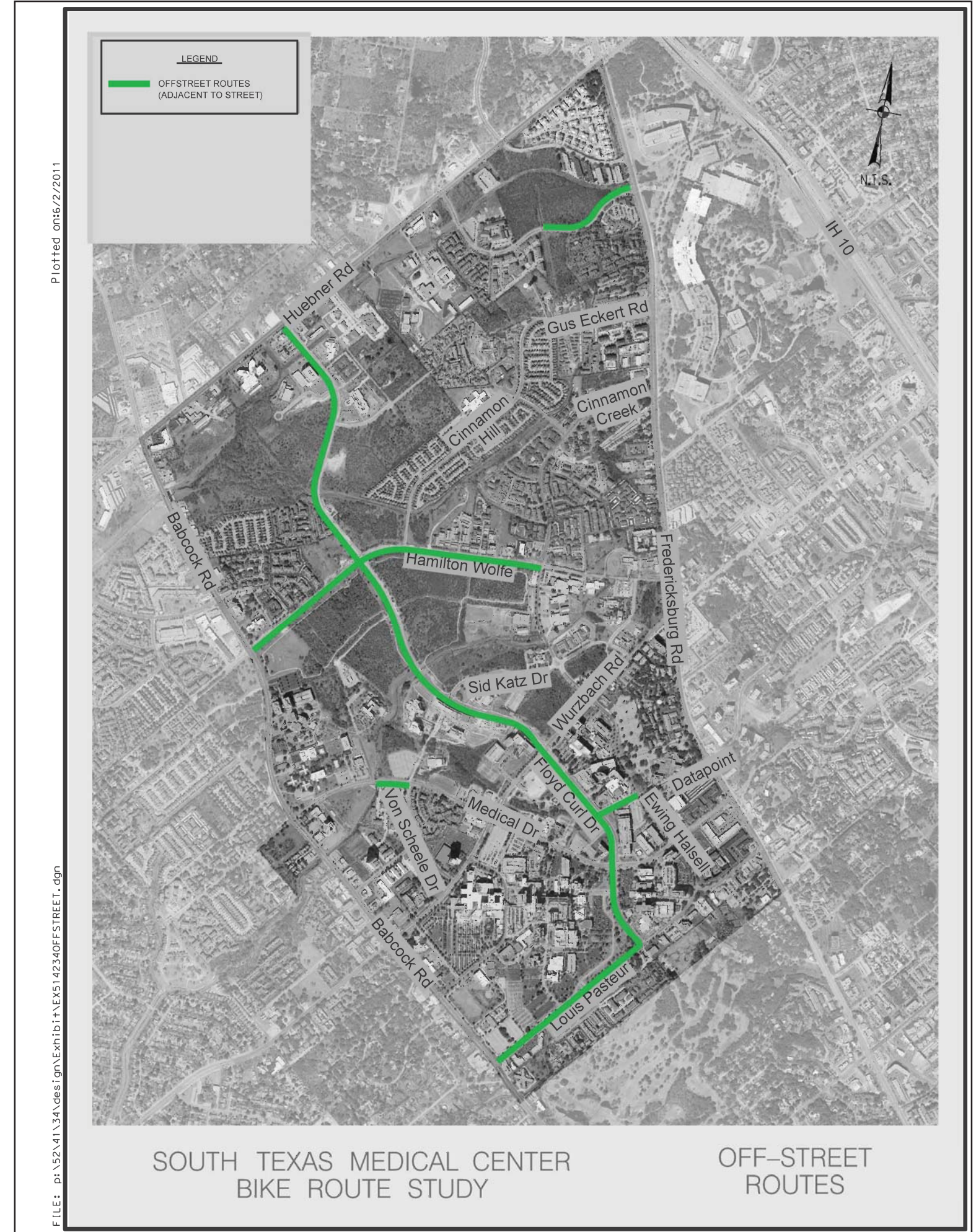
SOUTH TEXAS MEDICAL CENTER
BIKE ROUTE STUDY

ON-STREET
ROUTES

South Texas Medical Center Bicycle Master Plan

- Tom Slick. A bike route can be established here by prohibiting on-street parking and striping for bicycle use.
- Von Scheele Drive. Dedicated bike lanes can be established on this short street – connecting the UTHSC Greehey Campus with Wurzbach – by eliminating the existing on-street parking there. If on-street parking remains, signage would be added to alert drivers to the presence of bicycle traffic.
- Fawn Meadow. A minor route can be achieved here by adding signage announcing a bicycle presence on Fawn Meadow. This would connect Floyd Curl with a drainage easement route via a private access route.

Taken together, the proposed on-street routes would comprise approximately 3 miles of bike travel lane.

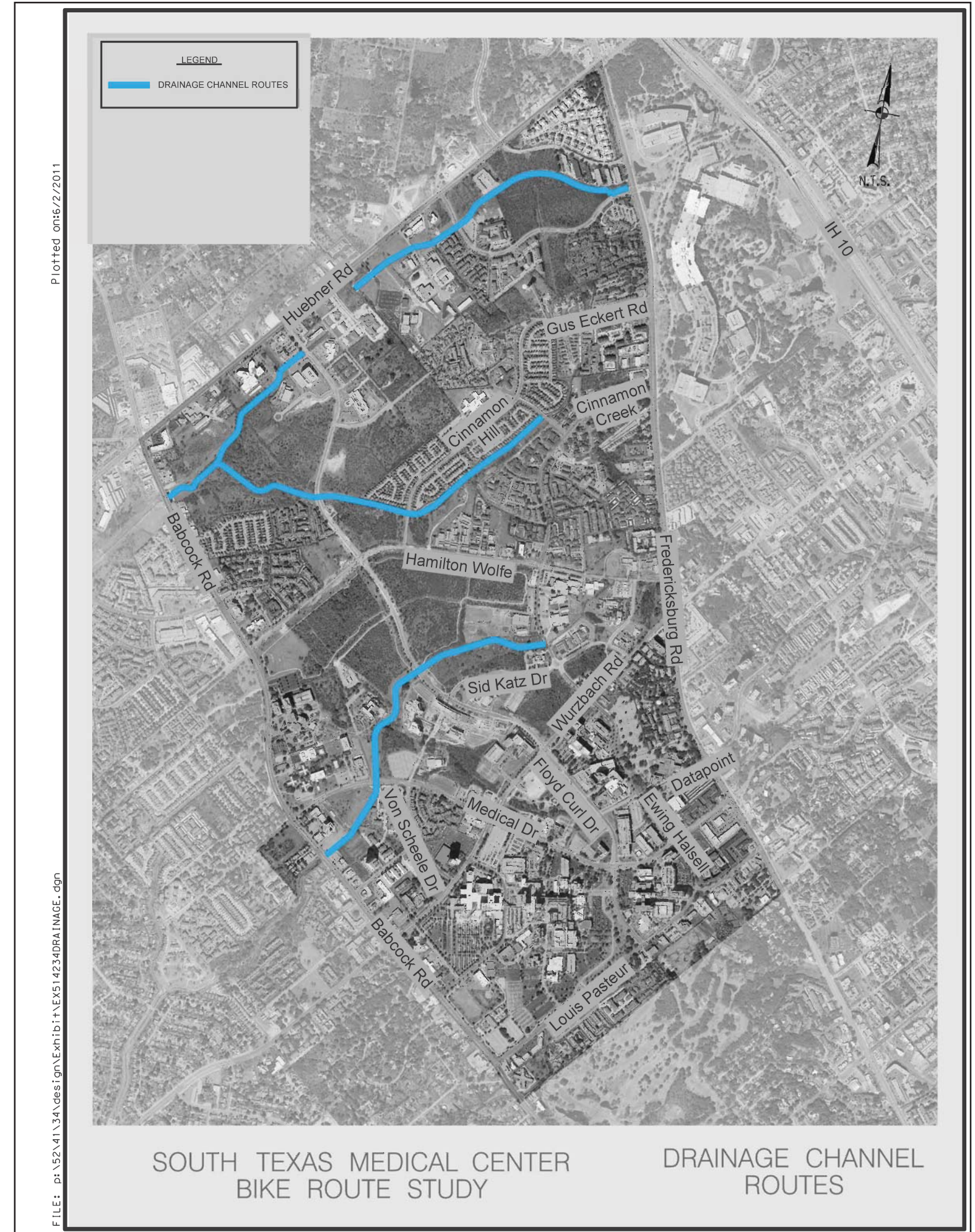


OFF-STREET ROUTES (ADJACENT TO STREET)

Off-street routes would be developed behind the curb by either developing a shared use bike path/sidewalk configuration within the existing ROW, or by adding bike lanes beyond existing ROW, requiring acquisition of additional ROW. The latter option is preferred to (1) minimize pedestrian/bicyclist conflicts and (2) avoid potential interference from existing conditions, such as retaining walls, utilities, or parking lots. The off-street routes would generally run parallel to existing roadways; the bike path would be established in the ROW or immediately adjacent to it. Users of off-street routes would be required to cross existing roadways at signaled pedestrian crossings (at Floyd Curl and Wurzbach, for example.) Proposed off-street routes are delineated by green lines on the preceding map, totaling approximately 4 miles of bike lane.

Off-street routes are proposed for the following streets:

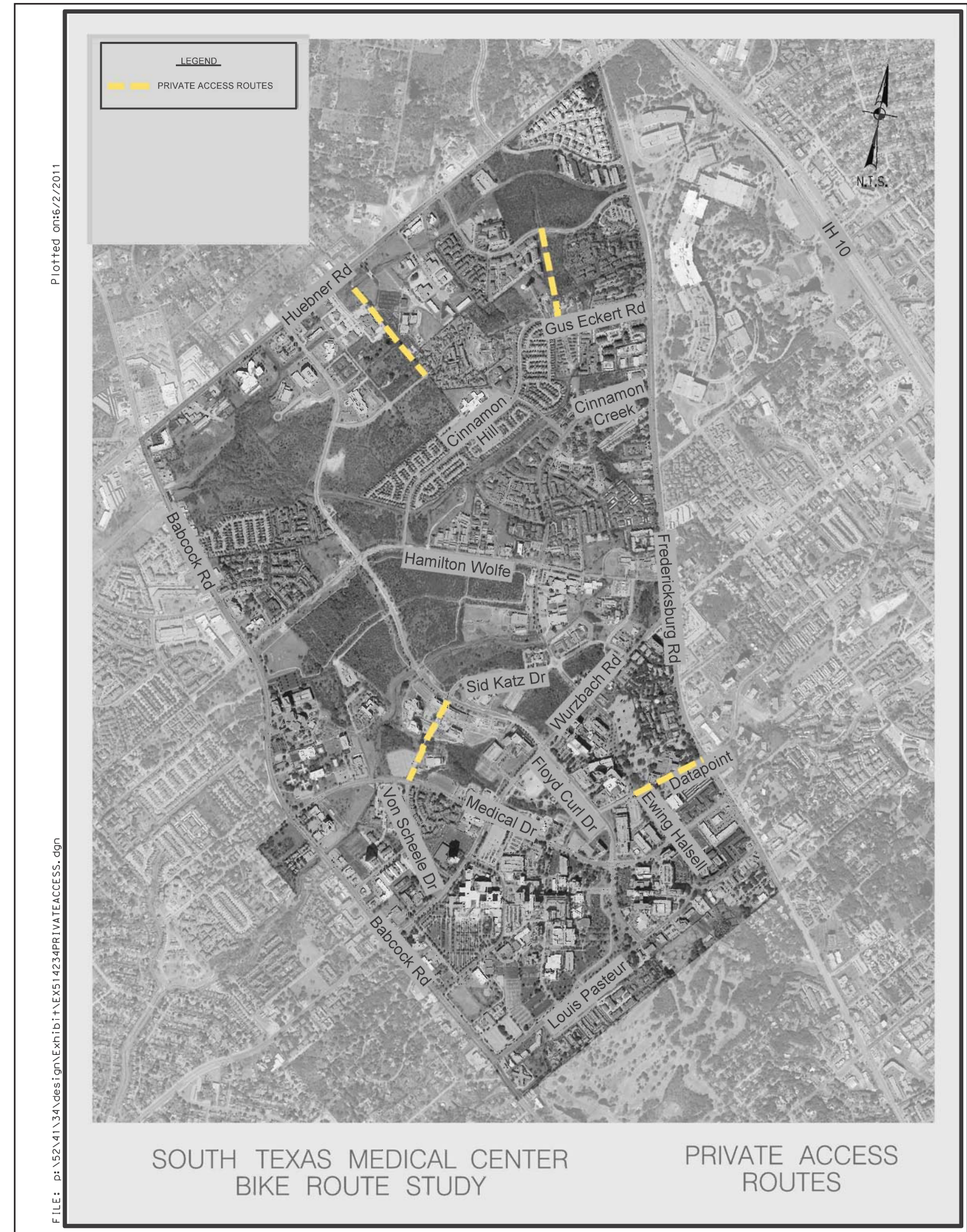
- Floyd Curl Drive. The longest continuous off-street route could be achieved along Floyd Curl Drive. The bike lane would be established along the west side of Floyd Curl for its entire length from Louis Pasteur to Huebner Road. This route would require the acquisition of additional ROW.
- Hamilton Wolfe. An off-street route is feasible along the south side of this street from Babcock Road to Ewing Halsell. Additional ROW would have to be acquired to accomplish this route.
- Louis Pasteur. An off-street route is feasible along the north side of this street from Babcock Road to its intersection with Floyd Curl Drive (from this point on, the route would become the on-street Ewing Halsell route). Additional ROW would have to be acquired.
- USAA Boulevard. This relatively short route would be constructed on the north side of the roadway and would connect Fredericksburg Road to a private access route, and thence to Gus Eckert. This route would require acquisition of additional ROW.



OFF-STREET ROUTES (UTILIZING DRAINAGE CHANNELS)

These off-street routes outside of street ROW would take advantage of found open space associated with drainage easements to develop bicycle routes. A series of drainage channels runs through portions of the medical center, between properties, and connecting periodically with streets, offering opportunity for establishment of off-street paved bike paths. Bike paths here would be free of potential conflict with vehicular traffic along their length. Where they engage streets at signaled intersections, bicyclists would be required to observe rules of traffic to cross streets safely, or to merge with another bike lane where available. These potential off-street routes (blue in color on the preceding map) associated with drainage channels would comprise approximately 4 miles of potential bike lane. Access easements would have to be negotiated with the property owner(s) in order to allow for establishment of bike paths. The drainage channel routes are recommended to increase connectivity. Bike paths could be established along each of three existing drainage channels:

- Northernmost channel parallel to Huebner Road
- Branch from northernmost channel into Cinnamon Hill subdivision
- Mid-STMC channel from Babcock Road to Ewing Halsell



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OFF-STREET ROUTES (UTILIZING PRIVATE ACCESS ROUTES)

These routes appear as dashed yellow lines on the preceding map and represent opportunities for links between bike paths that could occur across open space on private property. Approximately 1 mile of bike route may be achieved by this option. Physical observations confirm that there is sufficient space for a bike path, but the City would need to negotiate access agreements with the individual property owners. The private access routes are included here as a recommendation in the interest of increasing connectivity. Potential private access routes include:

- Between Fawn Meadow and Huebner Road drainage channel
- Between Gus Eckert Road and USAA Boulevard
- Between Medical Drive and Floyd Curl Drive, through UTHSC property
- Between Fredericksburg Road and Ewing Halsell, through Methodist Healthcare Systems property

SUMMARY

To summarize the STMC Bicycle Master Plan:

On-street routes are proposed on:

- Ewing Halsell / Cinnamon Creek
- Cinnamon Hill / Gus Eckert
- Charles Katz and Sid Katz
- Tom Slick
- Von Scheele Drive
- Fawn Meadow

Off-street routes (adjacent to street) are proposed on:

- Floyd Curl Drive
- Hamilton Wolfe
- Louis Pasteur
- USAA Boulevard

Off-street routes (utilizing drainage channels) are proposed at:

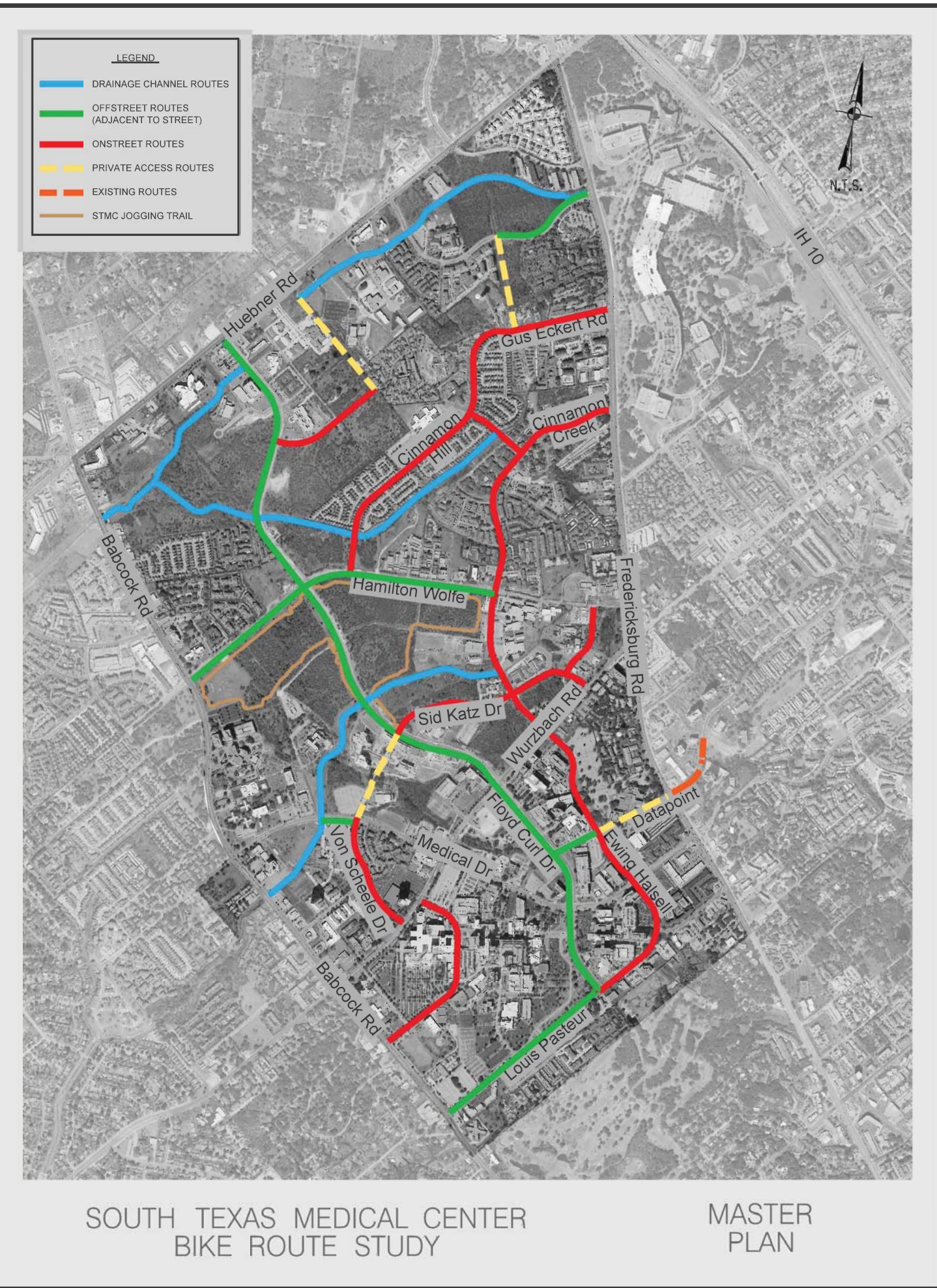
- Northernmost channel parallel to Huebner Road
- Branch from northernmost channel into Cinnamon Hill subdivision
- Mid-STMC channel from Babcock Road to Ewing Halsell

Off-street routes (utilizing private access routes) are proposed at:

- Between Fawn Meadow and Huebner Road drainage channel
- Between Gus Eckert Road and USAA Boulevard
- Between Medical Drive and Floyd Curl Drive, through UTHSC property
- Between Fredericksburg Road and Ewing Halsell, through Methodist Healthcare Systems property

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BICYCLE MASTER PLAN

The recommended STMC Bicycle Master Plan is inclusive of all of the recommended alternate routes discussed above, yielding a total of approximately 12 miles of interconnected routes. The Plan, delineated graphically by the preceding map, would:

- address the COSA/MPO interest in extending bicycle routes through the medical center
- afford bicyclists a broad network of interconnected routes within the medical center
- avoid conflicts with vehicular traffic on STMC's more heavily-traveled roadways
- connect the major generators and destinations of bicycle traffic within the medical center
- complement the City's long-range goal of increased bicycle capability throughout the metropolitan area

The Plan – as currently configured - represents the best interests of both the City of San Antonio/Metropolitan Planning Organization and the South Texas Medical Center. Future, as yet unknown, improvements would have to be factored into any implementation of routes, particularly if the implementation is phased over time. The Plan would continue the mutually-agreed tradition of joint decision-making by COSA and the MCA on improvements that occur within the medical center. The Medical Center Alliance and the San Antonio Medical Foundation are proud to recommend its adoption by the City.

APPENDIX

Traffic Analysis of On-Street Bicycle Routes

TRAFFIC ANALYSIS OF ON-STREET BICYCLE ROUTES

The impact on vehicular traffic from modifying the roadway cross sections to incorporate bicycle amenities such as bike lanes and wide outside lanes was analyzed in *Synchro Version 7*. A *Synchro* model was built of the South Texas Medical Center (STMC) road network. Automatic Daily Traffic counts (ADT) were gathered on STMC roads on March 8, 2011. Peak hour Turning movement counts (TMC) at the intersections were calculated by factoring turning movement counts collected for previous traffic studies by the hourly volumes identified on the roads in the ADT counts. The roads studied include Hamilton Wolfe Road, Floyd Curl Drive, Medical Drive, Wurzbach Road, Louis Pasteur Drive, and Ewing Halsell Drive.

Two alternative roadway cross sections, referred to as Option 1 and Option 2 were evaluated and are described below:

Option 1 consists of a wide outside travel lane to accommodate vehicles and bikes on Hamilton Wolfe Road, Floyd Curl Drive, Medical Drive, and Wurzbach Road and bike lanes on Louis Pasteur Drive and Ewing Halsell Drive. Accommodating the wide outside lane within the existing pavement requires a lane diet, which is a reduction of lane width. The lane diet will reduce the inside travel lanes from 12 feet to 10 feet in width and increase the outside travel lanes from 12 feet to 14 feet in width. For analysis purposes, this was assumed to be a 10 foot travel lane with a four foot bike lane. Additionally, the installation of bike lanes on Louis Pasteur Drive and Ewing Halsell Drive will require a road diet, which is a reduction in the number of travel lanes. These streets will be restriped to have one travel lane in each direction and a two-way center left turn lane. Existing dual left-turn lanes at intersections serving these streets will be reduced to single left-turn lanes due to only one receiving lane.

Option 2 consists of bike lanes and road diets on all study roadways. Louis Pasteur Drive and Ewing Halsell Drive will have the same cross sections as in Option 1. The other roads will have a 6 foot bike lane and 16 foot travel lane in each direction. Dual left turn lanes onto the roads will be reduced to single left turn lanes. An alternative cross-section that could be considered is a 5 foot bike lane with a 3 foot buffer strip and a 14 foot travel lane. The buffer strip offers a barrier between the travel lane and bike lane and is another visual indication of the bike lane.

Traffic Analysis

The *Synchro* models were updated to incorporate the changes in lane widths and lane reductions for Options 1 and 2. Dual left-turn lanes were reduced to single left-turn lanes where only one receiving lane would be available. All other turn lanes were unchanged. The signal timing and traffic volumes were unchanged.

Options 1 and 2 were compared to the existing configuration using the following criteria for three different levels of evaluation:

- Intersection Level - Intersection Level of Service (LOS)
- Arterial Level – Arterial Travel Speeds

- Overall Network Level - Network Measures of Effectiveness (MOE)

Intersection Level of Service (LOS)

The impacts to the Level of Service (LOS) at signalized intersections were analyzed in *Synchro*. Level of service is based on the average control-delay measured in seconds per vehicle. The control delay is calculated using an equation prescribed in the *Highway Capacity Manual* that combines the stopped-delay with the vehicle acceleration/deceleration delay that is caused by the signalized intersection. Level of Service is designated from A to F, with an A representing the best traffic conditions with the least delay and F representing poor conditions with the highest delay. **Table X1** shows the levels of service for the STMC signalized intersections.

Table X1: Signalized Intersection Levels of Service

Intersection	Existing Conditions		Option 1		Option 2	
	AM	PM	AM	PM	AM	PM
Hamilton Wolfe Rd & Ewing Halsell Dr	D	C	D	D	F	D
Wurzbach Rd & Ewing Halsell Dr	C	C	C	D	D	D
Medical Dr & Ewing Halsell Rd	C	C	C	C	C	C
Louis Pasteur Dr & Methodist Hospital Driveway	D	B	E	F	E	F
Hamilton Wolfe Rd & Floyd Curl Dr	F	D	F	D	F	F
Floyd Curl Dr & Sid Katz	B	C	B	C	C	D
Wurzbach Rd & Floyd Curl Dr	C	C	D	C	E	E
Medical Dr & Floyd Curl Dr	C	D	C	D	C	D
Louis Pasteur Dr & Floyd Curl Dr	B	D	B	D	B	D
Wurzbach Rd & Medical Dr	C	C	C	C	F	F
Wurzbach Rd & Merton Minter	B	B	B	B	D	C
Medical Dr & UHS Driveway	B	C	B	C	B	C

Note: Shaded cells indicate a reduction in LOS from existing conditions

As shown in **Table X1**, Option 1 primarily results in a decrease in level of service at intersections along Louis Pasteur Drive and Ewing Halsell Drive due to the reduction in number of travel lanes. The decrease in level of service at the intersection of Wurzbach Road and Floyd Curl Drive is due to the narrower travel lanes, which reduces the vehicle flow rate through the intersection. Option 2 results in a decrease in level of service for a majority of the signalized intersections when compared to the existing conditions.

The average travel speeds along the roads were also analyzed in *Synchro* and are shown in **Table X2** for the AM peak hour and **Table X3** for the PM peak hour. The average speeds include travel speeds along the road as well as the delay time incurred at signalized intersections.

Table X2: AM Peak Hour Arterial Speeds

Arterial	Direction	Average Speed (mph)				
		Existing	Option 1	% Diff	Option 2	% Diff
Ewing Halsell Dr.	NB	14.4	9.5	-34%	9.3	-35%
	SB	12.9	12.6	-2%	12.1	-6%
Floyd Curl Dr.	EB	15	14.9	-1%	11.3	-25%
	WB	17.1	17.1	0%	15.2	-11%
Hamilton Wolfe Rd.	EB	19.5	19	-3%	8.7	-55%
	WB	8.9	7.6	-15%	3.1	-65%
Medical Dr.	EB	14	13.5	-4%	11.8	-16%
	WB	17	17	0%	13.9	-18%
Wurzbach Rd.	NB	15.8	15.4	-3%	5.7	-64%
	SB	20.7	20.5	-1%	16.2	-22%

Table X3: PM Peak Hour Arterial Speeds

Arterial	Direction	Average Speed (mph)				
		Existing	Option 1	% Diff	Option 2	% Diff
Ewing Halsell Dr.	NB	14.6	8.4	-42%	8.3	-43%
	SB	12.7	12.1	-5%	11.5	-9%
Floyd Curl Dr.	EB	14.6	14.6	0%	14.1	-3%
	WB	14.4	14.9	3%	12.5	-13%
Hamilton Wolfe Rd.	EB	20.8	20.3	-2%	5.6	-73%
	WB	18.8	18.4	-2%	5.7	-70%
Medical Dr.	EB	11.7	11.5	-2%	9.1	-22%
	WB	15.3	15.3	0%	13.2	-14%
Wurzbach Rd.	NB	18.2	17.9	-2%	10.1	-45%
	SB	19.7	19.5	-1%	11.8	-40%

Tables X2 and **X3** show little to no change in the speeds of roads receiving a lane diet in Option 1, while the roads receiving a road diet in Options 1 and 2 typically show a significant decrease in speeds. Speeds on Wurzbach Road and Hamilton Wolfe Road show reductions in speed of more than 50 percent during the peak periods for Option 2.

The network Measures of Effectiveness consist of delay, average speed, and performance index for the overall network. The performance index is a value used by *Synchro* to compare network-wide delay and stops. The performance index is calculated by the equation:

$$\text{Performance Index} = (D+10*S)/3600$$

Where D is the total delay in seconds and S is the total number of stops. A lower performance index value indicates less traffic congestion for the network. **Table X4**

shows the Measures of Effectiveness for the Existing Conditions, Option 1, and Option 2 for the AM peak hour, and **Table X5** shows the Measures of Effectiveness for the PM peak hour.

Table X4: AM Peak Hour Network Measures of Effectiveness

Measure	Existing Conditions	Option 1	Option 2
Control Delay (s/veh)	33	37	81
Queue Delay (s/veh)	0	0	0
Total Delay (s/veh)	33	37	91
Average Speed (mph)	15	14	8
Performance Index	342.4	382	771.4

Table X5: PM Peak Hour Network Measures of Effectiveness

Measure	Existing Conditions	Option 1	Option 2
Control Delay (s/veh)	26	32	64
Queue Delay (s/veh)	0	0	0
Total Delay (s/veh)	26	32	64
Average Speed (mph)	17	15	10
Performance Index	284.7	345.3	626.8

Tables X4 and **X5** shows Option 1 results in a slight increase in delay and decrease in vehicle speeds when compared to the existing conditions. The delay and Performance Index for Option 2 show increases by more than 100 percent from the existing conditions. Based on the results above, the reduction in travel lanes on the STMC roads significantly degrades the overall traffic operations in the Medical Center.

Mitigation

The results of the analysis show implementing Option 2 will significantly reduce arterial speeds, degrade levels of service at intersections and cause the overall network delay to more than double from the existing conditions. The roadways with proposed lane diets in Option 1 will experience a small decrease in speeds but generally show no significant worsening of levels of service at intersections. However, Louis Pasteur Drive and Ewing Halsell Drive, where road diets are proposed in Option 1 will experience significant reductions in speeds and worsening of levels of service at intersections.

An additional analysis was performed to determine if improvements could be made to the network for Option 1 by modifying the signal timing. Specifically, the traffic signal timing on Louis Pasteur Drive and Ewing Halsell Drive was optimized in *Synchro* to determine if the levels of service could be improved. **Table X6** shows the levels of service at signalized intersections on Louis Pasteur Drive and Ewing Halsell Drive for the existing conditions, Option 1 with the original signal timing, and Option 1 with optimized signal timing.

Table X6: Ewing Halsell and Louis Pasteur Signalized Intersection Levels of Service

Intersection	Existing Conditions		Option 1 – Existing Timing		Option 1 – Optimized Timing	
	AM	PM	AM	PM	AM	PM
Hamilton Wolfe Rd. & Ewing Halsell Dr.	D	C	D	D	D	C
Wurzbach Rd. & Ewing Halsell Dr.	C	C	C	D	C	C
Medical Dr. & Ewing Halsell Rd.	C	C	C	C	C	C
Louis Pasteur Dr. & Methodist Hospital Driveway	D	B	E	F	D	E
Louis Pasteur Dr. & Floyd Curl Dr.	B	D	B	D	B	D

Note: Shaded cells indicate a reduction in LOS from existing conditions

Signal timing adjustments at the intersections of Hamilton Wolfe Road at Ewing Halsell Drive and Wurzbach Road at Ewing Halsell Drive can improve the levels of service for Option 1 to the existing levels of service. The Louis Pasteur Drive and Methodist Hospital Driveway intersection level of service is still reduced from LOS B for the existing conditions to LOS E for Option 1 with the optimized signal timings. However, this is an improvement from the LOS F at the intersection for Option 1 with the existing signal timings.

Recommendations

Based on our analysis, we have the following conclusions and recommendations:

- The lane diets in Option 1 will not have a significant impact on traffic operations.
- Delay and travel times on Louis Pasteur Drive and Ewing Halsell Drive will be increased in Option 1 because of the lane reduction on these roads. These increases can be mitigated to some extent by adjusting the traffic signal timing.
- Option 2 will cause a large increase in delay and travel time throughout the network. Option 2 will result in the average vehicle speed on the STMC roadway network to decrease by more than 40 percent and total delay on the road network to increase by more than 100 percent. The large increase in delay and travel times could delay emergency vehicles and ambulances arriving at hospitals.
- It is recommended that if the street cross sections are modified to accommodate bikes, Option 1 be used instead of Option 2.
- Consideration should be given to the connectivity of the bike facilities and the importance of incorporating a lane diet versus a road diet. Reductions in level-of-service, speeds and increases in delay may be considered an acceptable trade-off for improvements to pedestrian and bicyclist levels-of-service.

- This report only studies the effect on traffic operations using existing (2011) traffic volumes. As traffic increases in the future, the delay and travel times will also continue to increase.
- This analysis did not consider the use of alternate routes for traffic. If the cross section modifications result in a significant increase in delay on a roadway, drivers may choose another, less congested route. In Option 1, Louis Pasteur Drive and Ewing Halsell Drive are the only roads which experience a large increase in travel times and drivers may use Floyd Curl Drive instead. It is unlikely drivers would have the opportunity to use an alternate route in Option 2 since the congestion is spread throughout the network.

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South Texas Medical Center Master Plan, produced by Rialto Studio for the Medical Center Alliance, September 2000

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