Route Location Study

Fort Worth West and Southwest Commuterways

Prepared for the City of Fort Worth and
North Central Texas Council of Governments

Parsons Brinckerhoff Quade & Douglas, Inc.
June 1976

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THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

ROUTE LOCATION STUDY

FORT WORTH WEST AND SOUTHWEST COMMUTERWAYS

ACKNOWLEDGEMENT

During the course of this study, the Consultant maintained close collaboration with City of Fort Worth, CITRAN, and North Central Texas Council of Governments personnel. Their assistance and data input was invaluable in the preparation of this report.

Appreciation is hereby extended to the following participants in this study:

City of Fort Worth
James R. McMeans, Transportation Planning Coordinator
Walter A. Cooper, Transportation Planning Engineer

CITRAN
Alton McDonald, Executive Director
Larry Heil, General Manager

North Central Texas Council of Governments
John J. Roark, Director of Transportation
Garrison P. Smith, Jr., Deputy Director of Transportation

During the progress of the study, the Consultant received the benefit of constructive comments from City of Fort Worth Department Heads and the Public Transportation Advisory Committee.

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July 23, 1976

Mr. John J. Roark
Director of Transportation
North Central Texas Council of Governments
Drawer COG
Arlington, Texas

Dear Mr. Roark:

We are pleased to submit our Final Report on the Fort Worth West and Southwest Commuterways Route Location Study. This submission completes Task 1 of our Contract dated June 26, 1975.

We have found the completion of this study to be most interesting and trust that it will fulfill the needs of the Council of Governments and the City of Fort Worth.

We wish to thank James McMeans and Walter Cooper and the other representatives of the City of Fort Worth together with the staff of the North Central Texas Council of Governments for their fine cooperation during the execution of the Study.

Very truly yours,

Richard Duttenhoeffer
Senior Vice President

RD/kh

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I. INTRODUCTION

BACKGROUND

The Cities of Fort Worth and Dallas and the North Central Texas Council of Governments have conducted a Joint Regional Public Transportation Study aimed at establishing a regional framework for the development of long-range solutions to the public transportation needs of the Dallas/Fort Worth region. Within this framework, separate studies have been conducted to develop long-range public transportation improvement programs in each of the subregional areas.

In the Fort Worth Subregional Public Transportation Study, various transit alternatives were analyzed and evaluated. The conclusions and recommendations of these studies were documented in a report entitled Greater Fort Worth Transit Program and presented to the City Council by the Public Transportation Advisory Committee (PTAC). These recommendations were accepted in concept by the City Council on November 26, 1973.

The PTAC recommended the development of transitway (or commuterway) routes along six radial corridors, converging on the Central Business District (CBD) where a subway was proposed. This was to be accomplished through an orderly, staged development program that would include various support facilities such as terminals, park-and-ride lots, etc., eventually culminating in a long range plan.

Under the 1972-73 and 1973-74 "Unified Work Program for Transportation Planning in the North Central Texas Region", route location studies for the "Trans-Regional Line" and four other commuterway lines as well as the CBD subway were completed.

The current project described in this report is a part of a continuing series of studies to investigate and refine data and plans of projects identified in the Fort Worth portion of the "1990 Total Transportation Plan for the North Central Texas Region." The study program is funded under Work Program Element 6.2 (Preliminary Engineering Studies on Public Transportation Facilities) of the 1974-75 "Unified Work Program for Transportation Planning in the North Central Texas Region" and is conducted according to Urban Mass Transportation Administration (UMTA) Technical Studies guidelines.

Parsons Brinckerhoff Quade & Douglas, Inc. was authorized on September 1, 1975 by the City of Fort Worth and the North Central Texas Council of Governments to develop engineering studies of route location and right-of-way requirements.

PURPOSE AND SCOPE

The principal objective of this study was to identify the specific route location, required right-of-way, and associated construction costs for the implementation of the West Corridor transit alignment. Also, a preliminary review of community and socioeconomic impacts was to be made.

An examination was conducted to evaluate the total system balance and operational compatibility of the Fort Worth commuterway system. The conclusion of this work suggested an alternative route for a part of the previously located Southwest Line. Consequently, the alignment of this alternative Southwest Line was also studied and delineated; the final route selection is not within the scope of this project. These alignment studies will complete the engineering feasibility and route location study of the six proposed exclusive transitway corridors identified in the Fort Worth portion of the 1990 Total Transportation Plan for the North Central Texas Region.

The City of Fort Worth will add the output of this study to the results of the previous route location studies of the other five transit corridors--Northwest, East, Southeast, Southwest, and the Northeast (Trans-Regional Line)--to prepare a preliminary capital grant application for the reservation and/or purchase of right-of-way needed to implement the transit facilities.

This study largely investigates only the commuterway's physical/engineering feasibility. Such a scope has been formally established by the project contract and is entirely appropriate in light of preceeding and subsequent events. This study is by no means the last; it is not yet necessarily aimed toward a definite, unequivocal decision. Even if the findings were deemed to be overwhelmingly positive, more detailed work, including preparation of working drawings, will be required before actual construction. It is conceivable that, in the course of further metropolitan development, other alternatives may emerge. Also, other attitudes differing from those that are carefully judged to be most appropriate today may become dominant.

APPROACH

The preliminary route location study followed the steps listed below:

1. Selection of a specific vehicle system to serve as a basis for preliminary route geometry and prototypical structure designs.

2. Development of prototypical designs of line structures to serve as a basis for establishing right-of-way requirements and estimating construction costs. These designs are not site-specific nor intended to represent the final structural configuration; modifications are inevitable during the final design phase as a result of more definitive comparison studies and variation in site conditions.

3. Field reconnaissance of previously selected transitway corridors as shown in the "1990 Total Transportation Plan," as well as other possible right -of-way corridors.

4. Identification of possible alternative route locations based on the findings of field reconnaissance, commuterway geometrical and structural requirements, latest available information on future construction or development adjacent to the route and level of service, etc.

5. Evaluation of alternative routes with respect to level of service, construction cost, environmental impact, system balance, local jurisdictional and public opinions, etc.

6. Recommendation of preferred route alignment.

7. Preparation of preliminary plan/profile drawings for the selected route alignments.

8. Compilation of order-of-magnitude capital cost estimates based on Spring 1976 price levels.

9. Documentation and description of findings.

II. COMMUTERWAY CONCEPT AND DEVELOPMENT

GREATER FORT WORTH TRANSIT PROGRAM

In the Fort Worth Subregional Public Transportation Study, the Public Transportation Advisory Committee recommended development of transitway routes along six radial corridors. These six routes, comprising 38 miles, converge on the CBD, where an extension to the existing Leonards' M&O Subway is to be constructed. Two of the six corridors (West and Northeast) were foreseen as being developed initially for the operation of a high-speed rapid transit system; the remaining four corridors (North, East, Southeast, and Southwest) would be developed initially as Commuterways, and ultimately as transitways, in phases responsive to escalating transit demand.

This approach--providing first an exclusive and efficient channel for buses and carpools and allowing a later conversion to a guided track mode--has emerged in recent years as the most progressive and promising approach to urban mass transportation. Numerous studies have endorsed this concept, and a few actual examples already exist: the British new town of Runcorn which is completely dependent on an internal busway, and the rather well known American examples, the Shirley Highway outside Washington, D.C. and the San Bernardino Expressway in California. Conceptual or detailed designs range from the Westway along the Hudson shore of Manhattan to the proposed metropolitan system in Bangkok, Thailand.

COMMUTERWAY CONCEPT

In summary, the essential concept of the commuterway system as proposed in the Greater Fort Worth Transit Program included development of a 13-mile initial system extending along four routes from the CBD to points approximately half the distance to the proposed circumferential highway loop. These commuterways are to have the following characteristics:

1. Be designed for mutual operation by buses and automobiles

2. Be readily convertible in the future to operation by rapid transit vehicles

3. Be fully grade-separated, consisting initially of a 2-lane roadway and shoulders with appropriate fencing, lighting, and guardrails

4. Provide full control of access via a limited number of "bus-only" ramps located at key points along the route

5. Operate between large park-and-ride facilities located along the perimeter of the CBD and the outer terminus of each route where it intersects with a major arterial

6. Be designed to minimize their impact by having routes generally located adjacent to existing physical barriers such as railroad rights-of-way, freeways, rivers, etc.

PARK-AND-RIDE LOTS

Park-and-ride lots are integral adjuncts of the channels and are to be provided at the outer terminus of each route where it intersects a major arterial route. Buses and carpools will enter the commuterway facility either directly from the arterials or through the park-and-ride lots. These lots will serve as staging points for the formation of carpools and as transfer points for automobile passengers wishing to continue to the CBD by bus.

Before entering the park-and-ride lots, buses will operate along arterial streets. It is planned that arterial intersection improvements will be made to provide priority operation for these buses. These improvements could include devices for express buses to preempt traffic signals.

COMMUTERWAY/TRANSITWAY PHASED DEVELOPMENT AND OPERATION

The phased development of the rapid transit improvement program recommended by the PTAC is aimed at providing maximum flexibility in meeting transit demands at the lowest possible cost. The concept of the commuterway, as developed in the Fort Worth Subregional Study, was designed specifically to fulfill these aims.

It was found that the initial transit demand did not warrant immediate development of the high-capacity transitway system within the six transit corridors. However, it was also determined that by 1980 some form of exclusive transit service must be provided for some distance along these corridors. By developing a commuterway first, the early transit demands could be met at a relatively low cost while still providing the flexibility to increase system capacity with minimum disruption in the future.

It is planned that, in the early stage, the commuterways will be used jointly by buses and carpools during peak travel periods in a one-way operation. During these peak periods, the number of automobiles (carpools) entering the commuterway would be monitored and controlled to ensure optimum operation and maximum carrying capacity. Later, as travel demands increase, the residual capacity of the commuterways to carry even carpools will decrease, and the facilities will operate as exclusive busways. Finally, when travel demands increase to the point that additional capacity warrants the development of high-capacity systems, the commuterways will be converted to fixed guideway transitways.

The Fort Worth long-range development of this public transit improvement program is to be accomplished in four phases, as described in the following paragraphs.

PHASE I

This phase would involve acquisition of the existing Leonards' subway and construction of a new 1-mile extension within the CBD. Also required would be environmental and engineering studies leading up to the purchase of 38 miles of transitway right-of-way.

PHASE II

The second phase would consist of construction of a 13-mile initial system of commuterways within the four transitway corridors extending approximately half the distance out from the CBD to the proposed circumferential loop. Initially, commuterways would be utilized for both bus and carpool operation during peak travel periods but later would be converted to exclusive busway operation when required.

PHASE III

Phase III would comprise conversion of the 13-mile initial system from a commuterway (busway operation) to a transitway (rapid transit operation). An additional aspect would be construction of the high-speed system through the regional airport to Dallas, forming the first link in the regional transit network.

PHASE IV

Construction of the remaining 25 miles of transitways within the subregional system would be performed as Phase IV. Completion of a second regional link by connecting the Dallas west and Fort Worth east transitways with premium bus service through Arlington and Grand Prairie, as suggested by the Mid-cities Transit Plan, would conclude the development.

At present, the above general program is still logical and in force. However, it is also likely that each subsequent detailed study may uncover ways to improve it through construction modifications. Thus, the current planning and engineering effort has reached the conclusion that the West Line should become a part of the commuterway system rather than an extension of the Trans-Regional Express Line which was referred to as the U-TACV in the Greater Fort Worth Transit Program.

Therefore, it is recommended that the 4.6-mile West Line be included in the initial system of commuterways which is to be developed in the Phase II plan and converted into transitways in Phase III.

III. DESIGN CRITERIA

A set of design criteria was established to guide the development of route location designs and the preparation of realistic cost estimates. These items, governing the design of horizontal and vertical alignments, typical sections, and structures, were based upon assumed operating equipment. Most of the criteria were set by the requirements of buses/automobiles while others were controlled by the operation of the transitway hardware. Other aspects of the design were dictated by the requirement that the facility be readily convertible from the auto/bus mode to operation by rapid transit vehicles.

DESIGN VEHICLE

The single most important factor in determining design criteria for these route location studies is the selection of a "design vehicle." Although the vehicles themselves represent only a small portion of the total system cost, they determine the size and alignment of the fixed facilities and, in so doing, dictate their location and cost as well. Structure design and dimensions, and limiting values of horizontal curvature and vertical grades, are all functions of the system design vehicles.

The early phase (commuterway) design vehicles are automobile and bus. Criteria governing design of facilities for these vehicles are available in the publications of the American Association of State Highway Officials.

The selection of a design vehicle for the transitway system could not be "hardware specific"; this equipment will not be selected until final design is near. Only those characteristics of the hardware which govern the route location and the advance acquisition of property for system right-of-way need be determined at this time.

In the Greater Fort Worth Transit Program report, Volume I, performance standards for the long-range regional system equipment were specified. They must be: (1) realistic by today's standards, (2) aimed at meeting the ultimate long-range system needs, and (3) sufficiently flexible to meet unexpected future conditions. Electrically powered rail rapid transit equipment was selected for the long-range implementation of the ultimate system. The performance standards specified for the equipment (safe, quiet, reliable, comfortable, fully automated, capable of maximum speeds of 70 to 75 mph, and high performance acceleration/deceleration) are similar to those specified for equipment on other new regional rapid transit systems in several major United States cities (San Francisco, Washington, Atlanta, and Baltimore). The following criteria governing design of fixed facilities for this class of vehicle are similar and vary only slightly from city to city:

Dimension of car: 11 feet x 11 feet x 75 feet

Gross weight of car: 120,000 lbs.

Number of cars per train: 3

Length of train: 225 feet

DESIGN SPEED

It was determined that, to compete successfully with and offer a viable alternative to the private automobile, the rapid transit system should be designed to transport people comfortably between employment and housing areas at a minimum average speed of 40 miles per hour, including station stops. To achieve this minimum average speed, the following design speeds were used to establish station spacings, the location and degree of curves, spiral lengths, rate of superelevation, etc.

V = Design speed in miles per hour

V (optimum) = 75

V (minimum) = 40 (30 through a station and for a maximum distance of 1000 feet from either end of the station)

Maximum design speed for buses and automobiles is 60 miles per hour.

GEOMETRIC STANDARDS

Outline geometric standards were established to guide the development of alignments and route location. These standards are a composite, in that they reflect the controlling characteristics of both system design vehicles, and are drawn from the American Association of State Highway Officials Policy on Geometric Design, and from the various rapid transit system design criteria manuals (BART, WMATA, MARTA, etc.).

These outline geometric standards are not all-inclusive but rather are intended only to provide general guidelines for developing alignments along the previously selected routes and to assure physical feasibility. As final design is approached, more comprehensive composite criteria, including an analysis of their basis and derivation, will be necessary.

HORIZONTAL ALIGNMENT

The horizontal alignment consists of tangents joined to circular curves by spiral transition curves. Using the vehicle design speed described previously, the lengths of these elements are derived as follows:

Tangents (Minimum)

Length in feet	(desirable)	=	3V
	(absolute minimum)	=	75 feet

In addition, at the site of future transitway stations, the horizontal alignment provides for a 300-foot tangent.

Circular Curves (Minimum)

Radius R - Mainline	(desirable)	=	700 feet
	(absolute minimum)	=	500 feet
Bus Ramps		=	150 feet

Length = the larger of 3V or 100 feet

Transition Curves (Spiral)

Length = 50 feet x actual superelevation or
1.22V x unbalanced superelevation

Minimum = 100 feet

SUPERELEVATION (MAXIMUM)

The amount of actual superelevation can be adjusted when commuterways are converted to transitways. Within at-grade and embankment sections the adjustment can be accomplished during placement of ballast. On bridge and viaduct structures the adjustment can be accomplished during placement of rail fasteners and pads.

Commuterway actual	=	.06 ft./ft.
Transitway actual	=	6 inches
Transitway unbalanced	=	4-1/2 inches

VERTICAL ALIGNMENT

The vertical alignment consists of tangents joined by parabolic curves.

Gradients (Maximum)

Mainline	=	4.0%
Ramps	=	7.0%

Curvature*

Rate of Change	=	0.5%/station
Length (Minimum)	=	200 feet

*The length of vertical curve is controlled by both the requirement for providing minimum stopping sight distance during commuterway operation and the requirement for providing comfortable operation during transitway operation. Allowable maximum gradient shall be reduced by a factor of (200%)/R in area of horizontal curvature.

CLEARANCES (MINIMUM)

Vertical	=	14 feet
Horizontal	=	Varies, see typical sections

For existing railroads crossed by the commuterway facility, the 8-1/2 foot (horizontal) and 22-foot (vertical) "envelope" required by the Railroad Commission of Texas was provided.

STRUCTURE CRITERIA

Typical structure designs were prepared based on the requirements of both system design vehicles. Superstructure consists of a concrete deck supported by prestressed concrete girders. This arrangement was controlled primarily by the highway-type loading conditions. (A superstructure to accommodate a fixed rail-type loading exclusively would most likely have consisted of twin concrete box girders.) This deck can readily be converted to transitway operation by the placement of rail fasteners and pads directly on the concrete deck.

Highway design vehicle loading conditions selected were AASHO-H20. Transit design vehicle loading conditions represented the heaviest vehicles in this design class. A drilled shaft substructure was used in the design since it is most representative of similar local structures of this type.

IV. WEST LINE

CORRIDOR DESCRIPTION

The primary transit service area of the West Corridor is the portion of the Fort Worth subregion generally bounded on the east by the CBD, on the north by the West Fork of the Trinity River, on the south by the Clear Fork of the Trinity River, and on the west by Highway 183 and Loop 820.

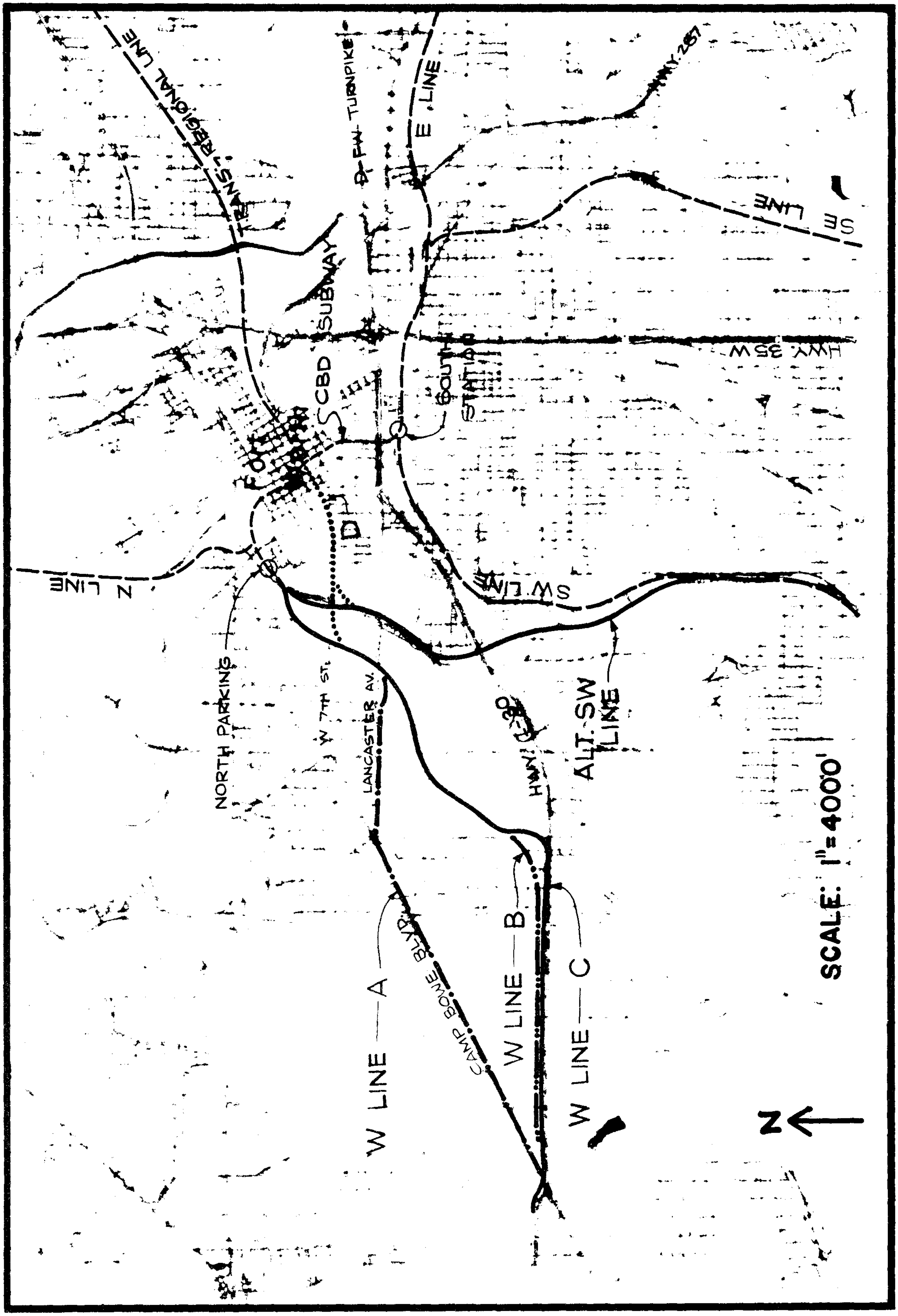
Besides residential areas, the West Corridor provides significant employment, cultural, and recreational activities which serve the entire Fort Worth area. The scope of this project did not include a reexamination of the developmental and urban features of the corridors. Also, since during the last two years no major changes in these trends and patterns have taken place, the rather extensive background information found in Volume VI, The West Corridor, of the Greater Fort Worth Transit Program (September 1974) is still valid and can be referred to. The most useful information regarding the physical conditions in the area have been obtained from aerial photographs and the (non-reproducible) set of land use maps of the Fort Worth Planning Department.

The extent of the specific route covered by this study is from the vicinity of the intersection of Camp Bowie Boulevard and Freeway I-30 to the CBD (North Parking Lot). While a number of possibilities were examined, only two alternative routes were found viable. One of these would follow Camp Bowie Boulevard northeasterly and then easterly along West Lancaster Avenue, and the other would follow the West Freeway and then the proposed North-Southwest Freeway. All the alternatives are shown in Figure 4.1 and will be described in the following sections.

HIGHWAY PLANS

Construction of the West Commuterway is closely associated with the planned construction or reconstruction of major limited access highways in this corridor. While the detailed analysis of these facilities is beyond the scope of this project, the background conditions are important and at least require brief description.

The West Freeway (I-30) was first proposed in the 1940s. It has been constructed in the section under study as a 4-lane facility with a median strip. The traffic loads that keep growing every year have, however, overwhelmed the available capacity, and plans for expansion have been made for some time. Specifically, the proposal is to double the channel by acquiring a block-wide strip on the north side of the present alignment. The commuterway would be built along the new centerline as an integral part of the total development (Alternative C). In this respect, the facility would resemble very closely the Shirley Highway configuration (Washington, D.C.).



ROUTE LOCATION STUDY

Fig. 4.1

This highway widening project is expected to proceed, and joint implementation will be readily achieved between Horne Street and Montgomery Street. This will necessitate the removal of an entire strip of modest houses, a few of which have already been demolished. There are also conflicts between the new roadway and a few institutional uses. These problems are being gradually resolved, and the community apparently accepts the project.

East of Montgomery Street the commuterway is planned to switch over to the proposed North-Southwest Freeway alignment, not in the middle but on one side, and follow it before turning into the CBD.

While this new freeway has received much support, is generally perceived to be necessary, and has even avoided local controversies (although it skirts very closely some major institutional and public uses, including Trinity Park), implemen tation may be delayed because of financial constraints. Consequently, the reality and implications of the commuterway through this sector have to be regarded quite differently than those along the first half. For example, the design of the public transit channel, as shown in the drawings in Appendix A, is physically independent of the freeway alignment.

The question that remains to be answered is the following: if the I-30 portion is implemented, but the North-Southwest Freeway is substantially delayed (or even eliminated), can the commuterway be constructed alone? The engineering answer is "yes", and the discussion here accepts that possibility. Whether it is socially and economically feasible will have to be decided in a larger forum, if and when such a necessity arises. The engineering work of this study should make a substantial contribution toward this decision. A major element, of course, will be the cost situation. The commuterway alone is a rather expensive facility because of some of the obstacles that it encounters and which necessitate elaborate construction. If it could be built together (at approximately the same time) with the freeway, considerable savings could be anticipated by common right-of-way acquisition, contractor mobilization and efficient use of equipment, traffic control measures, grading, etc.

The last question which has not yet been addressed is how to handle the bus and carpool flow in the vicinity of the CBD if the western portion (I-30) of the commuterway is built, but not the eastern (North-Southwest) portion. Clearly, proper channels would have to be selected, designated, controlled for priority movements, and most likely also physically upgraded.

ALTERNATIVE ROUTES

All alternative routes begin from the vicinity of Camp Bowie Boulevard and Freeway I-30 where a park-and-ride lot will be provided. The park-and-ride facility is bounded by Camp Bowie Boulevard, Horne Street, and Malvey Street with an additional T-shaped section between Malvey Street and the I-30 access road. For more details on this subject refer to the Consultant's report on Park-and-Ride Site Planning, June 1976.

ALTERNATIVE ROUTE A

The total length of Alternative A is 4.3 miles. This route will begin just east of Horne Street in the median of Camp Bowie Boulevard (at grade) where buses and car pools can enter or exit the commuterway to or from Camp Bowie Boulevard. Staying in the median, the channel will cross under the existing and additional proposed future I-30 interchange structures and run northeasterly along Camp Bowie Boulevard.

The portion of this route between I-30 and West Lancaster along Camp Bowie Boulevard can be placed either at grade or elevated, since there is a 25-foot median in this area which can be converted to two one-way bus or carpool lanes. For the alternative with at-grade crossings of side streets, a reasonable operational speed could be obtained by restricting automobile movements at the intersections and by utilization of bus preemptive signals.

The commuterway will then turn easterly along the south side of the West Lancaster Avenue through the Will Rogers Complex which is the major entertainment, recreational, and cultural center of the Fort Worth area. The line will have to be elevated at this section since access at the existing ground level to and from West 7th Street, and to the Will Rogers Coliseum, Casa Manana Theater, and the Fort Worth Art Center will have to be maintained. In addition, the major University Drive crossing must be grade-separated.

Starting at Farrington Field, the commuterway will have to climb high on aerial structures to cross over the tracks of the St. Louis Southwestern Railway and then curve northeasterly to cross over the West Lancaster Avenue viaduct just west of the Trinity River. Along the west edge of the park and the east side of the proposed North-Southwest Freeway, the line will remain on Aerial structures running northeasterly and cross over West 7th Street near Stayton Street. The line will then jump diagonally over three blocks of light industry facilities where no demolition will be required, except that easements for the footings and piers of the structure will have to be obtained.

East of Nebraska Street and Greenleaf Street, the elevated commuterway will curve easterly and cross over the Clear Fork of the Trinity River. The line will then descend onto grade level and terminate at the west end of the North Parking Lot.

In the future, this entire route can be readily converted to light rail transit operation without much structural modification. A considerable volume of walk-on passengers is likely to be generated by this mode because of the uniform population distribution along Camp Bowie Boulevard. There would be reasonable operational and esthetic compatibility with the surrounding community. If the ultimate transit development calls for a higher capacity system than light rail transit, aerial structures will be required throughout to provide an exclusive right-of-way, including the Camp Bowie portion. This would involve high construction costs and environmental impacts which are almost certain to make this alternative undesirable.

ALTERNATIVE ROUTE B

Alternative Route B of the West Line, approximately 4.6 miles long, will begin at Horne Street. As mentioned previously, current plans call for the West Freeway (I-30) to be widened to accommodate increased traffic demands. As shown by preliminary design plans furnished by the Texas State Department of Highways and Public Transportation, the freeway will be widened along its north side where a strip of blocks north of the existing service road between Montgomery Street and Halloran Street (west of Horne Street) will be acquired for the construction. Birchman Avenue west of Horne Street and Calmont Avenue east of Camp Bowie Boulevard and a new street connecting Birchman and Calmont between Horne and Camp Bowie Boulevard will become the new westbound service road of the widened freeway. The alignment will stay in the strip separating the new service road from the new freeway lanes inside the proposed new right-of-way to the north of the existing freeway alignment.

Although it shares the new right-of-way, the commuterway can be constructed independently of the freeway widening project; this is the principal difference between Alternatives B and C. Thus, since Alternative B has to go over or under crossing streets and access ramps of the proposed freeway, the line will have a poor vertical profile and high construction costs.

An intermediate bus ramp may be connected to Clover Lane just before Route B starts swinging to the north deviating from the West Freeway alignment. Curving northerly on aerial structures, the line will cross over Birchman Avenue and then Montgomery Street near Pershing Avenue and from there it will be the same alignment as described for Route C.

ALTERNATIVE ROUTE C

A major portion of this approximately 4.6-mile route also follows the West Freeway (I-30) and shares its proposed new right-of-way. Unlike Alternative B, Route C will use the median between the eastbound and westbound freeway lanes in a symmetrical arrangement. Therefore, the commuterway construction must be performed simultaneously with or after the freeway widening.

Alignment of the commuterway will follow that of the proposed freeway in general and will provide a smooth ride with good vertical profile and horizontal curvatures. Since most of the commuterway structures will be at-grade along the West Freeway, this alignment also offers the lowest construction cost among the three alternatives.

The Texas State Department of Highways and Public Transportation has indicated that a continuous 40-foot-wide right-of-way (increasing to 60 feet wide in the future station areas) could be preserved for the commuterway/transitway use. This channel of adequate width will not only simplify construction problems during future transit conversion but will also provide good flexibility in transit hardware selection.

Alternative C begins at Horne Street overpass with a perpendicular ramp structure going down to the freeway median. Ramps to both eastbound and westbound freeway lanes will also be provided in this vicinity to furnish direct access for carpools and buses to the West Freeway west of the Camp Bowie Boulevard interchange.

In the future, a transit station will be located just east of Horne Street with platforms at the grade (or freeway) level and entrances one level above. Therefore, a 60-foot right-of-way between Horne Street and Camp Bowie interchange is required to accommodate both the commuterway ramps and future transit station construction.

Moving easterly, a 700-foot-long elevated structure will be needed to cross over Camp Bowie Boulevard and a proposed freeway ramp. The line will then descend to a portion of filled section before reaching grade level to cross under Merrick Street Overpass. East of Merrick Street, the commuterway will be in a low retained cut section for about 1,200 feet and then will follow almost exactly the proposed freeway profile at-grade to Clover Lane.

A bus-only ramp will be provided from the Hulen Street overpass down to the commuterway. A future transit station is also planned in this area just under the existing pedestrian bridge connecting the service roads north of the Arlington Heights High School.

A 300-foot bridge will be required for the commuterway to cross over Clover Lane. Continuing easterly, the route will stay in the median at-grade until reaching south of Owasso Street where it will be raised onto an elevated structure and leave the West Freeway alignment curving to the north.

A complex five level interchange of the West Freeway and the proposed North-Southwest Freeway has been planned in the vicinity of Montgomery Street. The elevated commuterway will have to cross over the westbound I-30 Freeway lanes, Montgomery Street, a future freeway ramp, while passing under another future freeway ramp to run through the interchange, and reach the east side of Montgomery Street near Pershing Avenue.

Still on aerial structures, the alignment will then swing northeasterly crossing over to the east side of the proposed North-Southwest Freeway near Linden Avenue.

Along the east side of the proposed freeway and west boundary of the Trinity Park, the line will run northeasterly with a portion on fill. It will then become elevated once again to cross over University Drive and Crestline Road to the south of Farrington Field. A future transit station may be located between University Drive and Crestline Road to serve the stadium and nearby Will Rogers Auditorium, Coliseum and Casa Manana Theater.

After crossing Currie Street, the line will occupy a portion of the abandoned railroad track along the south side of Foch Street. East of Foch Street, the line will rise up to cross over the St. Louis Southwestern Railway and then West Lancaster Avenue. To surmount these arteries, the height of the structure will have to reach 50 feet. From there, the commuterway will descend and run northeasterly along the west edge of Trinity Park and cross over West 7th Street east of Stayton Street. It will then cross diagonally over three blocks of light industry. It can be aligned so that only easements for footings and piers will be necessary but no demolition will be required.

East of Nebraska Street and Greenleaf Street, the line will curve easterly to cross over the Clear Fork of the Trinity and then descend to grade and terminate at the west end of the North Parking Lot, as did the other alternatives. At this location, bus passengers may transfer to the subway to get into the CBD, while carpools may either park and passengers can transfer to the subway or vehicles can enter nearby streets and drive to their CBD designations. In the future, transit tracks can be connected directly to the CBD subway tracks.

CONNECTION D

As shown in Figure 4.1, all alternatives of the West Line can be connected to the Trans-Regional Line, as it was recommended by the Greater Fort Worth Transit Program.

If this becomes a real possibility, instead of terminating at the North Parking Lot, the line would turn easterly before reaching West 7th Street and then run parallel to the south side of the 7th Street viaduct crossing over to the east bank of the Trinity River. After crossing over Forest Park Boulevard, the line would descend to grade level and continue downward in a trench until merging into a subway portal east of Fournier Street. The subway would then skew under and follow West 7th Street. East of Lake Street, the subway would start to curve northeasterly and turn into 4th Street near Macon Street. It would then stay under 4th Street and connect to the Trans-Regional Line at the City Center Station under Throckmorton Street.

Because of the extensive length of the subway through the CBD required for this alignment, construction costs would be extremely high compared to the other alternative. Also, this alignment must be built and used as a transitway from the very beginning since the tunnels clearly cannot be used for car pools and buses. The concept of staged conversion and flexibility becomes lost.

Therefore, the alternative Connection D is not recommended.

COMPARISON OF ALTERNATIVE ROUTES

The three alternatives--A, B, and C--present some clear-cut choices. Each has very specific features which, when coupled with the fact that there are only three of them and all are located in the same rather restricted area, makes the selection process a reasonably straightforward one.

The criteria against which the alternatives are to be evaluated have emerged from this study and take advantage of findings in other cities. The list has been further streamlined by not including those elements against which each possible route would receive an equal rating. Consequently, while it would have been possible to structure a complex evaluation matrix, it was felt that in this case a direct review would be more useful. As the following paragraphs show, this approach does bring reliable conclusions that are very useful at this stage of the long-range process which is to move toward a substantially improved Fort Worth public transportation system.

POTENTIAL CAPACITY

Alternative A has to be limited to light rail transit type operation, while B and C can be developed to full size rapid transit.

PROXIMITY OF ROUTE TO EXISTING ACTIVITY CENTERS

Although A, B, and C serve the Will Rogers complex, A provides better access to more activities.

PROXIMITY TO SHOPPING

Only Alternative A provides direct access to local commercial areas when being operated as a light rail transit in the future.

TRAVEL TIME TO CBD

Alternative C provides the most effective path since it has the best geometrical alignments. Alternative A is the least desirable because of numerous grade crossings along Camp Bowie Boulevard.

PROVIDE TRAFFIC RELIEF

Alternatives B and C will greatly relieve traffic on the West Freeway, while Alternative A can relieve some of the traffic on Camp Bowie Boulevard. However, it will make the congested north-south traffic circulation difficult in the West Corridor.

PROVIDE CONVENIENT LOCAL SERVICE

When operating as light rail transit, Alternative A can provide walk-on service to residential areas along Camp Bowie Boulevard, while B and C require auto or local bus transfers for most passengers.

CONSTRUCTION COST

Alternative C will have the lowest construction cost since it shares the freeway right-of-way and is mostly at-grade west of Montgomery Street. Alternative A will have low construction cost only because it will be at-grade and have a lower level of service.

LEVEL OF SERVICE

Alternative C will offer the best riding comfort, highest speed, and maximum safety and security for passengers while A is the least desirable.

COMPATIBILITY WITH EXISTING LOCAL IMPROVEMENT PLANS

Alternative A will interfere with a proposed widening plan for Camp Bowie Boulevard. Alternative C is well-fitted to the West Freeway widening plan, while B is a force solution reasonable only if the freeway widening is performed considerably later than the commuterway construction.

ENVIRONMENTAL AND SOCIOECONOMIC IMPACT

Alternative C will have the least negative impact, while A will provide the largest impact. Land use along Camp Bowie Boulevard between I-30 and West 7th Street is mostly residential which is most sensitive to noise and air pollution. Along West 7th Street, negative impact will be created upon landscaped areas, open space, and historical sites. The impact of Alternative C is discussed further in the following paragraph.

RECOMMENDED ROUTE

The three alternative routes were presented to representatives of the Texas State Department of Highways and Public Transportation, Fort Worth Public Transportation Advisory Committee, and various City departments such as City Planning, Traffic, Public Works, etc.

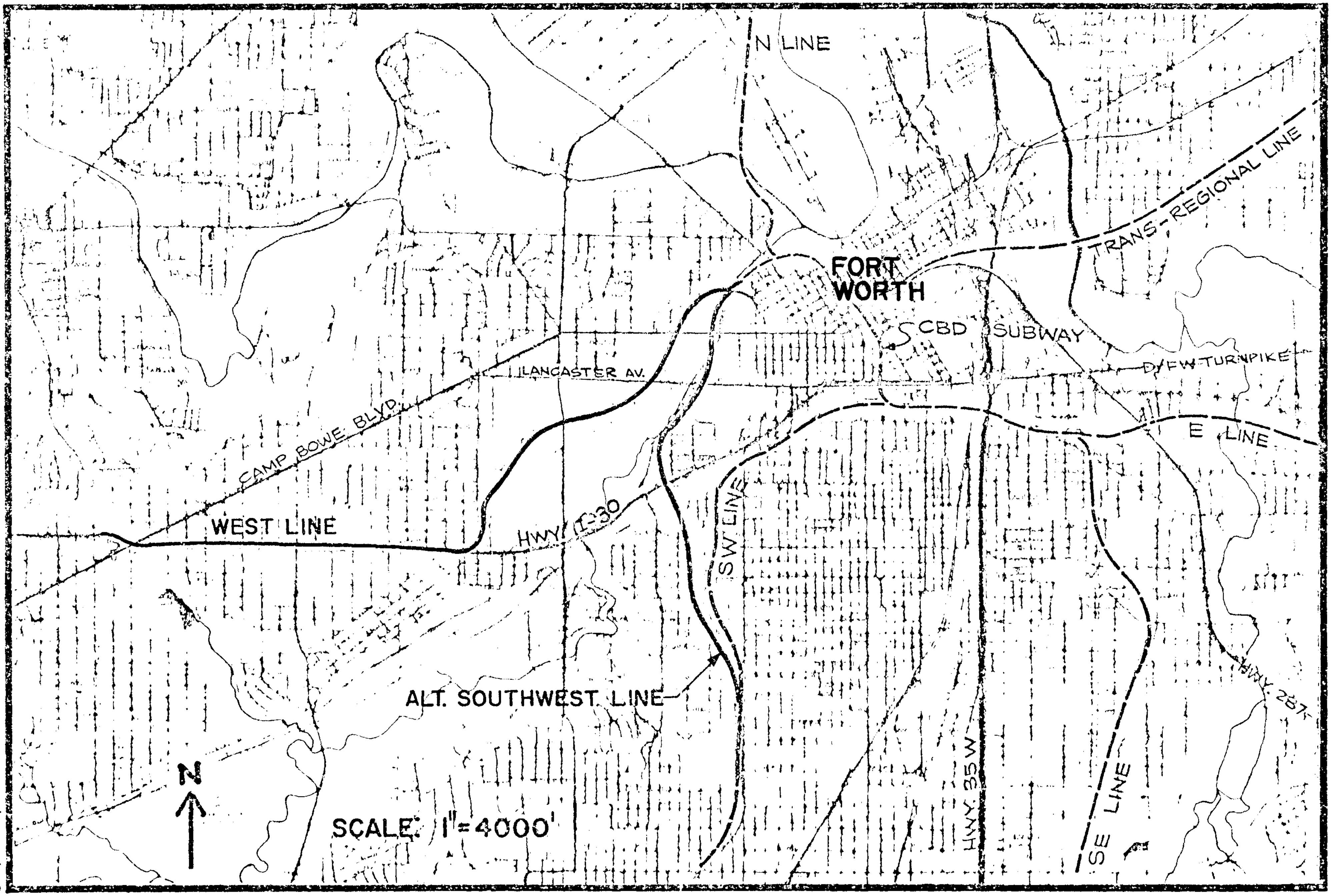
Every review favored the Alternative C alignment since the concensus was that the people in the area involved would object to a line in the median of Camp Bowie Boulevard.

It is also believed that the West Freeway will be widened in the near future but that construction of the North-Southwest Freeway appears more distant. However, the line can be built without the North-Southwest Freeway and will create much less negative environmental and socioeconomic impact than would the fully approved freeway.

Combining all the aforementioned facts with the comparison of alternative routes described under Alternative Routes, it is apparent that Alternative C should be the recommended West Line commuterway/transitway route. The general location of the recommended route is shown in Figure 4.2. The alignment of the West Line is shown with more detail on Drawing Sheet Nos. 1 through 5 in standard plan-profile fashion in Appendix A. Typical structural sections for commuterway, developed in a previous study, are also included in this report on Sheet Nos. 9 through 11.

COMMUNITY AND ENVIRONMENTAL IMPACTS

Within the scope of the present study, specific environmental impact calculations and precise estimates of community disturbance by the proposed facility are not possible, nor required. Such analyses will be required when the project



SELECTED ROUTE LOCATIONS

Fig. 4.2

moves closer to implementation; it is necessary, however, at this time to outline the various elements and features that can cause concern. These discussions are limited to Alternative C exclusively. As was suggested before, this evaluation is intimately tied to the events surrounding the proposed highway work in the West Corridor.

In the portion of the route that follows I-30, the specific impacts ascribable to the commuterway can only be characterized as positive: by favoring bus and carpool operations, total vehicle miles in the corridor will be reduced and, therefore, less air pollution, noise, congestion, traffic accidents, etc. will be generated. This does not hide the fact, however, that the entire construction effort will significantly impact on the local community by demolishing an entire strip of blocks occupied by residences and some public uses, and that the vehicle-carrying capacity of this artery will be doubled. If this can be accepted as given, as far as the freeway is concerned, then it only remains to be pointed out that the containment of the transitway channel in the middle of the highway will provide desirable distance between it and surrounding land uses. The ambient noise and pollution levels in effect will completely mask the contributions from the commuterway. The fact that the entire facility will be depressed below grade will, of course, materially improve the environmental and visual characteristics. The smooth movement along the roadway will also minimize adverse impacts. The major control concern should be the proper design and sizing of access points and approaches to the commuterway along which heavy traffic will converge. These impacts will be rapidly diluted by distance, but at the ends of ramps the level of vehicular activity is likely to be quite high.

The commuterway by itself will not require any residential relocation; the widened freeway very definitely will. It is to be expected that this will be accomplished equitably, with all necessary relocation assistance provided.

The massive interchanges of the proposed freeway system at Camp Bowie Boulevard and Montgomery Street will present visual design challenges in their own right.

In the second part of the study route, the concerns are quite different. No residential neighborhoods will be affected at all; the commuterway will cross industrial districts and run near parks.

After passing the Montgomery Street interchange, it will be almost entirely an elevated structure and thus will have very high visibility. In several places where industrial lots are to be crossed this should not be a major issue, but some attention will have to be paid to what happens under the viaduct. Such left-over and shaded spaces have a tendency to become cluttered and dirty.

The commuterway along several pieces of park and open space will be a different problem. It will very definitely establish an unmistakable edge and visual separation between the green areas and the industrial or exhibition buildings. As such, it can be considered a definite asset, if properly designed. This concept is helped by the already existing earth levees along much of the route. It should also be noted that no objections to the proposed freeway have been raised by the community or park interest groups. Special attention, however, must be given to the structure over West Lancaster Avenue. Here, an almost dizzying altitude will be achieved, and the construction effort will be most prominent. In a few places, column footings may have to be placed at the very edge but inside the park space. Another dimension of this analysis is the rather exciting visual experience that passengers in the buses and carpools will receive of the park and downtown area as they traverse these elevated sections near the CBD.

The last portion of the commuterway also has esthetic implications; it will cross the flood plain of the Trinity River before entering the north parking lot. The open sweep of this space will be cut by the viaduct, and, consequently, it should receive careful architectural attention.

When the commuterway is transformed into a transitway, the major difference will be, of course, that previous air pollution and noise levels will be drastically reduced due to the nature of electrical propulsion. It is assumed that technology producing the least noise will be selected.

Furthermore, while experience has shown that entry ramps to a major roadway do not generate any significant intensification of land uses along the accessways, this will not be the case with transit stations. New high-density residences can well be expected, although there are a multitude of forces in action, and an unequivocal conclusion cannot be reached at the present whether this will or will not occur. There is, however, little doubt that service establishments and other commercial activities will be attracted to the station vicinity thereby taking advantage of heavy passenger flows. In other words, it can be postulated that the commuterway phase will probably have little influence on the overall land use distribution or intensification in the corridor. The facility will basically serve what exists there now and what will develop in any case.

The final transitway phase, conversely, is likely to have a more fundamental impact and could cause considerable recrystallization of activities and clustering around station nodes. Indeed, the feasibility of transit service could very well depend in the first place on such intensification of demand.

COST ESTIMATE

RIGHT-OF-WAY-COST

The cost of property and easements for the West Line right-of-way was estimated by the City of Fort Worth staff. The total cost is estimated to be $600,000.

The estimate was based on approximate right-of-way lines drawn on 1" = 400' scale city property maps. The right-of-way costs include land and improvements, if any, at 1976 price levels. The cost does not include any state-owned or City-owned lands.

CONSTRUCTION COST

The preliminary construction cost estimate was performed by Carter & Burgess, Inc. of Fort Worth.

The total construction cost is estimated to be $25.8 million at Spring 1976 price levels. This cost includes all new construction, engineering/architectural design, supervision, and contingencies.

TOTAL COST

Total cost of the West Line commuterway is estimated to be $26.4 million.

The anticipated sources of funds are listed as follows:

Federal Grant (80%)	$21,120,000
State Grant (13%)	3,432,000
Local Share (7%)	1,848,000
Total	$26,400,000

If the City uses bond funding to secure its $1,848,000 contribution, it is anticipated that a 6 percent interest rate could be obtained on 25-year term bonds backed by the full faith and credit of the City. A standard amortization schedule indicates an annual cost of $142,910 to meet the interest and bond redemption schedule.

CONSTRUCTION SCHEDULE AND CASH FLOW

The construction schedule and cash flow are shown in Figure 5.4.

V. ALTERNATIVE SOUTHWEST LINE

THE ORIGINAL ROUTE

The generalized Southwest Transitway route corridor was selected by the "Greater Fort Worth Transit Program". A more detailed alignment was shown in the "Route Location Report on the Fort Worth Commuterways" by Parsons Brinckerhoff Quade & Douglas, Inc. in October 1974.

The Southwest commuterway route is approximately 3.5 miles long extending between the South CBD Parking Complex at Jennings Street and West Vickery Boulevard, and a park-and-ride lot at West Berry Street and Cleburne Road. For most of its length, the commuterway route is located within and along the right-of-way of the Gulf-Colorado & Santa Fe Railroad, and along the right-of-way of the Texas and Pacific Railway.

DEFECTS OF THE ORIGINAL ROUTE

SYSTEM IMBALANCE

Figure 5.1 shows the original Fort Worth Subregional Transit System and projected 1990 patronage figures of each line in the system. The Trans-Regional Line, which has an estimated 22,000 daily patronage is directly connected to the West Line, which has a projected daily patronage of 7000 riders. The East and Southeast Lines totaling 39,000 daily passengers are connected directly to the CBD subway at the south end, while the North Line with an estimated daily patronage of 9000 is the only line connected to the CBD subway at the north end. Passengers from the Southwest Line, which has an estimated daily ridership of 8000, must transfer at the South CBD subway station. That means an estimated daily patronage of 47,000 may enter the CBD subway from the south end while only 9000 may come from the north. This patronage imbalance may cause severe transit operational difficulty in train scheduling, train control, station circulation, and result in unreasonably high operational costs.

TRANSFER REQUIRED

The future Southwest Transitway will be terminated at the South Station. Passengers with downtown destinations will have to transfer to the CBD subway one level below at the same station. This will cause inconvenience and loss of time to numerous rush-hour passengers, resulting in decreased patronage.

NO ACCESS TO MAINTENANCE FACILITIES

Since the track of the future Southwest Transitway alignment will not be connected directly to any other lines, cars on this transitway will not be able to use the storage yard and maintenance shop located in the north parking area. A complete set of separated and expensive facilities will be required for the Southwest Line alone. For a branch line of short length, this would be economically unfeasible.

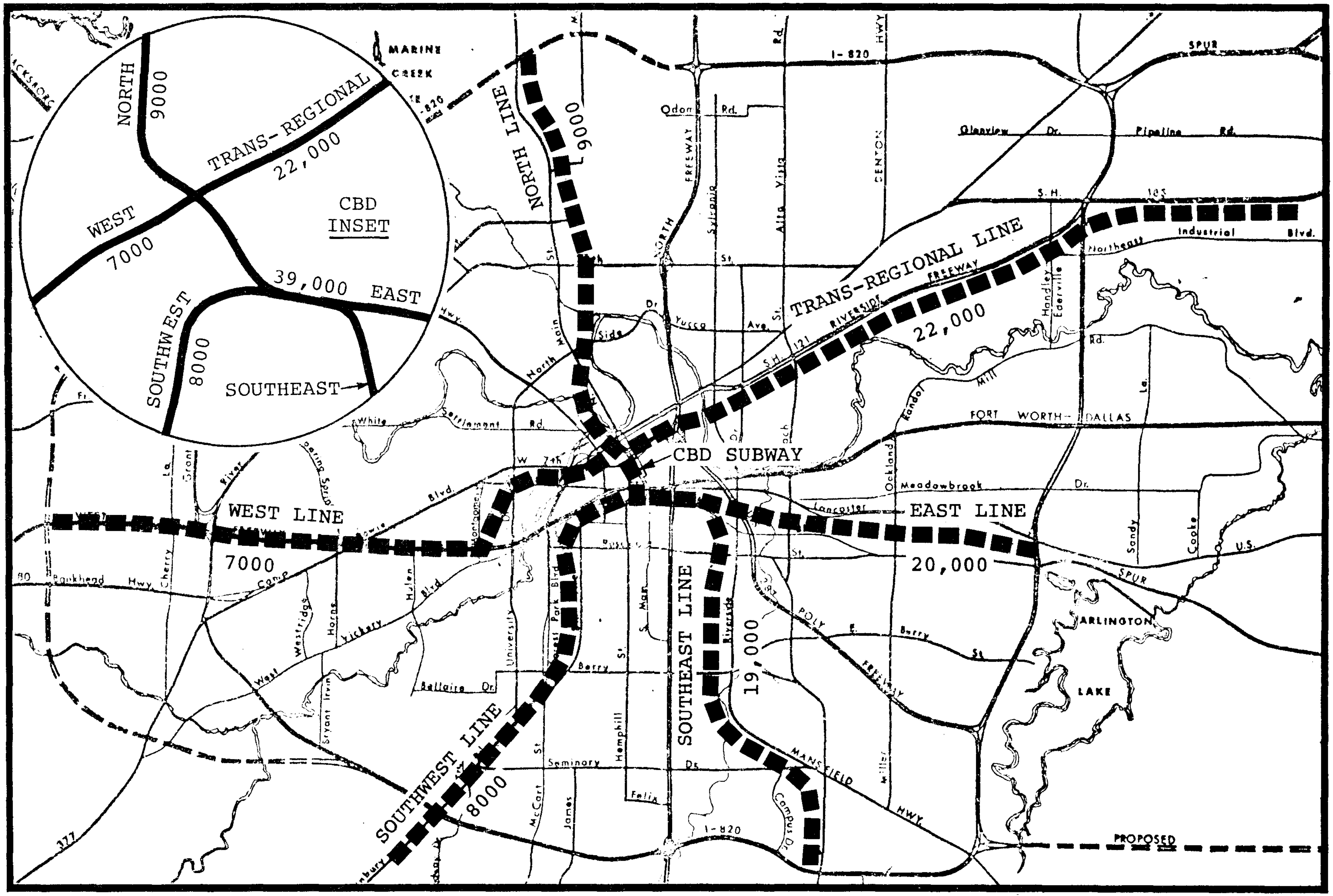


Fig. 5.1

ORIGINAL FORT WORTH SUBREGIONAL TRANSITWAY SYSTEM

INTERFERING RAILROAD OPERATION

North of Windsor Place, the 50-foot right-of-way of a single-tracked spur line of the Gulf-Colorado & Santa Fe Railroad extending approximately 1.4 miles must be acquired for the commuterway's exclusive use. This spur services several sidings along Javis Street and Vickery Boulevard and eventually connects to the Texas and Pacific Railway. If full cooperation could be obtained from the railroad companies, expensive compensation still must be paid for the right-of-way and loss of services. In addition, a new connection must be built for the two railroad lines.

TRAFFIC DISRUPTION DURING CONSTRUCTION

Three existing bridges carrying Summit Avenue, Ballinger Avenue, and Daggett Avenue above the railroad tracks must be reconstructed to accommodate the commuterway route. Major disruption to surface auto traffic and some railroad operations will be created during the construction. The reconstruction cost of the bridges will also be high.

ALTERNATIVE SOUTHWEST ROUTE

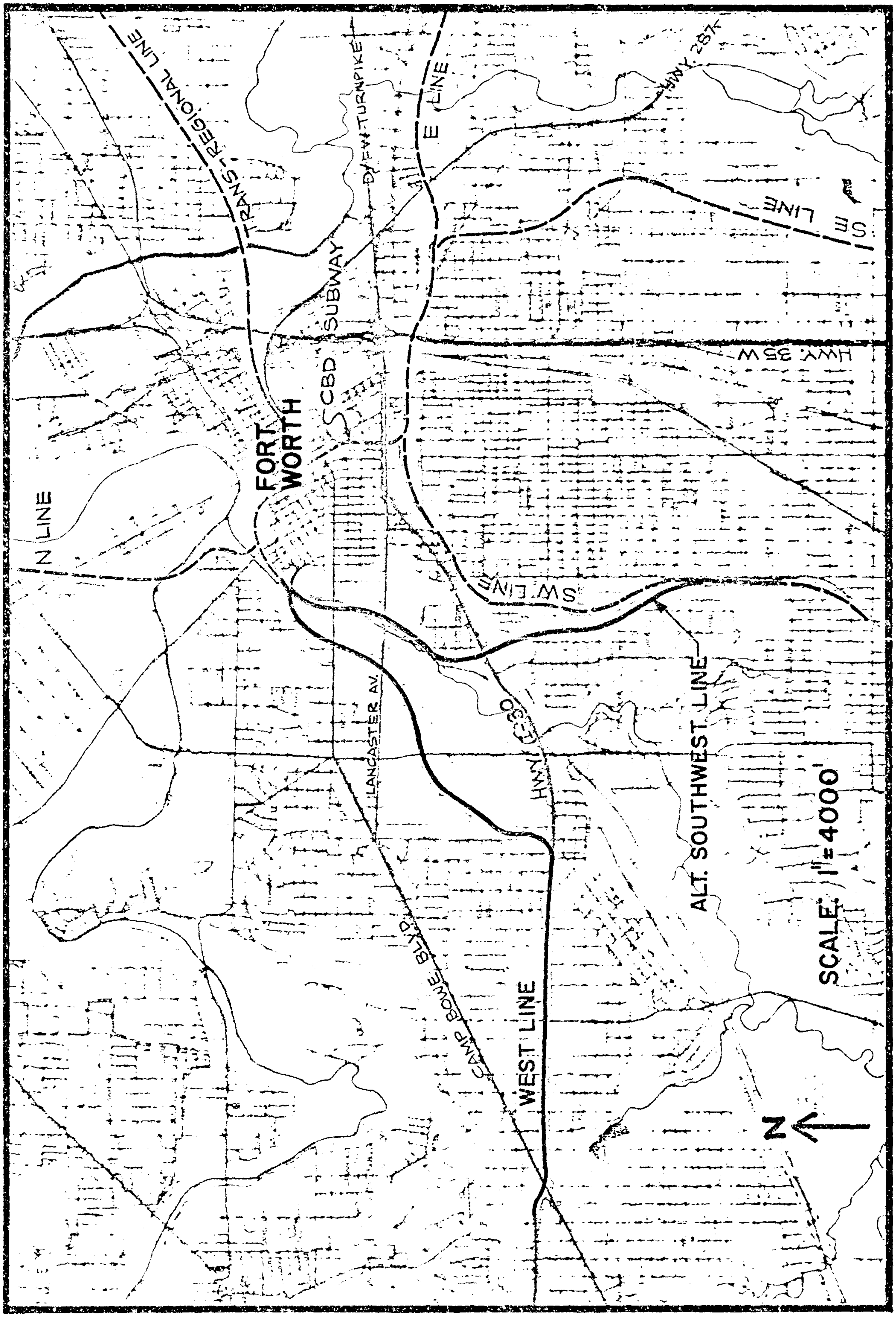
To eliminate the aforementioned defects, alternative routes have been examined to serve the Southwest corridor. The most serious defects of the original alignment are: undesirable passenger transfers, no access to maintenance facilities, and system imbalance. To correct this, first it must be possible to connect the line directly to the system. Secondly, the line must not be connected or terminated at the south end of the CBD Subway. The Southwest Line could be linked to the Trans-Regional Line via a subway through the west CBD. This is not a viable solution because of the same reasons as described under Highway Plans in Section IV. The only remaining alternative is to connect the Southwest Line to the north end of the CBD Subway.

After a careful study of aerial photographic maps and field reconnaissance, a feasible route which can provide the regional service but without most of the aforementioned defects has been found. The general location of this route is shown in Figure 5.2. Although this alternative line will deviate from the original route near Windsor Place, the actual transitway will vary only slightly from the length of the original alignment. The alternative line will follow the main line of the Gulf-Colorado & Santa Fe Railroad northeasterly, then will follow Forest Park Boulevard east of the Clear Fork of the Trinity River and will terminate at the west end of the North Parking Lot. When converted to a transitway, the Southwest Line can be linked directly to the tracks of the CBD Subway in the North Parking area.

This alignment can provide:

1. Better system balance. Figure 5.3 shows the new system arrangement which indicates a better patronage balance than the original system.

2. Direct service to CBD. No transfer will be required after being converted to transitway.



SELECTED ROUTE LOCATIONS

Fig. 5.2

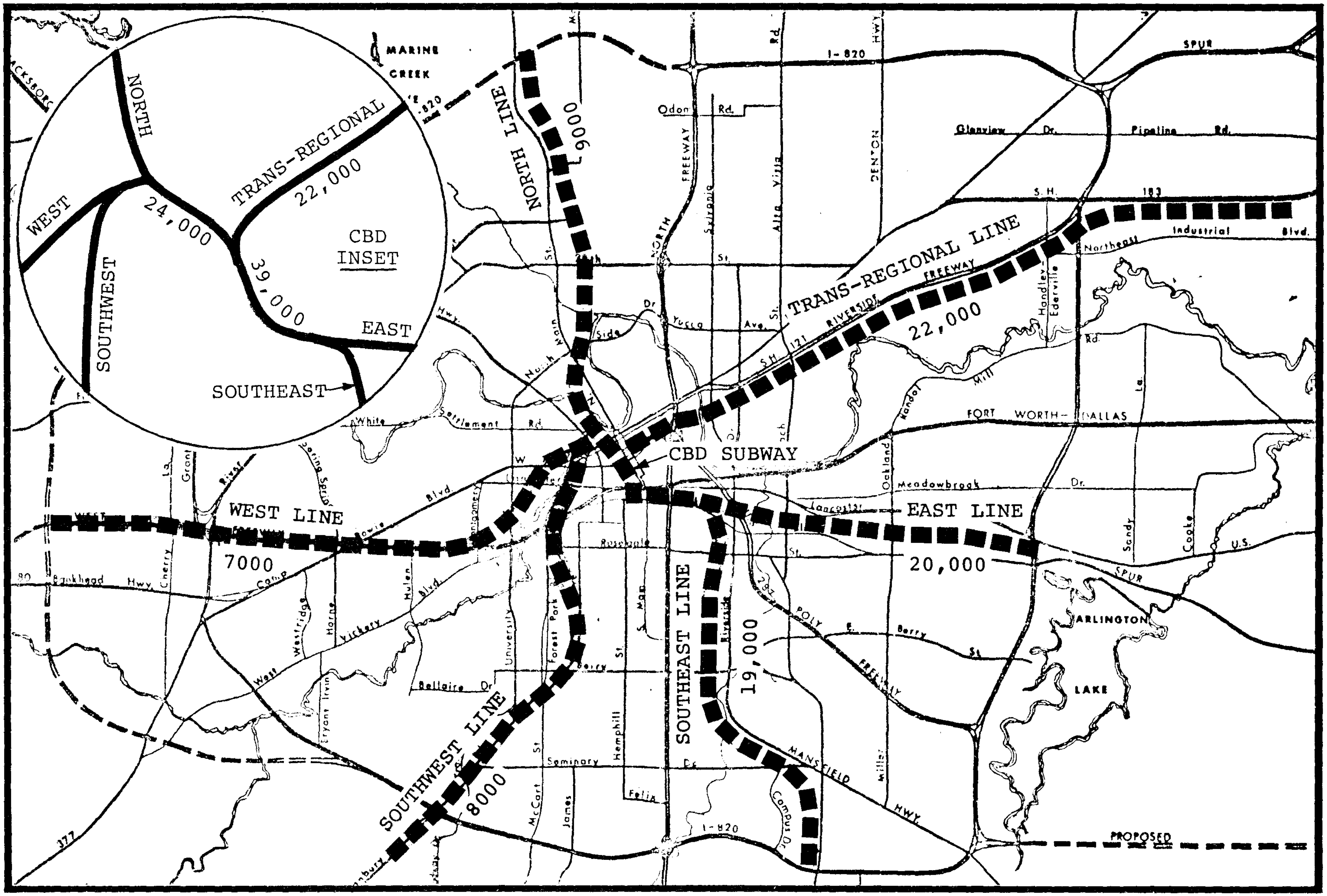


Fig. 5.3

PROPOSED REVISED FORT WORTH SUBREGIONAL TRANSITWAY SYSTEM

3. Access to maintenance facilities.

4. No interference to railroad operation. Removal of railroad tracks will no longer be necessary.

5. Less traffic disruption during construction. Some traffic disruption on Vickery Boulevard is expected where a temporary detour must be used during the construction of a proposed new overpass at the existing railroad and Southwest Line crossing. Traffic flow will be greatly improved after the construction.

ALIGNMENT DESCRIPTION

The alignment of the Alternative Southwest Line is shown on Plan-Profile Sheet Nos. 6, 7, and 8 in Appendix A. The Alternative Line begins at Station 49+00 just north of Mitchell Avenue inside the Gulf-Colorado & Santa Fe Railroad yard west of 8th Avenue at grade level.

The line will rise gradually first onto a retained fill and then aerial structures to cross over Windsor Place and railroad tracks which may require some minor shifting to accommodate the commuterway structures. It will then curve northeasterly to follow the main line of the Gulf-Colorado & Santa Fe Railroad along the western edge of a lumber yard. The elevated line skews over to the west side of the railroad track while crossing over Park Place Drive. North of Park Place Drive, the line will start to descend down to grade level in a strip of undeveloped land between the railroad and the Lily B. Clayton Elementary School. It will then run parallel to and along the west side of the railroad northerly at about the railroad track's grade. The line will grade-cross Mistletoe Boulevard which therefore must be closed at the crossing. Continuing northerly at grade, the line will cross under the existing Rosedale Street overpass and an existing Texas and Pacific Railway bridge. The commuterway can just go through an existing span of the street overpass while some minor modification is needed on the railroad bridge to accommodate the crossing.

A bus ramp will be provided to connect Rosedale Street at Jerome Street to the Commuterway. A future transit station may be located just south of Rosedale Street.

To the north of the Texas and Pacific Railway bridge, the Gulf-Colorado & Santa Fe Railroad crosses Vickery Boulevard at-grade. Since the commuterway will be at grade in this area, a new overpass is proposed for Vickery Boulevard to provide full grade-separation. Then the commuterway will cross under the East-West Freeway through an existing span opening. After clearing the freeway structure, the line will rise onto an elevated structure and swing northeasterly cresting over the railroad track and then descend to grade level to follow Forest Park Boulevard along its east side. A railroad spur of about 700 feet located near the elevated commuterway structure must be shifted slightly.

The commuterway will cross under West Lancaster Avenue through an existing span opening and then skew northerly leaping over to the west side of Forest Park Boulevard. It will then be lowered to grade level again and run through a span opening under the existing West 7th Street Bridge. North of West 7th Street, the line will be on retained fill or low structures running through a strip of low ground between the Trinity River and Forest Park Boulevard. The Line will then be carried on a bridge over a drainage channel and run into the North Parking Lot which is its north terminus. In the future, when being converted into fixed-rail transit, the Southwest Line can be linked directly at this location to the CBD Subway.

COMMUNITY AND ENVIRONMENTAL IMPACTS

No specific problems are experienced at the very beginning of the line as it diverges from the previous alignment. The line will start in a railroad yard next to 8th Avenue, and thus being between an active rail facility and a busy urban highway, any impacts can be absorbed by this environment. The following elevated portion will become dominant visually, but it will cross a district that is completely industrial; therefore, again, no influences out of character with the area can be identified.

The situation changes, however, over the next section. In this section, the alignment will descend to grade level and directly follow parallel to, and west of, the rail line, largely within the same right-of-way. At this point, the commuterway will directly abut the backyards of many residences. The occasional trains along this channel have never caused any appreciable concern but the steady motor vehicle noise and gaseous emissions so close to residences are likely to be perceived as detrimental. Furthermore, the new construction will require the removal of a healthy growth of trees and bushes all along the rail line. This will be a visual loss, as well as a noise screen loss. It is even possible that some land will have to be taken from backyards to accommodate the vehicular channel. In addition, Mistletoe Street would have to be closed to eliminate a grade crossing, but this should not generate significant inconvenience because of the different characters of the adjoining neighborhoods.

It is believed that these problems can all be dealt with in physical design and economic compensation terms, but these conditions certainly highlight the rather serious concerns that are likely to emerge.

In the section between Rosedale Street and the Trinity River, the environmental character changes again. The district is heavily commercial in nature. While there are several challenging physical construction problems in the area, no environmental or visual disturbances would be generated.

The last portion along the Trinity River is again completely different. The line has to run longitudinally within the flood plain which is quite free from visual obstructions. The openness of the space between levees cannot tolerate too much of an intrusion. The commuterway parallels Forest Park Boulevard; a bridge crossing is required, and the channel cannot be completely at grade either because of flooding dangers.

Thus, the new facility will have to receive careful urban design inputs to allow a harmonious coexistance with its environment. Throughout the entire length of this route, not a single family has to be displaced or major structure removed. There are, however, environmental and visual problems of some significance.

The conversion of the commuterway to transit operations could cause similar effects as discussed in connection with the West Line.

COST ESTIMATE

RIGHT-OF-WAY COST

The cost of right-of-way for the Southwest Line was estimated by the City of Fort Worth staff. The total cost is estimated to be $1,400,000. The estimate was based on approximate right-of-way lines drawn on 1" = 400' scale City property maps. The right-of-way costs include land and improvements, if any, and any necessary easements at 1976 price levels. The cost does not include any State-owned or City-owned lands.

CONSTRUCTION COST

The preliminary construction cost estimate was performed by Carter & Burgess, Inc. of Fort Worth. The total construction cost is estimated to be $22.6 million at Spring 1976 price levels. This cost includes all new construction, engineering/architectural design, construction supervision, and contingencies.

TOTAL COST

Total cost of the Alternate Southwest Line Commuterway is estimated to be $24 million. The anticipated sources of funds are listed as follows:

Federal Grant (80%)	$19,200,000
State Grant (13%)	3,120,000
Local Share (7%)	1,680,000
Total	$24,000,000

If the City uses bond funding to secure its $1,680,000 contribution, it is anticipated that a 6 percent interest rate could be obtained on 25-year term bonds backed by the full faith and credit of the City. A standard amortization schedule indicates an annual cost of $129,900 to meet the interest and bond redemption schedule.

CONSTRUCTION SCHEDULE AND CASH FLOW

Figure 5.4 shows the construction schedule and cash flow.

ITEMS	COST (In $1000) WEST LINE	COST (In $1000) ALT. SW LINE
ENGINEERING:		
DESIGN	1,310	1,150
CONSTRUCTION SUPERVISION	600	520
RIGHT-OF-WAY ACQUISITION	600	1,400
BIDDING & CONTRACT	—	—
CONSTRUCTION	23,900	20,950
TOTAL COST	26,410	24,020

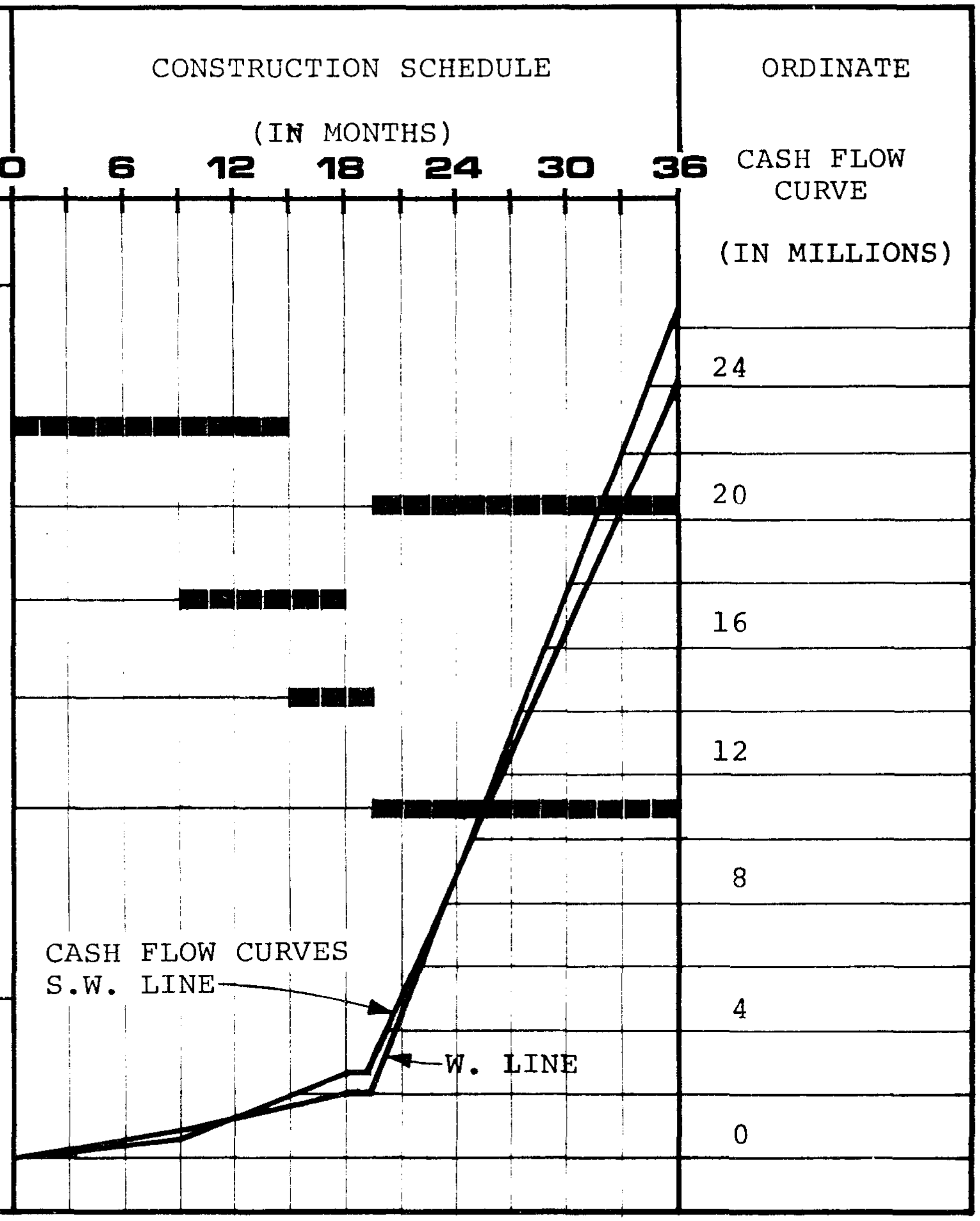


Fig. 5.4

CONSTRUCTION SCHEDULE AND CASH FLOW

VI. CONCLUSIONS

DRAWINGS

A set of eight sheets of plan/profile drawings was prepared and is included as Appendix A. These drawings show the horizontal and vertical alignments of the West and Alternative Southwest Commuterway Lines.

A second set of three drawings showing prototypical designs of line structures was also prepared. These drawings were used as a basis for establishing right-of-way requirements and for developing cost estimates.

SELECTED ALIGNMENTS

The selected alignments lie generally within the corridors shown in the Greater Fort Worth Transit Program. However, for reasons discussed earlier in Sections IV and V, both lines deviate from the original plan at their CBD ends. These deviations are as follows:

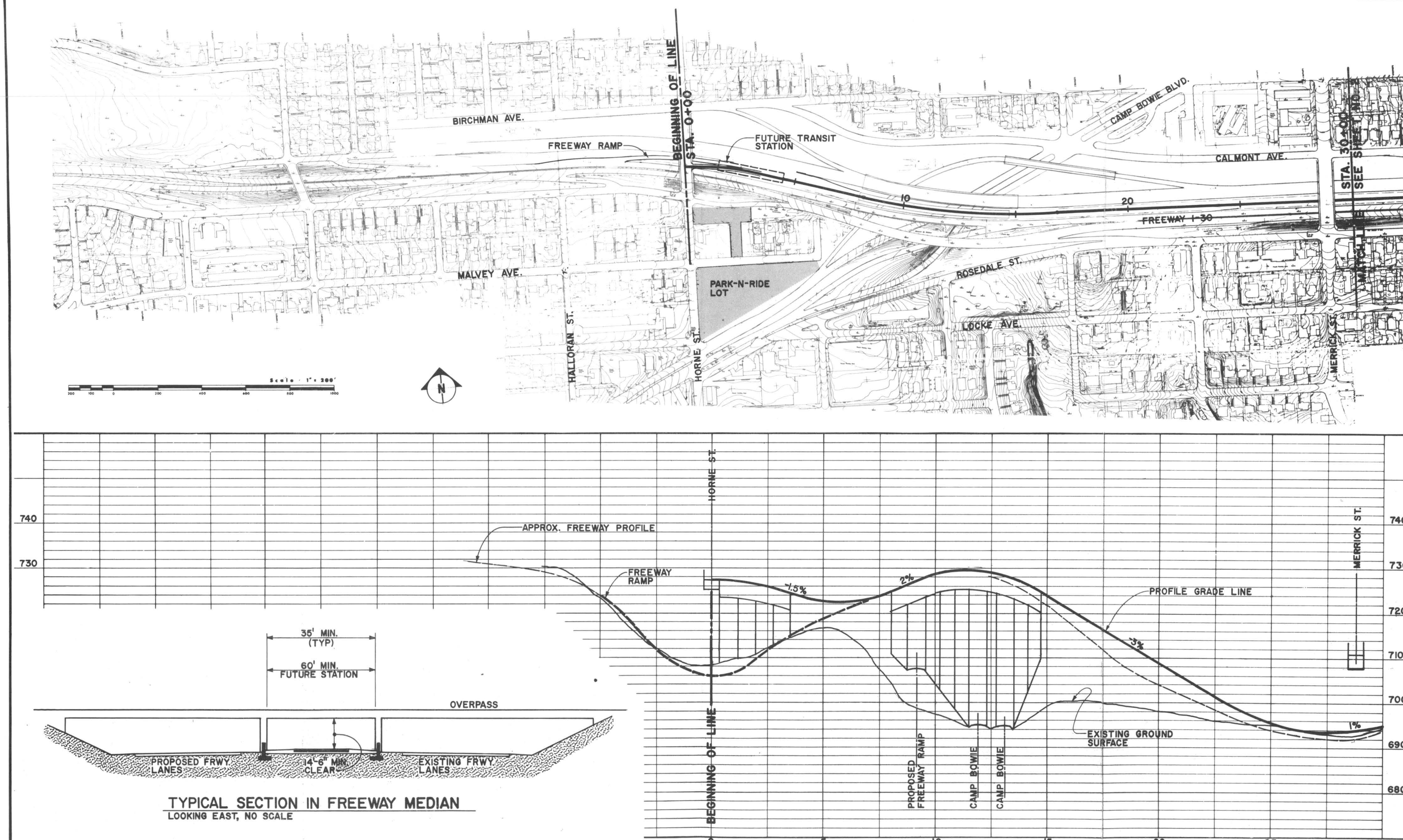
1. The West Line would be connected to the CBD subway at the North Parking Lot instead of at the U-TACV (Trans-Regional Line)

2. The Southwest Line is also connected to the CBD subway at the North Parking Lot instead of terminating at the South Station.

ENVIRONMENTAL ISSUES

While a full environmental impact analysis has not been performed (nor would it have been possible at this stage), a concerted effort has been made to outline and draw attention to various associated secondary environmental features and consequences.

APPENDIX A – DRAWINGS



NO	REVISION	BY

FILE NO.

JOINT REGIONAL PUBLIC TRANSPORTATION STUDY

The preparation of this study was financed in part through a grant from the URBAN MASS TRANSPORTATION ADMINISTRATION, UNITED STATES DEPARTMENT OF TRANSPORTATION

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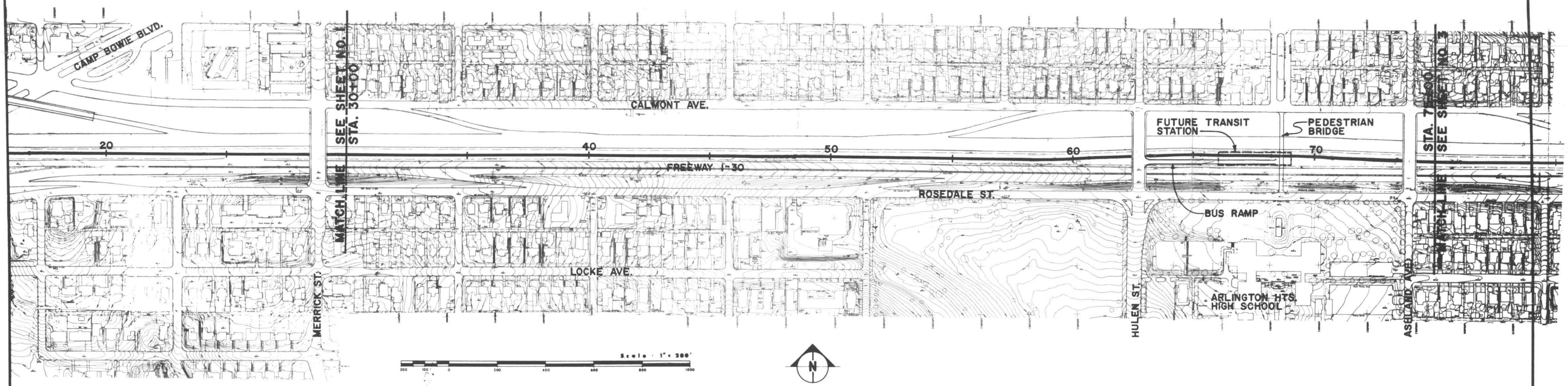
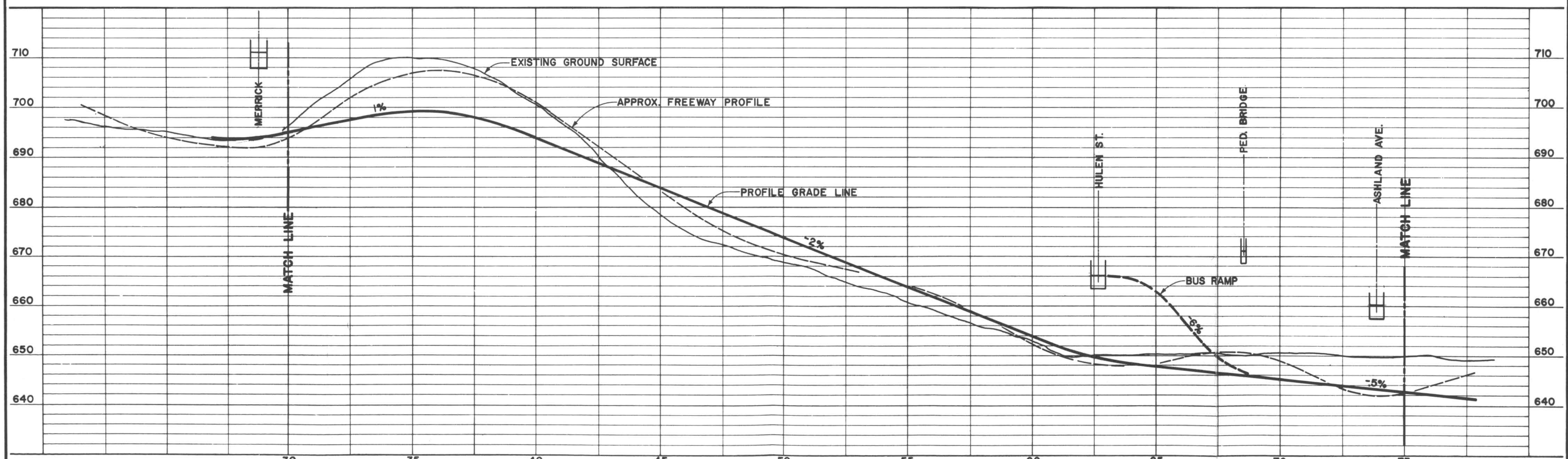
FORT WORTH PRELIMINARY ENGINEERING STUDIES

WEST LINE COMMUTERWAY PLAN-PROFILE

SHEET 1 OF 5

DATE: 4-15-76
SCALE: H: 1" = 200' V: 1" = 10'
SHEET NO. 1
1 OF 11





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WEST LINE COMMUTERWAY PLAN-PROFILE

SHEET 2 OF 5

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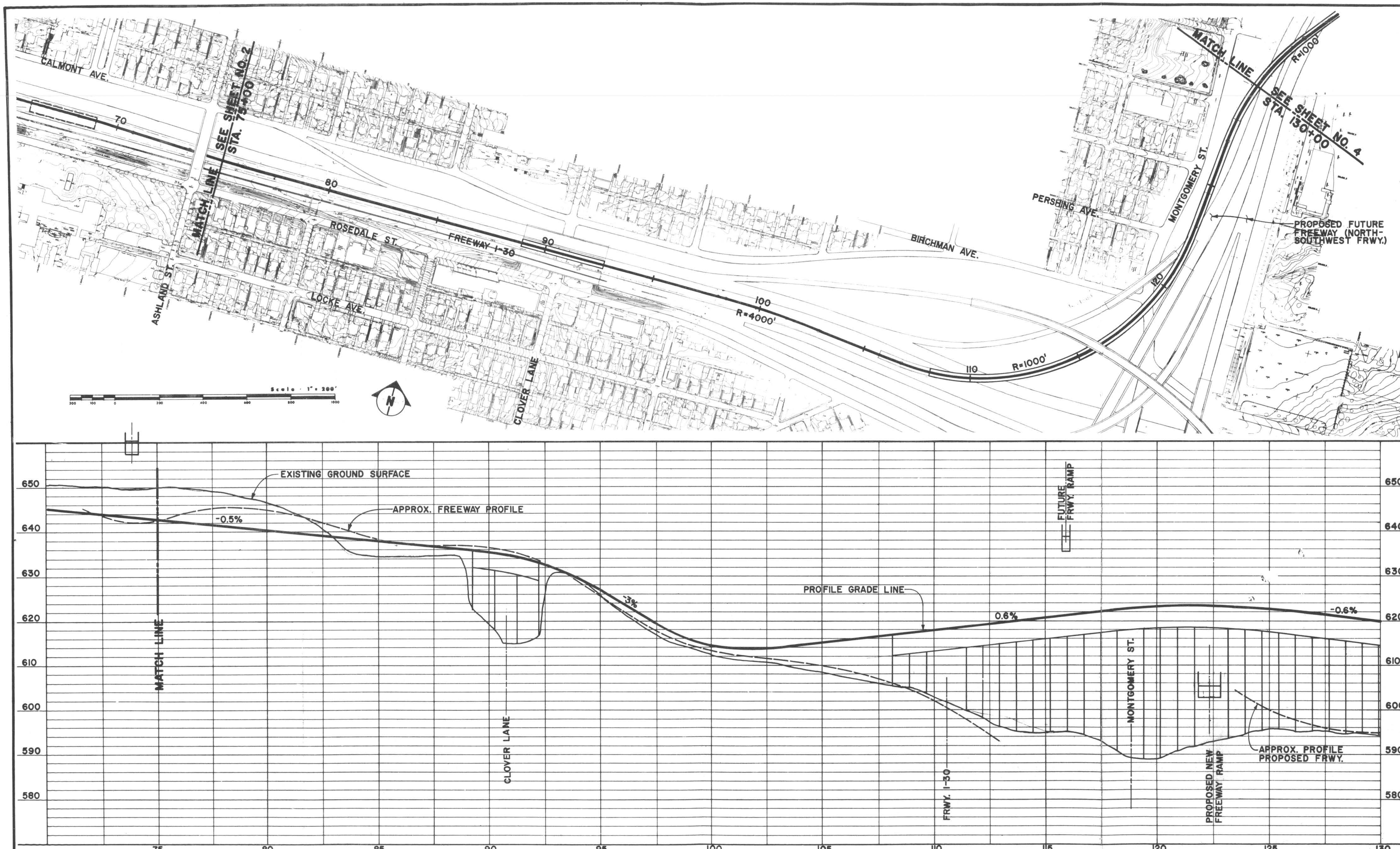

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SHEET 3 OF 5

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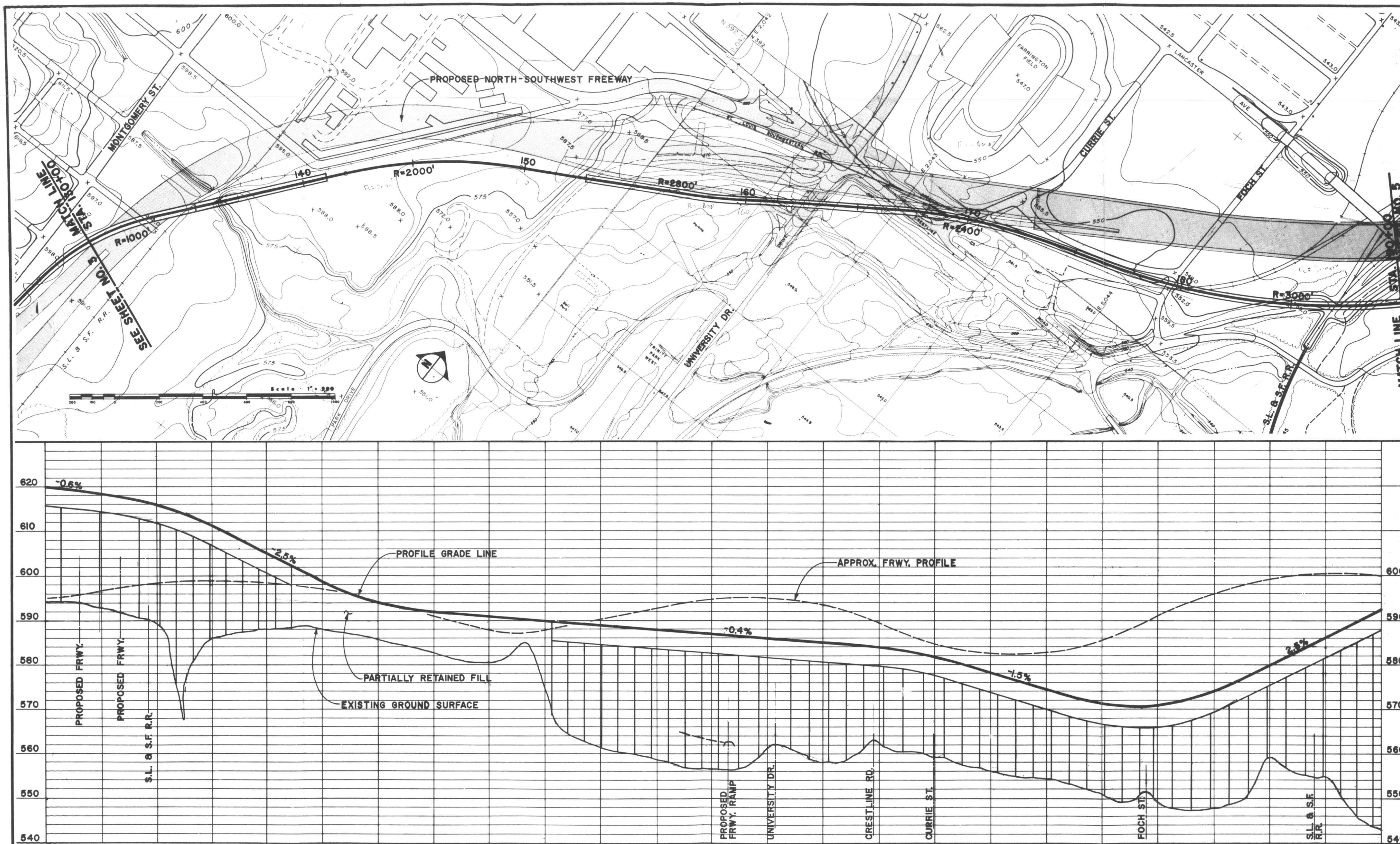

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ARLINGTON, TEXAS 76011

FORT WORTH PRELIMINARY ENGINEERING STUDIES

WEST LINE COMMUTERWAY PLAN-PROFILE

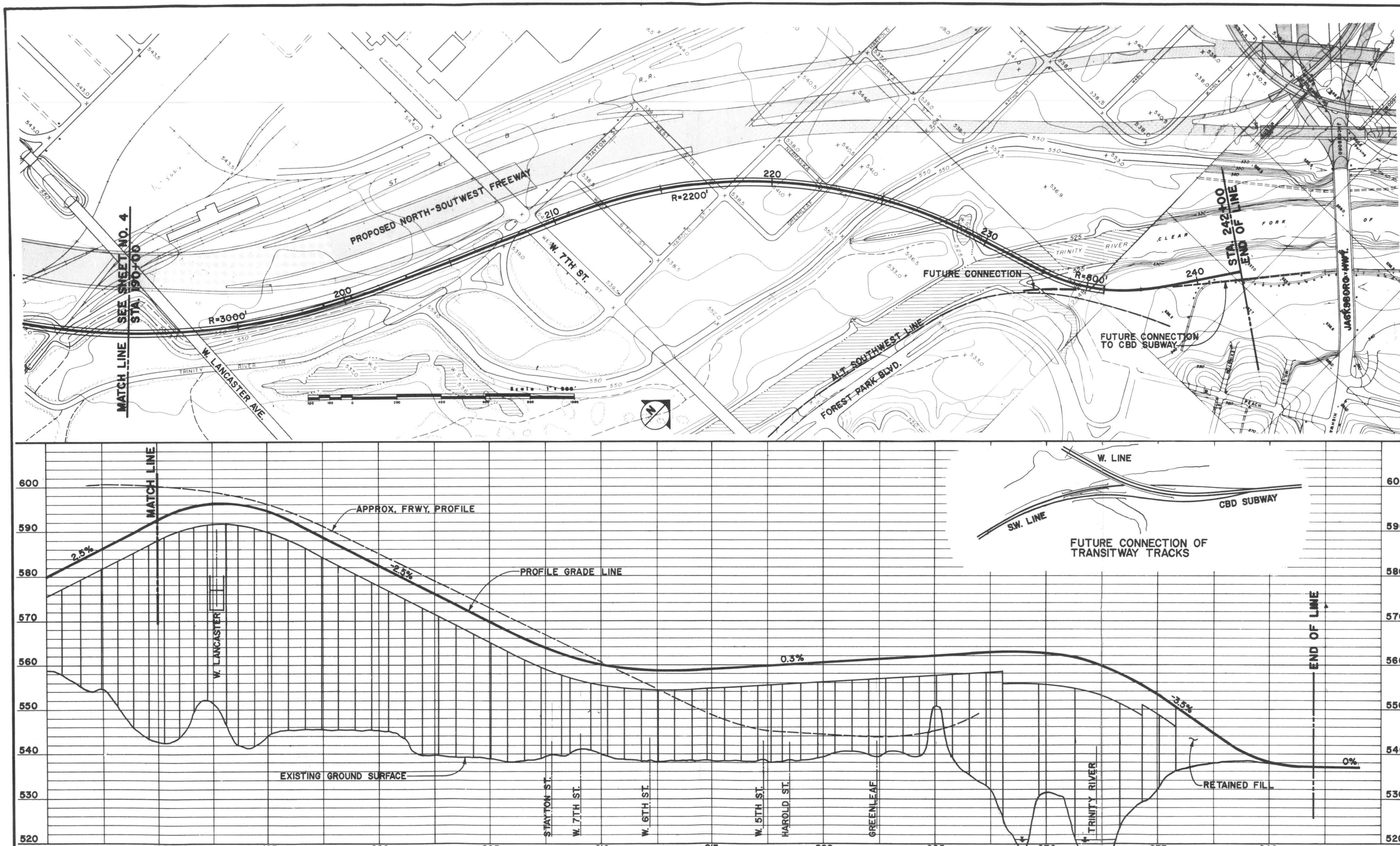
SHEET 4 OF 5

DATE: 4-15-76

SCALE: H: 1"=200' V: 1"=10'

SHEET NO. 4

4 OF 11



NO.	REVISION	BY	DATE

FILE NO.

JOINT REGIONAL PUBLIC TRANSPORTATION STUDY

The preparation of this study was financed in part through a grant from the URBAN MASS TRANSPORTATION ADMINISTRATION, UNITED STATES DEPARTMENT OF TRANSPORTATION

STATE OF TEXAS — REGISTERED PROFESSIONAL ENGINEER — 27481

DESIGNED BY: K. TANG
CHECKED BY: M. KOHN
DRAWN BY: R. SPRINGER
CHECKED BY: K. TANG

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FORT WORTH PRELIMINARY ENGINEERING STUDIES

WEST LINE COMMUTERWAY PLAN-PROFILE

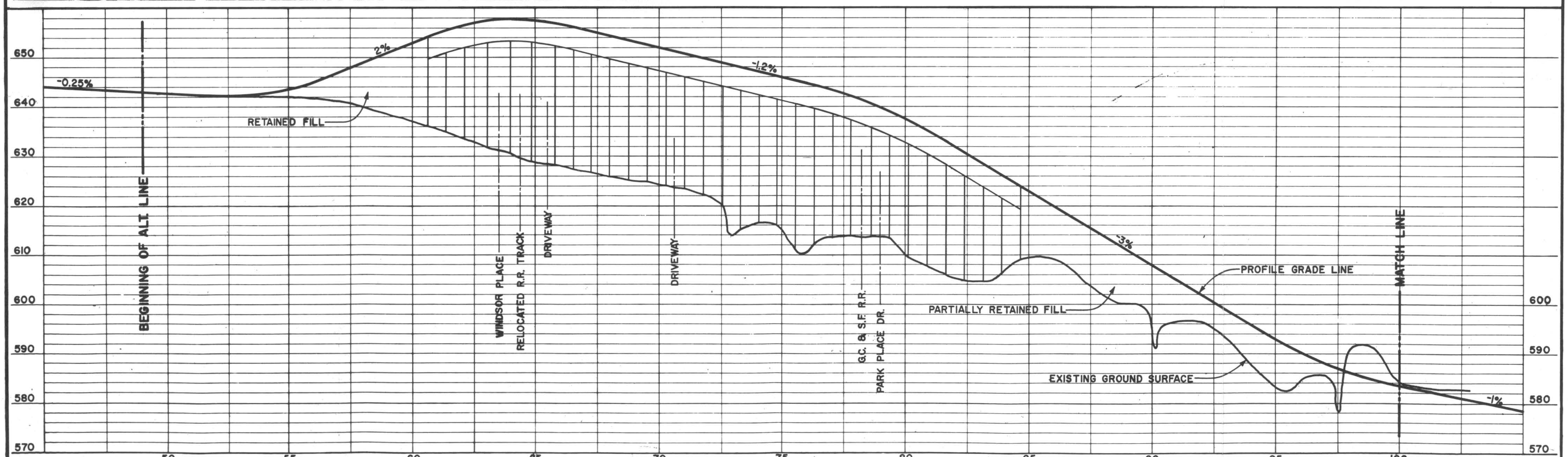
SHEET 5 OF 5

DATE: 4-15-76

SCALE: H: 1"=200' V: 1"=10'

SHEET NO. 5

5 OF 11



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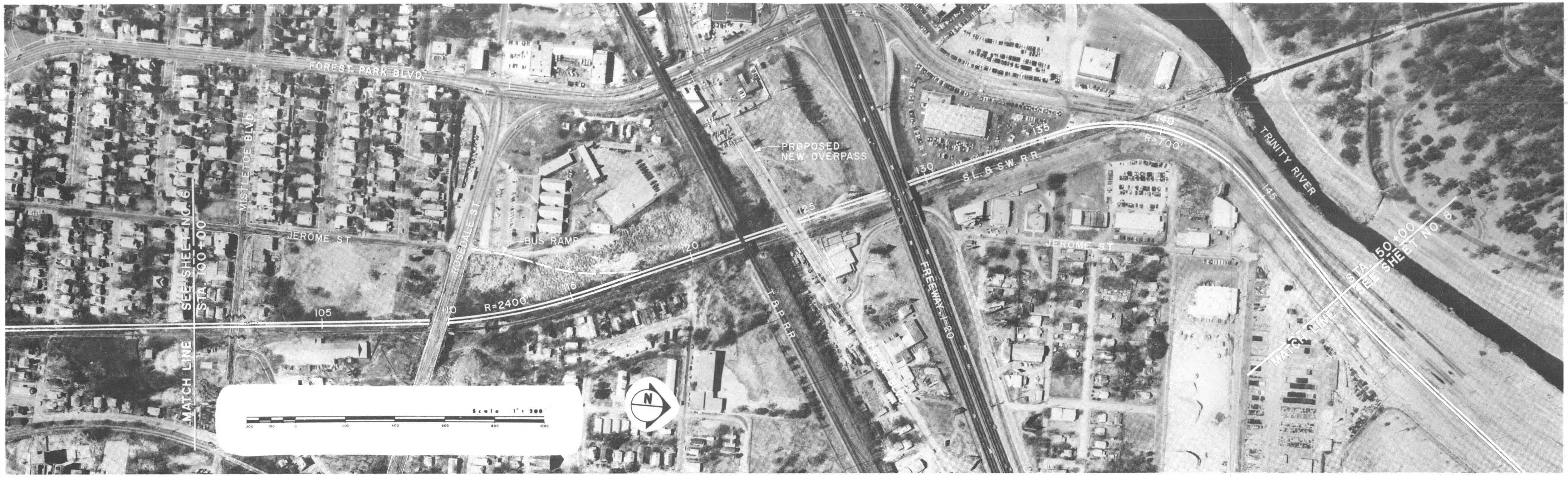
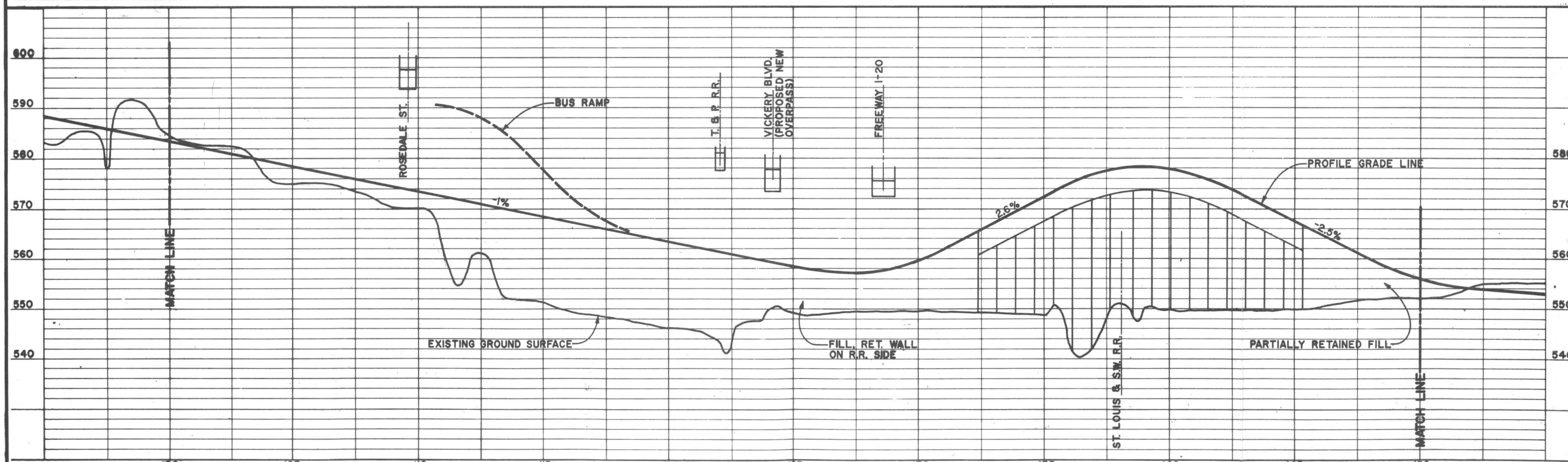
FORT WORTH PRELIMINARY ENGINEERING STUDIES

SOUTHWEST LINE COMMUTERWAY
(ALTERNATE ROUTE)
PLAN-PROFILE

SHEET 1 OF 3

DATE: 4-15-76
SCALE: H: 1"=200' V: 1"=10'
SHEET NO. 6
8 OF 11





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STATE OF TEXAS — REGISTERED PROFESSIONAL ENGINEER

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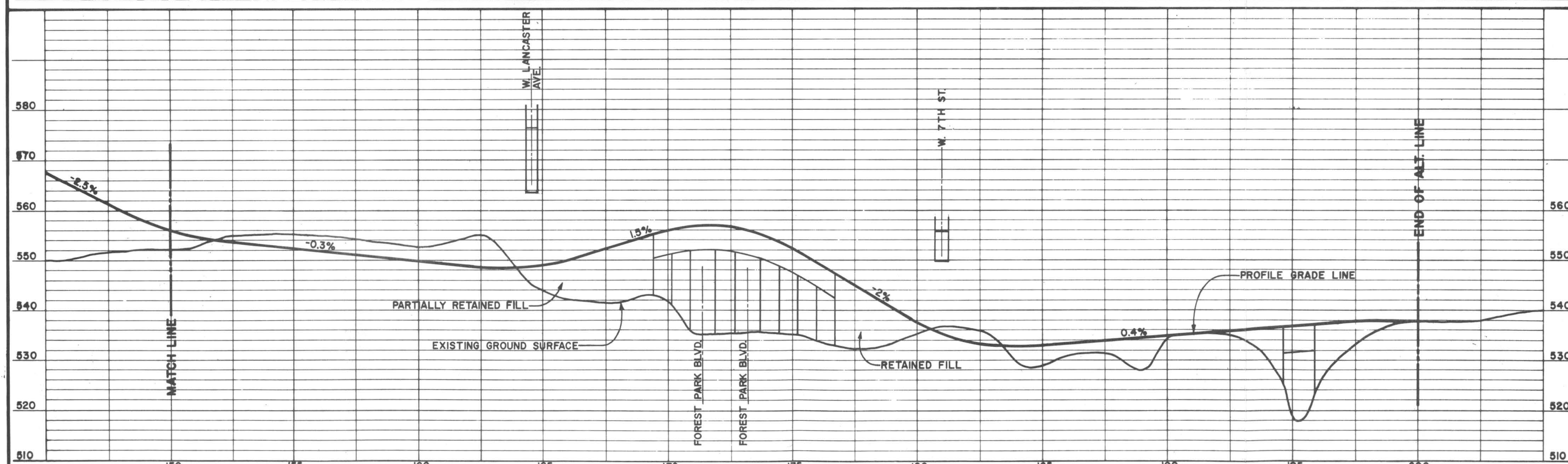
FORT WORTH PRELIMINARY ENGINEERING STUDIES

SOUTHWEST LINE COMMUTERWAY
(ALTERNATE ROUTE)
PLAN-PROFILE

SHEET 2 OF 3

DATE: 4-15-76
SCALE: H: 1"=200' V: 1"=10'
SHEET NO. 7
7 OF 11



NO.	REVISION	BY	DATE

FILE NO.

JOINT REGIONAL PUBLIC TRANSPORTATION STUDY

The preparation of this study was financed in part through a grant from the URBAN MASS TRANSPORTATION ADMINISTRATION, UNITED STATES DEPARTMENT OF TRANSPORTATION

STATE OF TEXAS · RICHARD ... · 27480 · REGISTERED PROFESSIONAL ENGINEER

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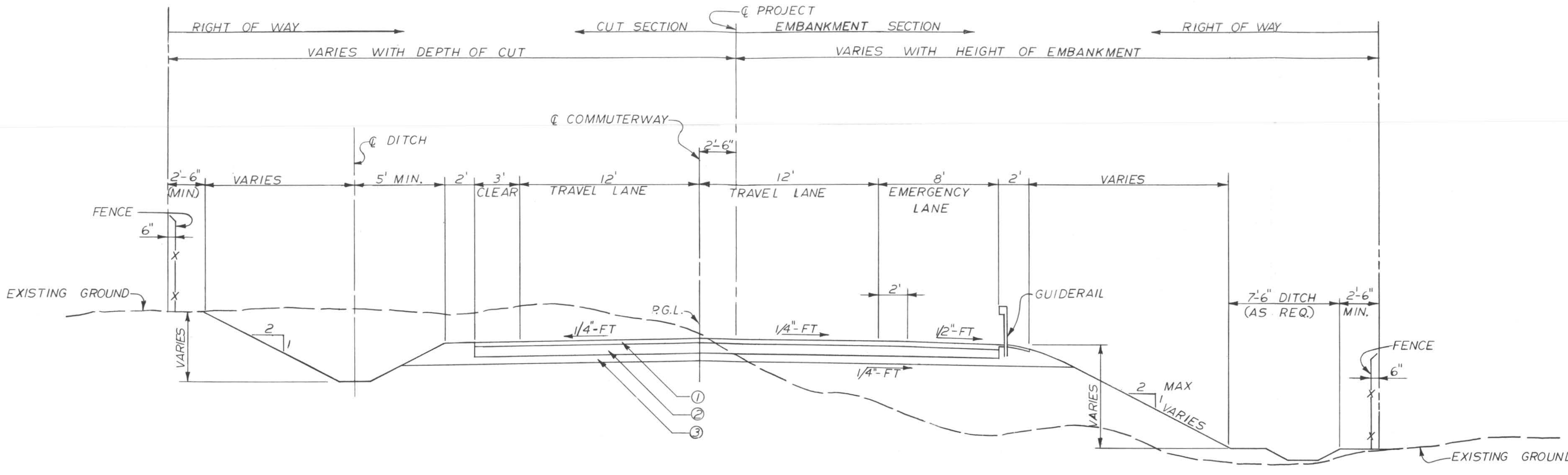
FORT WORTH PRELIMINARY ENGINEERING STUDIES

SOUTHWEST LINE COMMUTERWAY
(ALTERNATE ROUTE)
PLAN-PROFILE

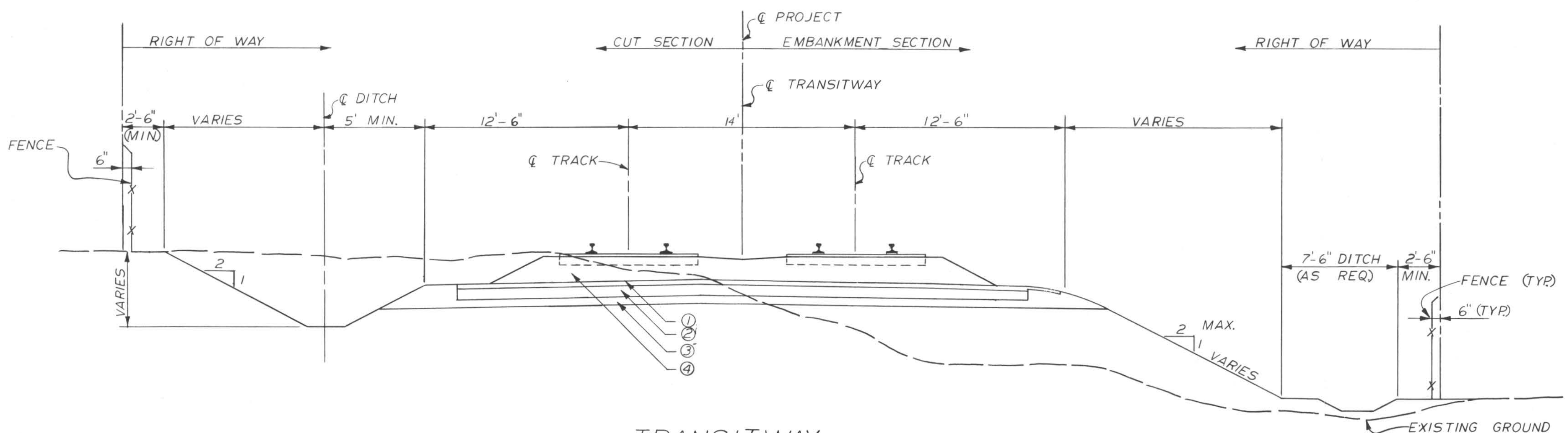
SHEET 3 OF 3

DATE: 4-15-76
SCALE: H: 1"=200' V: 1"=10'
SHEET NO. 8
8 OF 11



COMMUTERWAY
UNRETAINED SECTION
(TANGENT ALIGNMENT)

① BITUMINOUS CONCRETE PAVEMENT SURFACE
② BITUMINOUS CONCRETE BASE
③ LIME STABILIZED BASE
④ STONE BALLAST



TRANSITWAY
UNRETAINED SECTION
(TANGENT ALIGNMENT)

NOTE: DESIGN AS SHOWN IS PRELIMINARY

NO.	REVISION	BY	DATE
	FILE NO.		

JOINT REGIONAL PUBLIC TRANSPORTATION STUDY

The preparation of this study was financed in part through a grant from the URBAN MASS TRANSPORTATION ADMINISTRATION, UNITED STATES DEPARTMENT OF TRANSPORTATION

STATE OF TEXAS — P. H. GILBERT — 36564 — REGISTERED PROFESSIONAL ENGINEER

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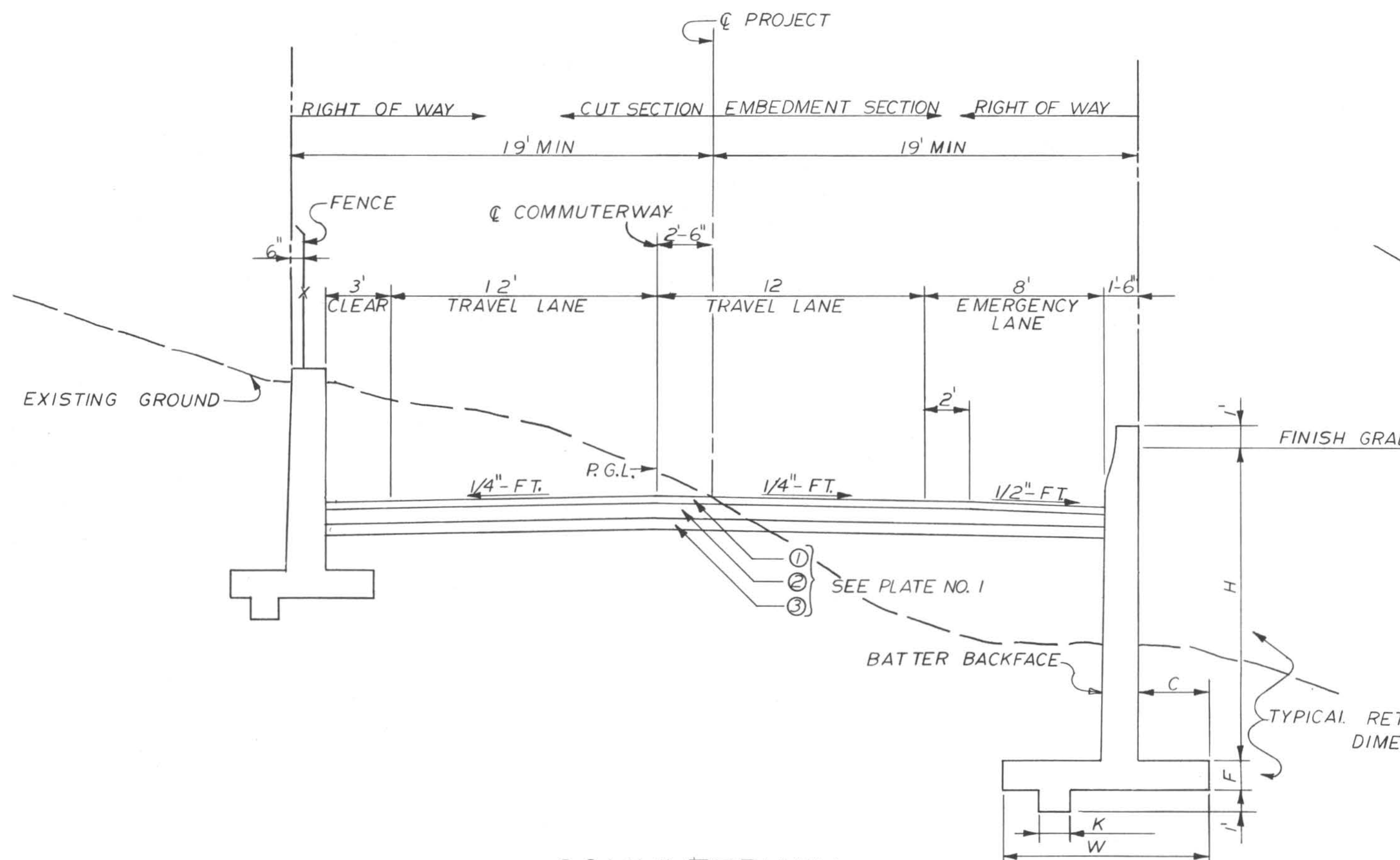
FORT WORTH COMMUTERWAY STUDY

TYPICAL SECTIONS

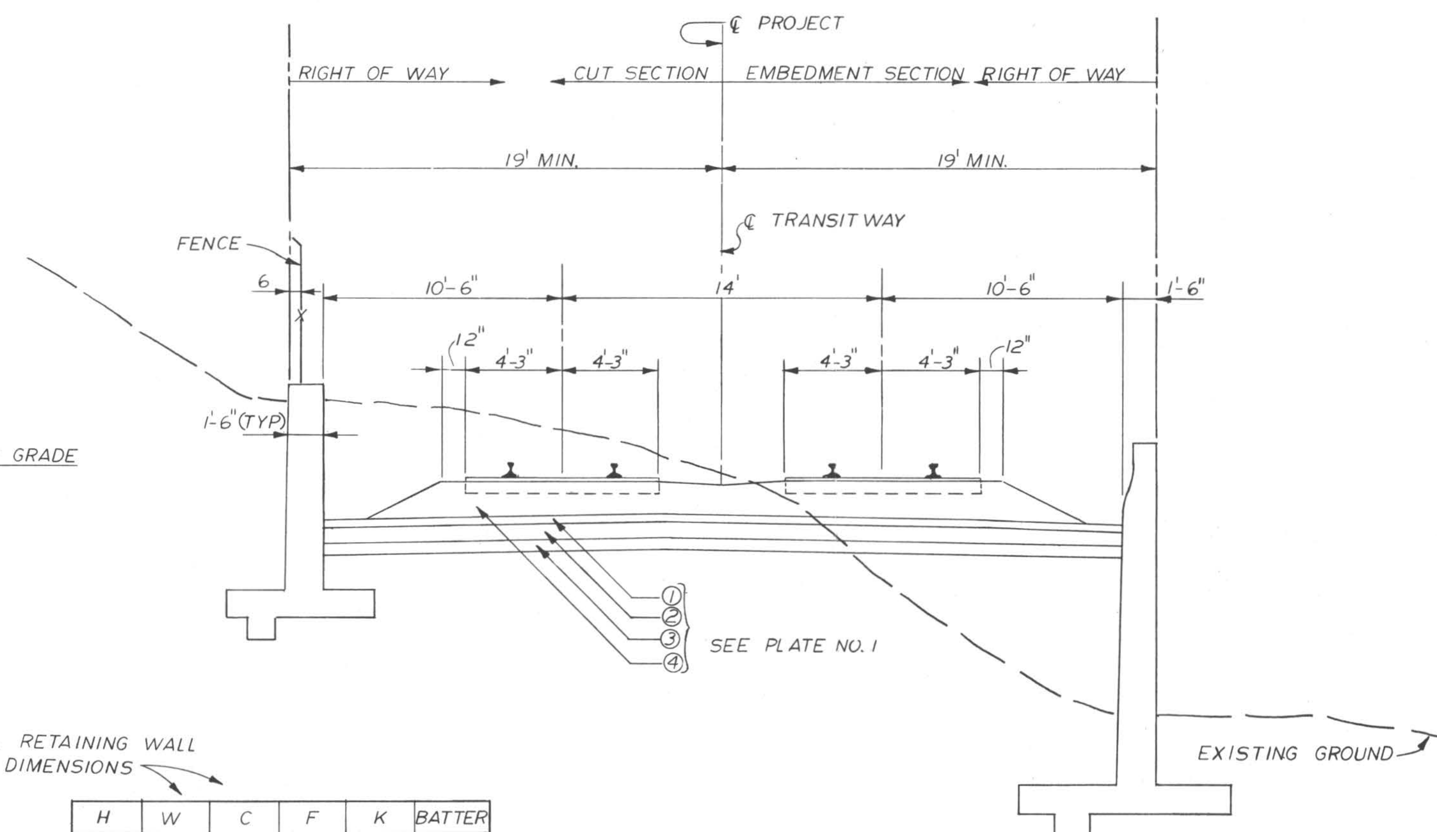
DATE: AUGUST 1974
SCALE: NO SCALE
PLATE NO. 9 OF 11



COMMUTERWAY
RETAINED SECTION
(TANGENT ALIGNMENT)

TYPICAL RETAINING WALL DIMENSIONS

H	W	C	F	K	BATTER
6FT.	3'-10"	1'-4"	1'-2"	1-3	1/4:12
8	5'-2"	1'-9"	"	"	"
10	6'-6"	2'-3"	"	"	"
12	8'-0"	2'-9"	"	"	"
14	9'-3"	3'-2"	1'-4"	1-6	"
16	10'-6"	3'-6"	1'-8"	"	1/2:12
18	12'-0"	4'-0"	1'-10"	1-9	"
20	14'-0"	4'-9"	2'-1"	2-0	"
22	16'-0"	5'-9"	2'-4"	2-0	3/4:12
24	18'-3"	6'-9"	2'-7"	2-3	"



FUTURE
TRANSITWAY
RETAINED SECTION
(TANGENT ALIGNMENT)

NOTE: DESIGN AS SHOWN IS PRELIMINARY

NO.	REVISION	BY	DATE

FILE NO.

JOINT REGIONAL PUBLIC TRANSPORTATION STUDY

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STATE OF TEXAS — P. H. GILBERT — 36564 — REGISTERED PROFESSIONAL ENGINEER

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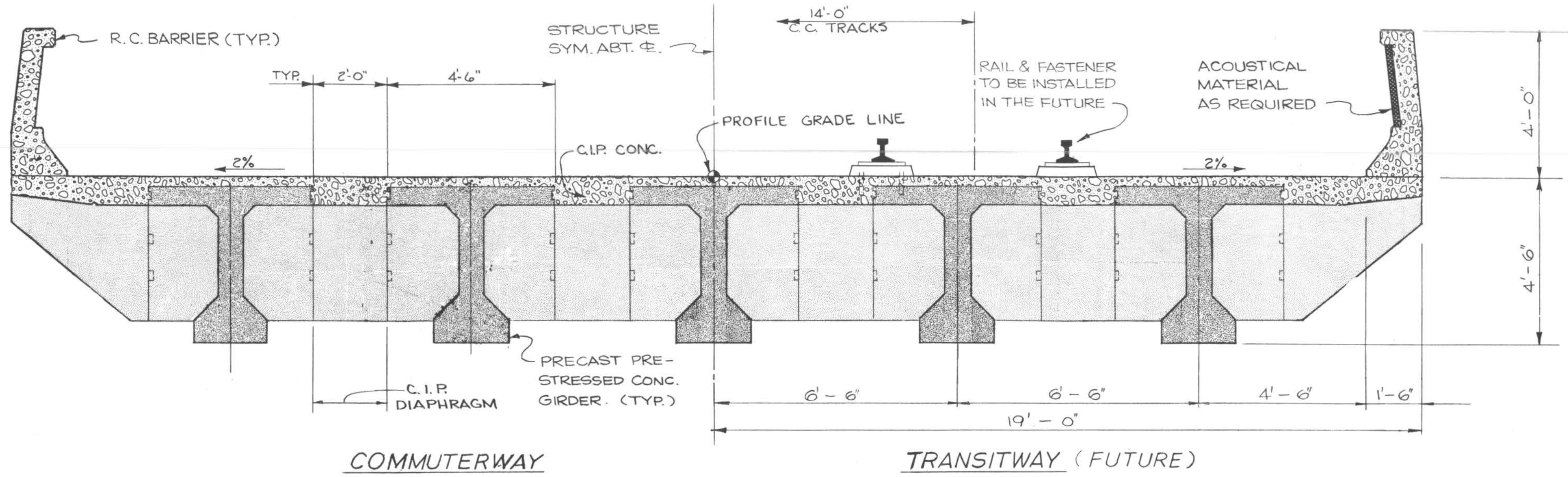
FORT WORTH COMMUTERWAY STUDY

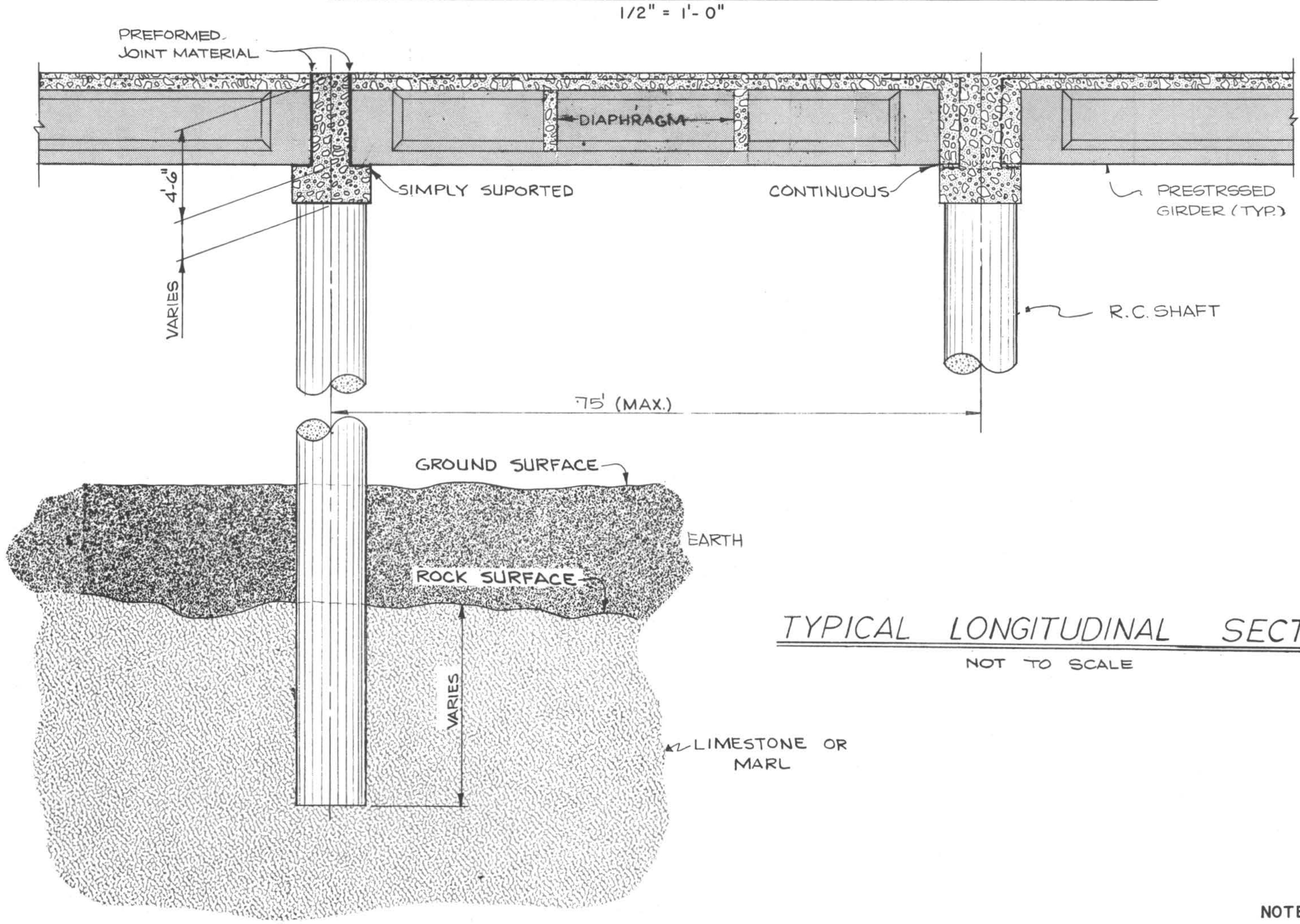
TYPICAL SECTIONS

DATE: AUGUST 1974
SCALE: NO SCALE
PLATE NO. 10 OF 11



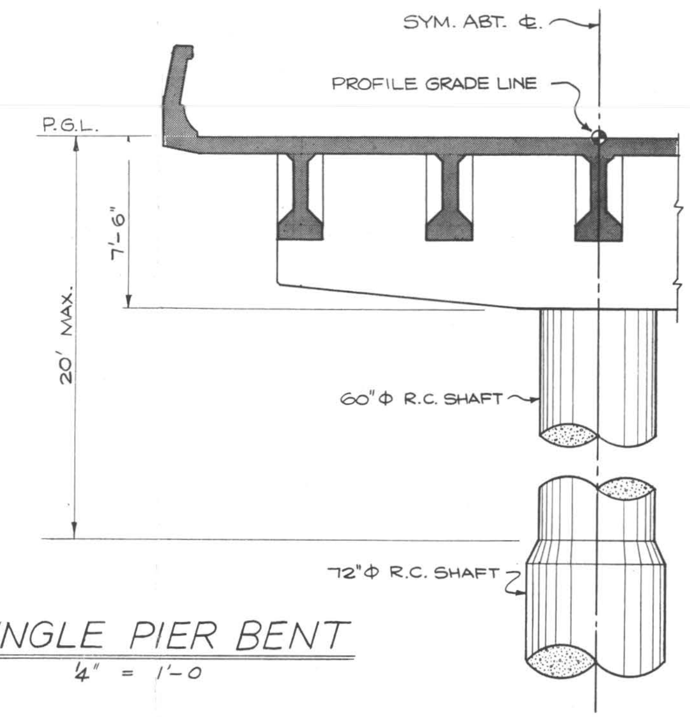
TYPICAL SECTION — SUPERSTRUCTURE

1/2" = 1'-0"



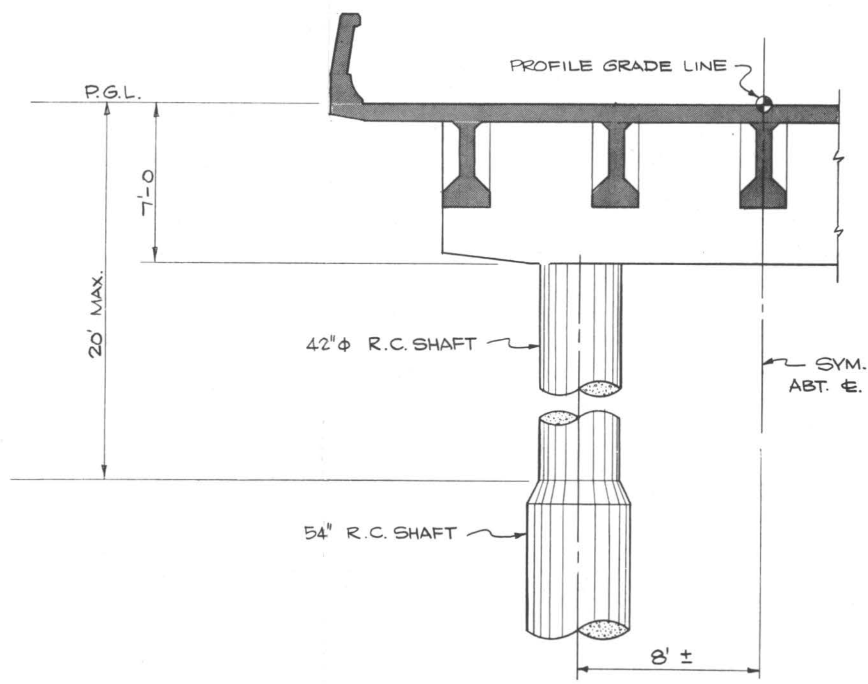
TYPICAL LONGITUDINAL SECTION

NOT TO SCALE



SINGLE PIER BENT

1/4" = 1'-0



DOUBLE PIER BENT

1/4" = 1'-0

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FORT WORTH COMMUTERWAY STUDY

TYPICAL ELEVATED STRUCTURE

DATE: AUGUST 1974
SCALE: AS NOTED
PLATE NO. 11 OF 11