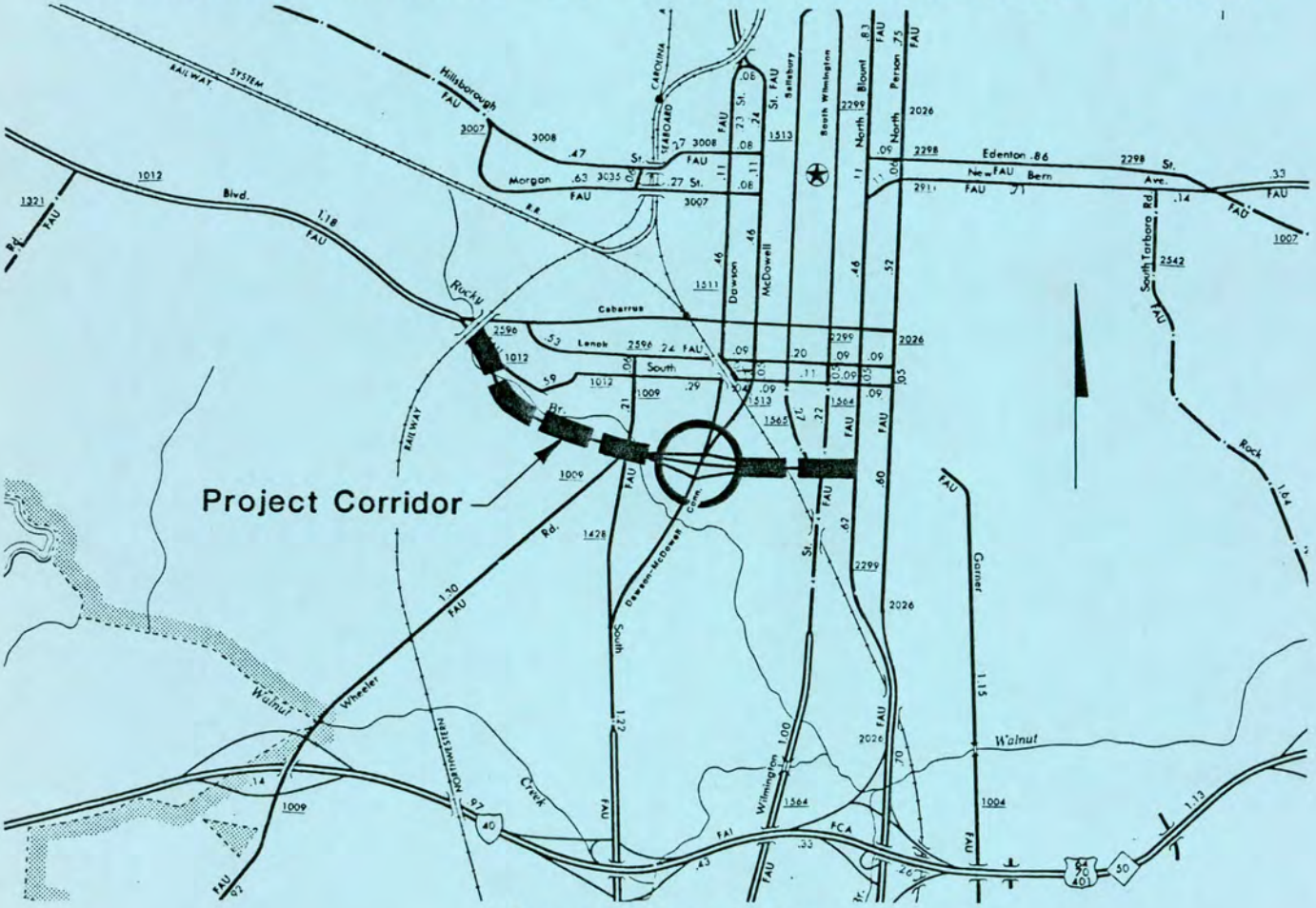
CITY OF RALEIGH

ENGINEERING STUDY REPORT
FOR
EXTENSION OF WESTERN BOULEVARD
CABARRUS STREET TO SOUTH WILMINGTON STREET



Location Map

PREPARED BY
RUMMEL,KLEPPER & KAHL
CONSULTING ENGINEERS
RALEIGH, NORTH CAROLINA

JANUARY,1989

WESTERN BOULEVARD EXTENSION
CABARRUS STREET TO SOUTH WILMINGTON STREET
RALEIGH, NORTH CAROLINA

A PRELIMINARY LOCATION STUDY AND ALTERNATIVE EVALUATION

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I. INTRODUCTION

A. General

This report presents the results and findings of an engineering highway study to determine the most feasible and cost-effective location for the Extension of Western Boulevard from its present terminus at Cabarrus Street to South Wilmington Street.

The transportation corridor for the proposed project begins in the vicinity of the Governor Morehead School on existing Western Boulevard, crosses under the existing Southern Railroad Bridge and follows eastwardly along the general alignment of the existing Dorothea Drive and the Rocky Branch of Walnut Creek. Extending eastwardly, the corridor crosses South Saunders Street, the recently completed Dawson/McDowell Extension, and connects to South Wilmington Street at the intersection of existing Smithfield Street. The Wilmington/Smithfield intersection is the western terminus for the future Martin Luther King Jr. Boulevard. The route provides a direct east-west connection, from existing Western Boulevard to Martin Luther King, Jr. Boulevard and southeast Raleigh bypassing the Boylan Heights area.

The initial efforts under this study review the factors contributing to the need and justification for a Western Boulevard extension as identified in the Raleigh Thoroughfare Improvement Plan.

The first step in the Location Analysis involves a development of feasible alternative routes for the proposed extension and evaluate the environmental and neighborhood impacts.

These alternatives are evaluated and the most feasible alternatives are established, and a more complete analysis of the engineering feasibilities and the impact on the human and natural environment is performed. Included in these analyses are evaluations to determine impacts on sensitive noise receptors, the existing oak tree groves, the existing greenway, Rocky Branch floodplain, and the historic Boylan Heights District. The study also investigates the feasibility of construction of the roadway in phases. Additionally, cost estimates based on 1988 dollars for the construction and right-of-way acquisition are developed to compare the alternatives.

B. Justification and Need

The need for improvements to the east-west traffic patterns of Raleigh have long been recognized by the City and State approved Thoroughfare Plans. There are currently two corridors handling the east-west traffic flow; Hillsborough Street, and a corridor which extends from Western Boulevard and passes through the streets of the Boylan Heights neighborhood. The existing corridors

have numerous signalized intersections, substantial traffic congestion during peak travel periods, congested flow causing poor air quality, and unsafe residential conditions due to high vehicular traffic volumes. Traffic studies indicate that this corridor capacity must be increased to meet future demands. The Raleigh Thoroughfare Plan, adopted by the City Council of Raleigh and the State Department of Transportation, includes the extension of Western Boulevard to address these problems.

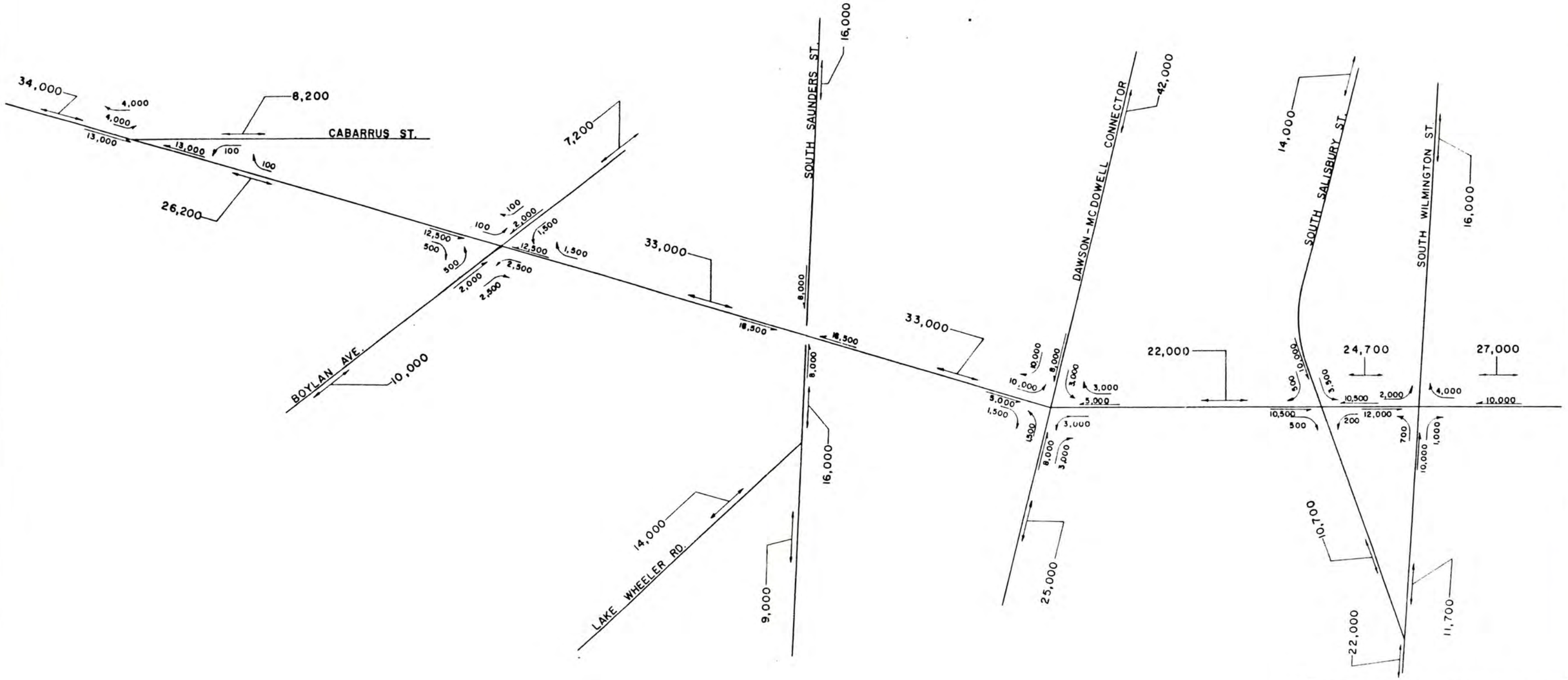
Implementation of a major uninterrupted east-west transportation facility from Western Boulevard to Martin Luther King Jr. Boulevard is critical to the overall goals of encouraging bus and/or car pool ridership, reducing congestion, relieving traffic volumes on heavily travelled Hillsborough Street, providing safer residential neighborhoods by reducing through traffic, improving travel conditions and responding to the demand for travel to and from Uptown Raleigh. Implementation of the proposed facility provides a crosstown link from the North Carolina State University campus to the developing area in southeast Raleigh and is an actual part of the plan for development of NCSU's Centennial Campus.

C. Procedures

1. Base Documents and Traffic Data

To establish feasible alternative roadway locations which blend with the existing terrain features and evaluate right-of-way impacts, various terrain data and information was obtained and assembled. To ensure that the facility's design is adequate to carry anticipated travel demand, traffic data and turning movement information is also required. These data are based on the travel demand forecasting models developed by the North Carolina Department of Transportation and the City for development of the Thoroughfare Plan (Exhibit A). A detailed discussion of base document formulation and traffic data analysis is provided in the previously prepared Preliminary Engineering Highway Location Study.

A graphic traffic volume chart for the construction year is provided herein which compares existing traffic volumes to projected traffic volumes after construction of the Western Boulevard Extension (Exhibit G).



WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST.		
TRAFFIC VOLUMES FOR 2008 (ADT)		
DATE: 6-1-88	NOT TO SCALE	EXHIBIT
RUMMEL, KLEPPER & KAHL RALEIGH, NC		A

BOYLAN HEIGHTS

NCSU

RALEIGH
Central Business District

NCSU
CENTENNIAL CAMPUS

WESTERN BOULEVARD

BOYLAN AVE.

SOUTH SAUNDERS ST.

CABARRUS ST.

LENOIR ST.

SOUTH ST.

DOROTHEA DR.

DAWSON–McDOWELL CONNECTOR

DOROTHEA DIX HOSPITAL

PROPOSED WESTERN BOULEVARD EXTENSION

LAKE WHEELER RD.

20 15 10 5 — EXISTING

5 10 15 20 — AFTER CONSTRUCTION

THOUSANDS OF VEHICLES

WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST.		
GRAPHIC TRAFFIC VOLUMES BOYLAN HEIGHTS		
DATE: JAN. 89	NOT TO SCALE	EXHIBIT
RUMMEL, KLEPPER, & KAHL RALEIGH, NC		G

2. Critical Design Considerations

Critical issues for the location of this project evolve around the feasibility of establishing a compatible alignment that will pass under the existing Southern Railroad Bridge in the vicinity of Cabarrus Street and the establishment of an alignment to provide a grade separation at the crossing of the Southern Railroad in the vicinity of South Wilmington Street. Other critical issues involve evaluating the feasibility of an at-grade intersection at South Saunders Street, minimizing neighborhood and historical district disruption, maintaining the existing greenway and bicycle path continuity, retaining suitable access to the Dorothea Dix Hospital, and retaining a suitable, functional connection to the Dawson-McDowell extension. These critical issues provide the alignment constraints controlling the design location for the proposed extension of Western Boulevard.

3. Other Considerations

a. Public Transit Facilities

The extension of Western Boulevard provides for the extension of the present bus transit corridor and could provide a very good

route from North Carolina State University to the Raleigh Central Business District (CBD) via the Dawson/McDowell Interchange. Additionally, the connection to the Dorothea Dix Hospital Campus at Boylan Avenue could provide public transportation access for the patients and staff members.

Various studies for the possible implementation of a rail-based public transit system within the region are currently underway. These studies involve the utilization of existing rail rights-of-way as well as the development of new transportation corridors with multi-model concepts. In the area of this project, particular concerns are for a connection to the NCSU Centennial Campus. The extension of Western Boulevard will not conflict with light rail concepts utilizing existing rail rights-of-way. The roadway's general location and direction do not provide sufficient potential to justify incorporation of a future light rail facility within its right-of-way serving the Raleigh CBD. The roadway would be beneficial to bus transit vehicles.

b. Greenway, Bikeway, and Pedestrian Paths

The extension of Western Boulevard, although significantly impacting existing greenways, bikeways, and pedestrian paths, provides an opportunity for establishment of continuity and enhancement in the Raleigh greenway system through incorporation of bikeways and pedestrian greenway paths in the planning and design of this project. The compatibility of the project with possible greenway improvements is shown in Exhibits F1 through F5. The recreation and open space facilities proposed in these exhibits, which were prepared by the City's Environmental Planning Division, maximizes the potential of the existing greenway area, and provides for the establishment of bicycle and pedestrian access from NCSU and the Dorothea Dix Hospital campus to the CBD. These improvements would make a positive contribution to the revitalization of uptown Raleigh.

CENTRAL PRISON

N

TO PULLEN PARK AND CENTENNIAL CAMPUS

WESTERN BOULEVARD

BIKE ROUTE

TRAIL

WEST CABARRUS ST.

BOYLAN HEIGHTS HISTORIC DISTRICT

PROPOSED CONCRETE BARRIER

BOULEVARD

GREENWAY

RELOCATED GAZEBO

GREENWAY

BOYLAN AVENUE

EXISTING GREENWAY BOUNDARY

PEDESTRIAN PATH

BEGIN PROJECT

WESTERN BLVD. ALTERNATE A-1

OPEN SPACE

HUNT DRIVE

KEMP DRIVE

DRIVE

DOROTHEA DIX HOSPITAL

RUMMEL, KLEPPER & KAHL
Consulting Engineers
RALEIGH, NORTH CAROLINA

100 0 100 200 300 400 500
SCALE IN FEET

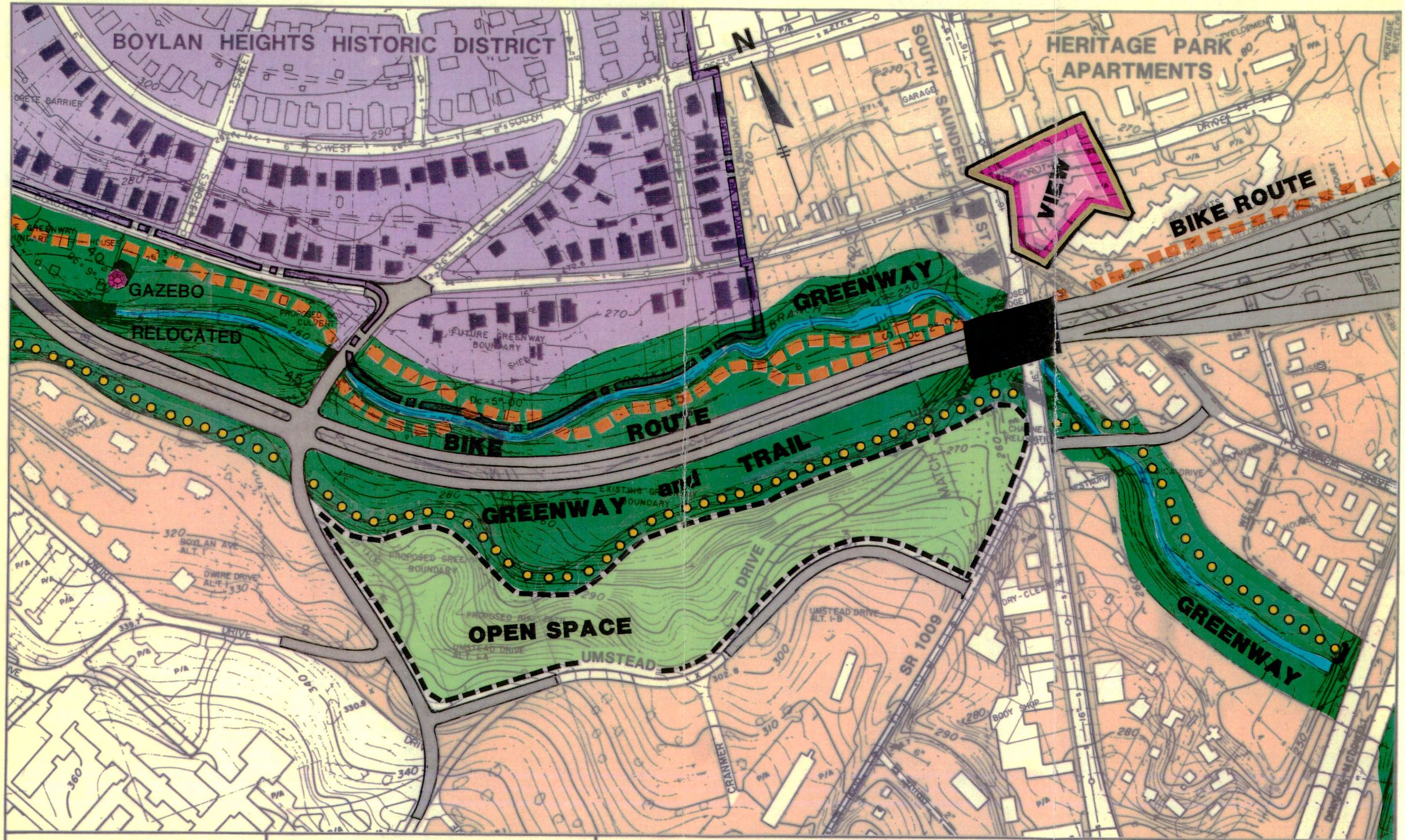
EXTENSION OF WESTERN BOULEVARD

CABARRUS ST. TO SOUTH WILMINGTON ST.
Raleigh, North Carolina

ALTERNATE A-1 ALIGNMENT

SHEET 1 of 3

FIGURE F-1



RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	**EXTENSION OF WESTERN BOULEVARD** CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE **A-1** ALIGNMENT	SHEET 2 of 3 FIGURE F-2

ENTRYWAY ART AND PLANTING

TO DOWNTOWN

HERITAGE PARK APARTMENTS

HERITAGE PARK HOUSING BOUNDARY

BIKE ROUTE

PROPOSED BRIDGE

SOUTHERN

KINDLEY

OFFICE BUILDING 2 STORY

AUDITORIUM

SOUTH

SMITHFIELD STREET

END PROJECT

WESTERN BLVD. ALTERNATE A-1

OPEN SPACE

RAILWAY

WASHINGTON ELEMENTARY SCHOOL

WASHINGTON ELEMENTARY SCHOOL BOUNDARY

FAYETTEVILLE STREET

PEDESTRIAN PATH

WALNUT TERRACE APARTMENTS

WILMINGTON STREET

VIEW

GREENWAY BOUNDARY

EXISTING UNDERPASS

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-1&4 ALIGNMENT	SHEET 3 of 3 FIGURE F-3

CENTRAL PRISON

TO PULLEN PARK AND CENTENNIAL CAMPUS

N

WESTERN BOULEVARD

BIKE ROUTE and GREENWAY

BOULEVARD

GREENWAY

EXISTING GREENWAY BOUNDARY

BEGIN PROJECT

WESTERN BLVD. ALTERNATE A-4

OPEN SPACE

WEST CABARRUS ST.

BOYLAN HEIGHTS HISTORIC DISTRICT

GREENWAY TRAIL

BOYLAN AVENUE

OPEN SPACE

HUNT DRIVE

KEMP DRIVE

EXISTING GREENWAY BOUNDARY

DOROTHEA DIX HOSPITAL

RUMMEL, KLEPPER & KAHL
Consulting Engineers
RALEIGH, NORTH CAROLINA

100 0 100 200 300 400 500
SCALE IN FEET

EXTENSION OF WESTERN BOULEVARD

CABARRUS ST. TO SOUTH WILMINGTON ST.
Raleigh, North Carolina

ALTERNATE **A-4** ALIGNMENT

SHEET 1 of 3

FIGURE F-4

BOYLAN HEIGHTS HISTORIC DISTRICT

N

HERITAGE PARK APARTMENTS

VIEW

BOYLAN AVENUE

SOUTH SAUNDERS ST.

ROUTE

HOUSES

RELOCATED

BIKE

GREENWAY

TATE DRIVE

GREENWAY and TRAIL

PROPOSED GREENWAY BOUNDARY

EXISTING GREENWAY BOUNDARY

DRIVE

GAZEBO

OPEN SPACE

UMSTEAD DRIVE ALT. I-B

SR 1009

CRANMER

JAMAICA DRIVE ALT.

GREENWAY

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-4 ALIGNMENT	SHEET 2 of 3 FIGURE F-5

II. ALTERNATIVES

A. Location Alternatives

Four basic alignment alternatives are established as being representative of the feasible locations for this project. Each of these alignments begins with the extension of Western Boulevard, across the Southern Railroad and terminates at Smithfield Street at the intersection of Smithfield and South Wilmington Streets. Alternate vertical alignments which provide an at-grade intersection at South Saunders Street were investigated.

Based on this investigation, it was determined that the proximity of the proposed Dawson/McDowell interchange ramps and the connections to Jamaica and Umstead Drives at South Saunders Street make an at-grade intersection of South Saunders Street unsafe and unfeasible. Based on this unfeasibility, the alternatives were developed with provision for a grade separation structure over South Saunders Street. Similarly, a study of the traffic movements and the traffic turning volumes at the intersection with the Dawson/McDowell extension indicated that an at-grade intersection would not be feasible due to the high volume left-turn movement from Western Boulevard north on the Dawson/McDowell extension. As a

result of these determinations, the four alternate designs from South Saunders Street to Smithfield Street are identical.

1. Alternate A-1 (Exhibit D-1)

Alternate A-1 is designed to establish an alignment through the Dorothea Dix Hospital property that will least encroach upon existing Rocky Branch. The proposed extension is split slightly to fit under separate spans of the existing Norfolk-Southern Railroad Bridge spans with the Eastbound lanes fitting in the second span and the Westbound lanes fitting through the third span (Exhibit C). This alternate is the closest alignment to Dorothea Dix Hospital, running just south of Rocky Branch and grade separates over South Saunders Street with no access to existing South Saunders Street. Proceeding East, the alignment crosses existing Dawson/McDowell with an Urban Diamond Interchange proposed to connect Western Boulevard Extension and Dawson/McDowell. East of the Dawson/McDowell interchange the grade decends to underpass the existing Southern Railroad tracks. Fayetteville Road is extended to pass under an extended existing Southern Railroad Bridge adjacent to Western Boulevard and curved back to meet at grade with

South Wilmington Street. Western Boulevard then intersects with South Wilmington. The intersection must be reworked and redesigned to improve to a level of satisfactory service. The total engineering, right-of-way, and construction cost for Alternate A-1 is $16,052,000.

2. Alternate A-2 (Exhibit D-2)

Alternate A-2 is designed to be located closer and more nearly following the location of existing Rocky Branch. This location has been established to place the proposed roadway at some distance from the noise sensitive activities of the Dorothea Dix Hospital. With the exception of its location in the vicinity of the Dorothea Dix Hospital, Alternate A-2 incorporates the same design features associated with Alternate A-1. However, the connection to allow the development of the Land Area immediately south of Boylan Avenue can be accomplished with less grading requirements. The total engineering, right-of-way, and construction cost for Alternate A-2 is $17,370,000.

3. Alternate A-3 (Exhibit D-3)

The development of Alternate A-3 was initiated to explore the feasibility of splitting the east and west bound lanes at the Western end of the project where it connects with existing Western Boulevard.

This would allow an improved intersection connection if used with an existing Cabarrus Street, but requires a new railroad bridge over the eastbound lane of Western Boulevard. All the other salient features incorporated with Alternates A-1 or A-2 are incorporated into Alternate A-3. This alternate encroaches highly on Rocky Branch requiring significant channel relocation and is associated with the highest estimated cost, $20,980,000.

4. Alternate A-4 (Exhibit D-4)

Alternate A-4 is designed north of Rocky Branch closer to Dorothea Drive. The location places the proposed roadway as far distant from the noise sensitive activities of the Dorothea Dix Hospital as feasible and an at-grade tie at existing Boylan Avenue, eliminating the reconstruction of the Dorothea Dix entrance road south of Boylan Ave. All other features incorporated with Alternates A-1 and A-2 are incorporated into Alternate A-4. The total engineering, right-of-way, and construction cost for Alternate A-4 is $15,311,000, the lowest estimated cost.

CENTRAL PRISON

BOYLAN HEIGHTS HISTORIC DISTRICT

WEST CABARRUS ST.

WESTERN BOULEVARD

BRANCH

EXISTING GREENWAY BOUNDARY

BEGIN PROJECT
WESTERN BLVD. ALTERNATE A-1

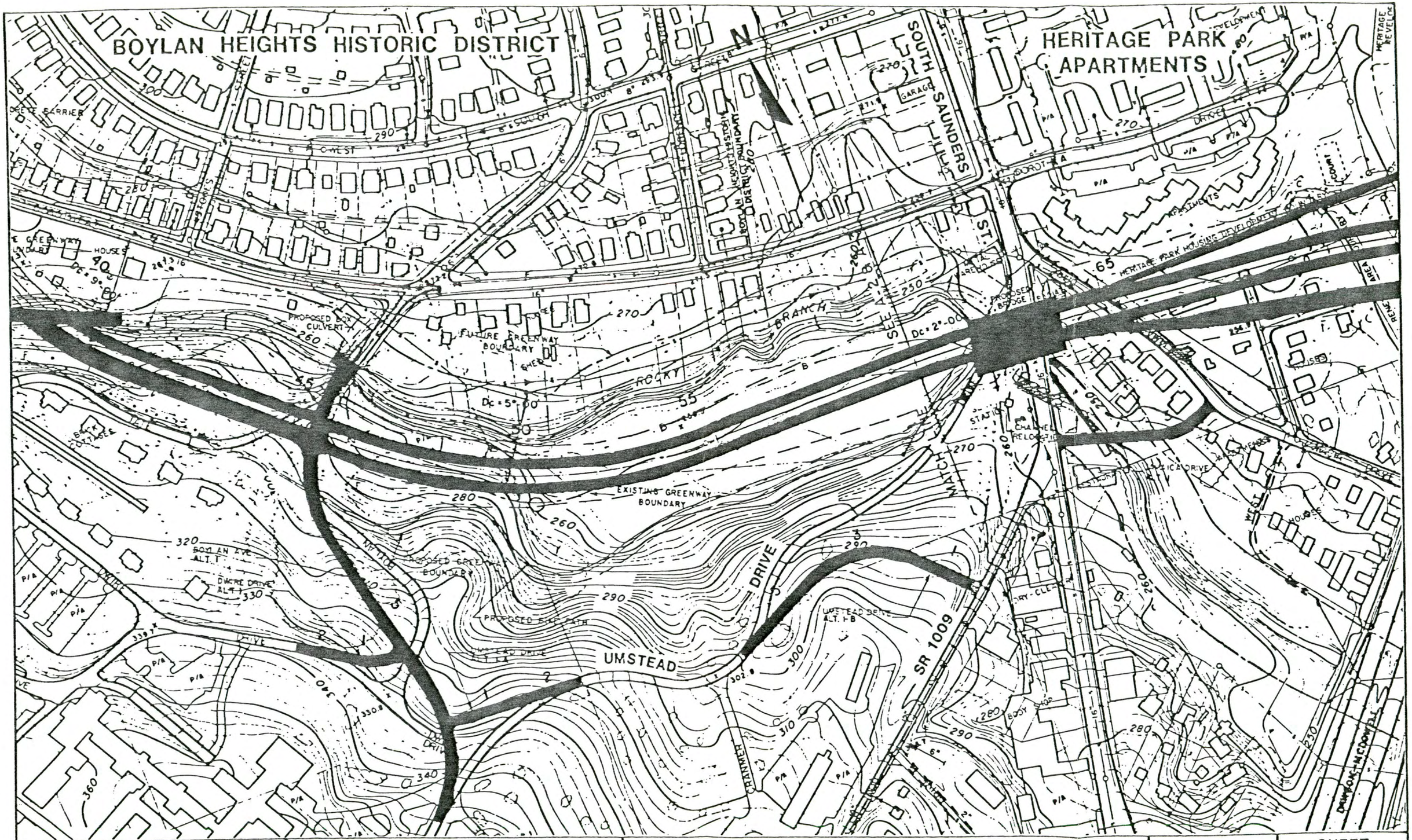
HUNT DRIVE

BOYLAN AVENUE

TATE DRIVE

DOROTHEA DIX HOSPITAL

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-1 ALIGNMENT	SHEET 1 of 3 EXHIBIT D-1



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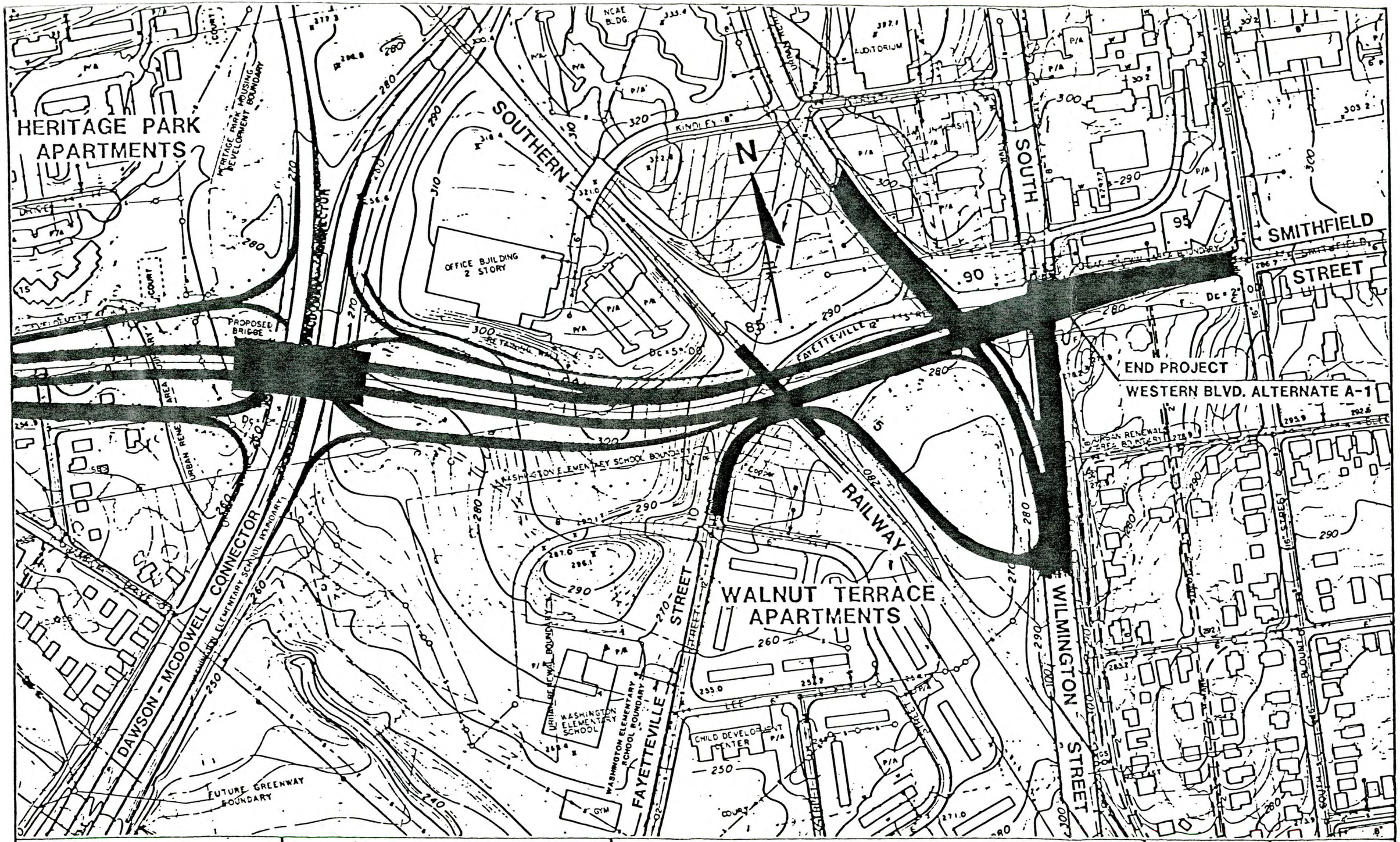


RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-1 ALIGNMENT	SHEET 3 of 3 EXHIBIT D-1

CENTRAL PRISON

BOYLAN HEIGHTS HISTORIC DISTRICT

WEST CABARRUS ST.

WESTERN BOULEVARD

PROPOSED BOX CULVERT EXTENSION

Dc = 5°45'

Dc = 9°00'

Dc = 8°45'

PROPOSED CONCRETE BARRIER

PROPOSED BOX CULVERT

EXISTING GREENWAY BOUNDARY

EXISTING BIKE PATH

BEGIN PROJECT
WESTERN BLVD. ALTERNATE A-2

HUNT DRIVE

TATE DRIVE

BOYLAN AVENUE

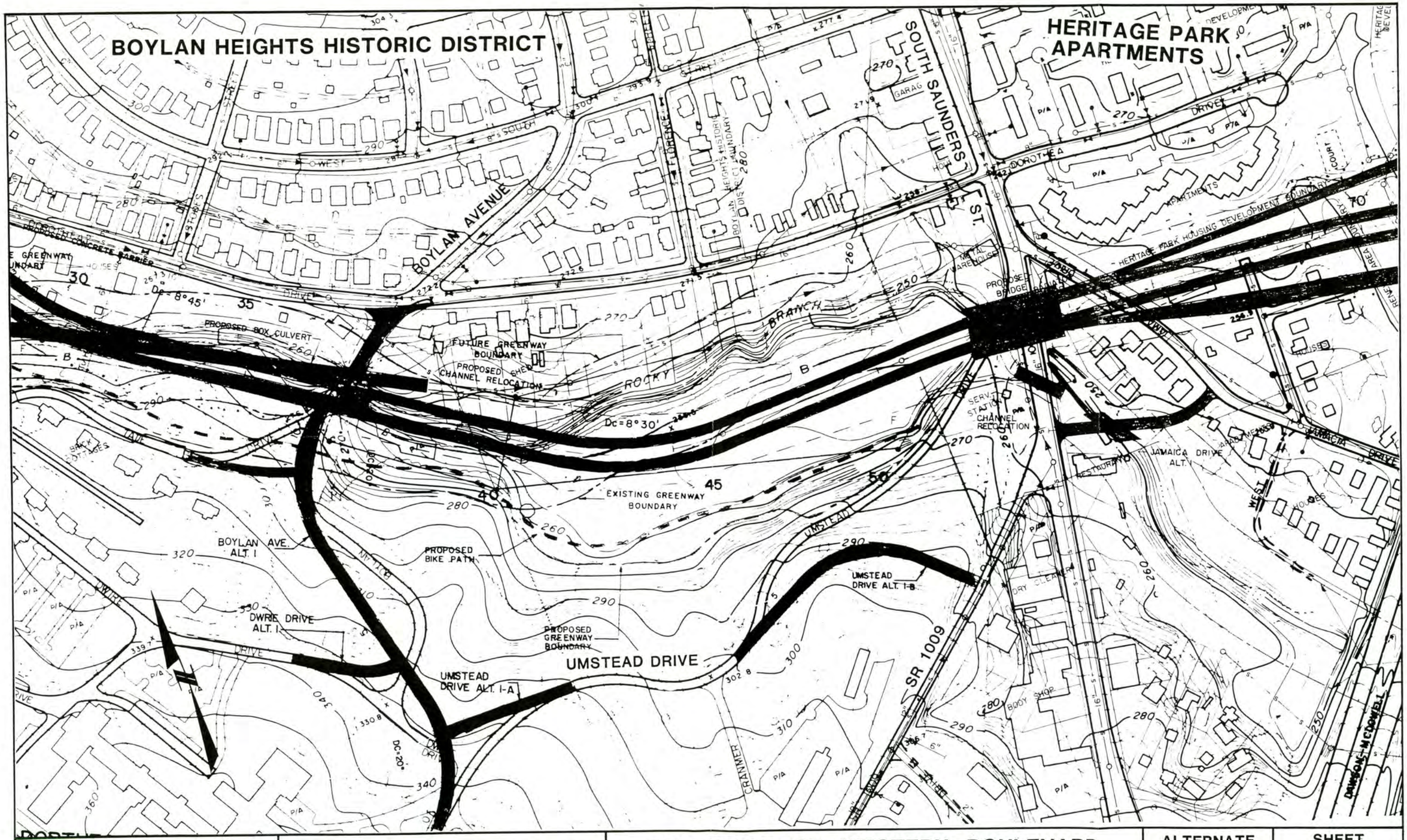
BOYLAN AVE. ALT. 1

DWIRE DRIVE ALT. 1

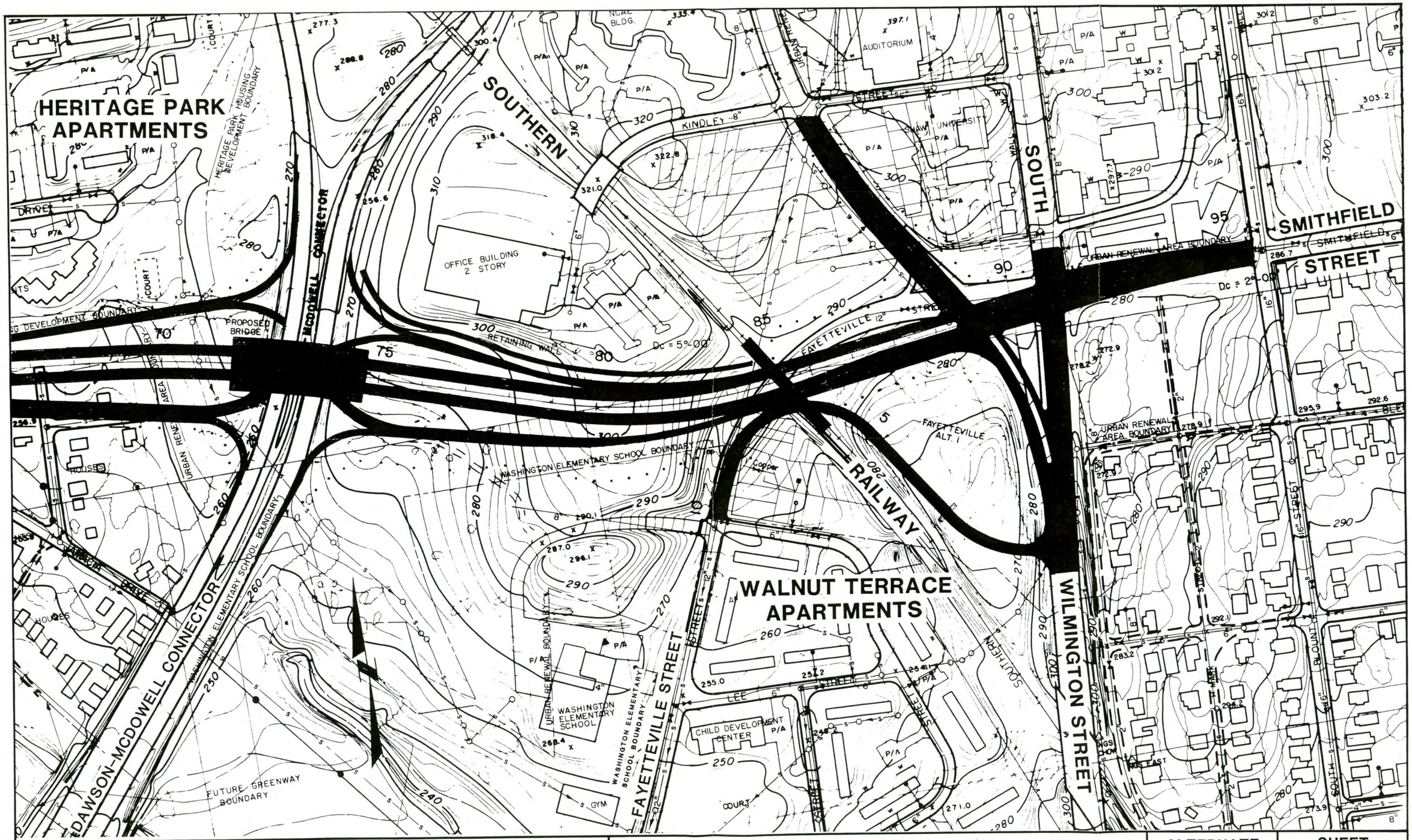
DOROTHEA DIX HOSPITAL

RICHARDSON DRIVE

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	**EXTENSION OF WESTERN BOULEVARD** CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE **A-2** ALIGNMENT	SHEET 1 of 3 EXHIBIT D2



RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	**EXTENSION OF WESTERN BOULEVARD** CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE **A-2** ALIGNMENT	SHEET 2 of 3 EXHIBIT D2



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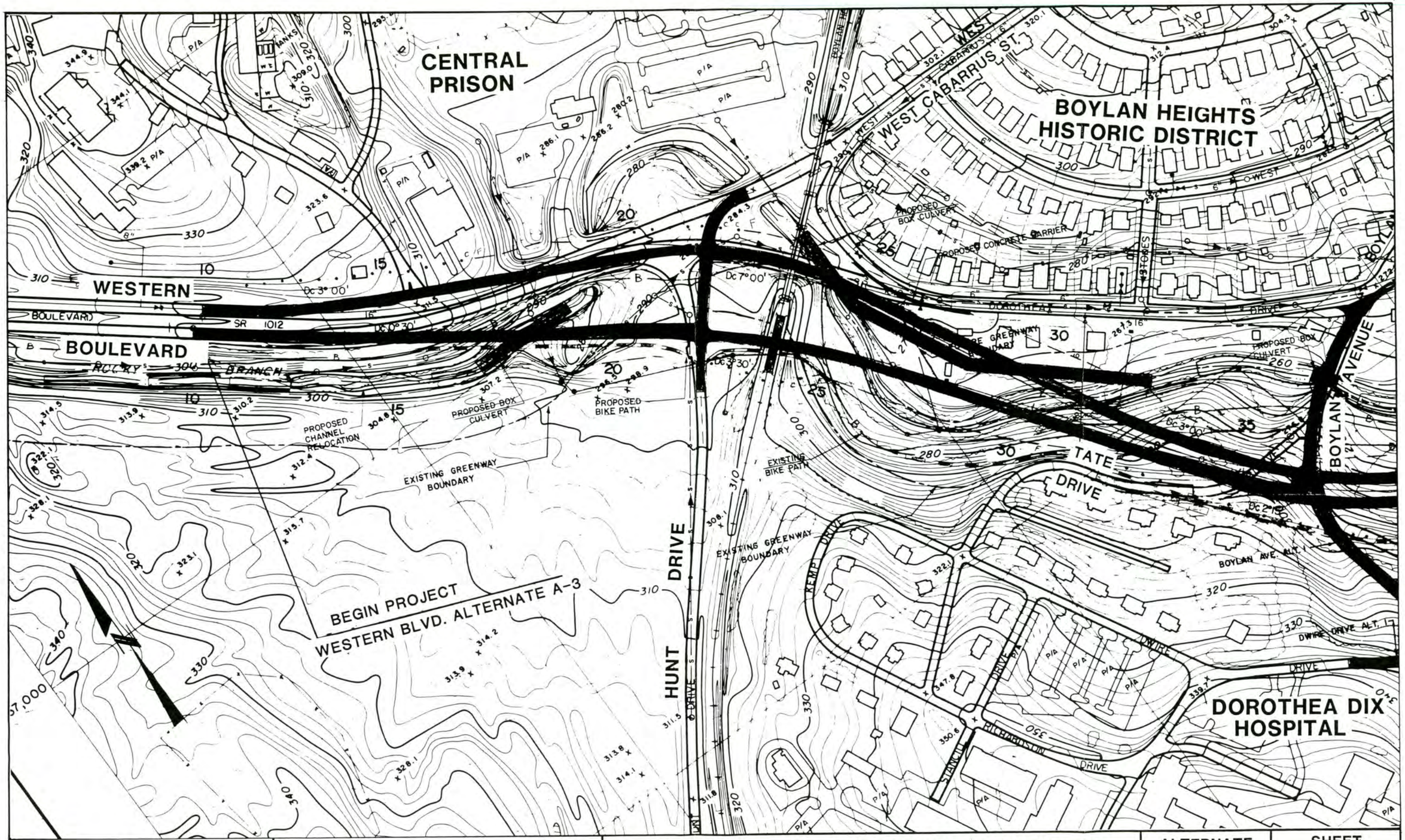

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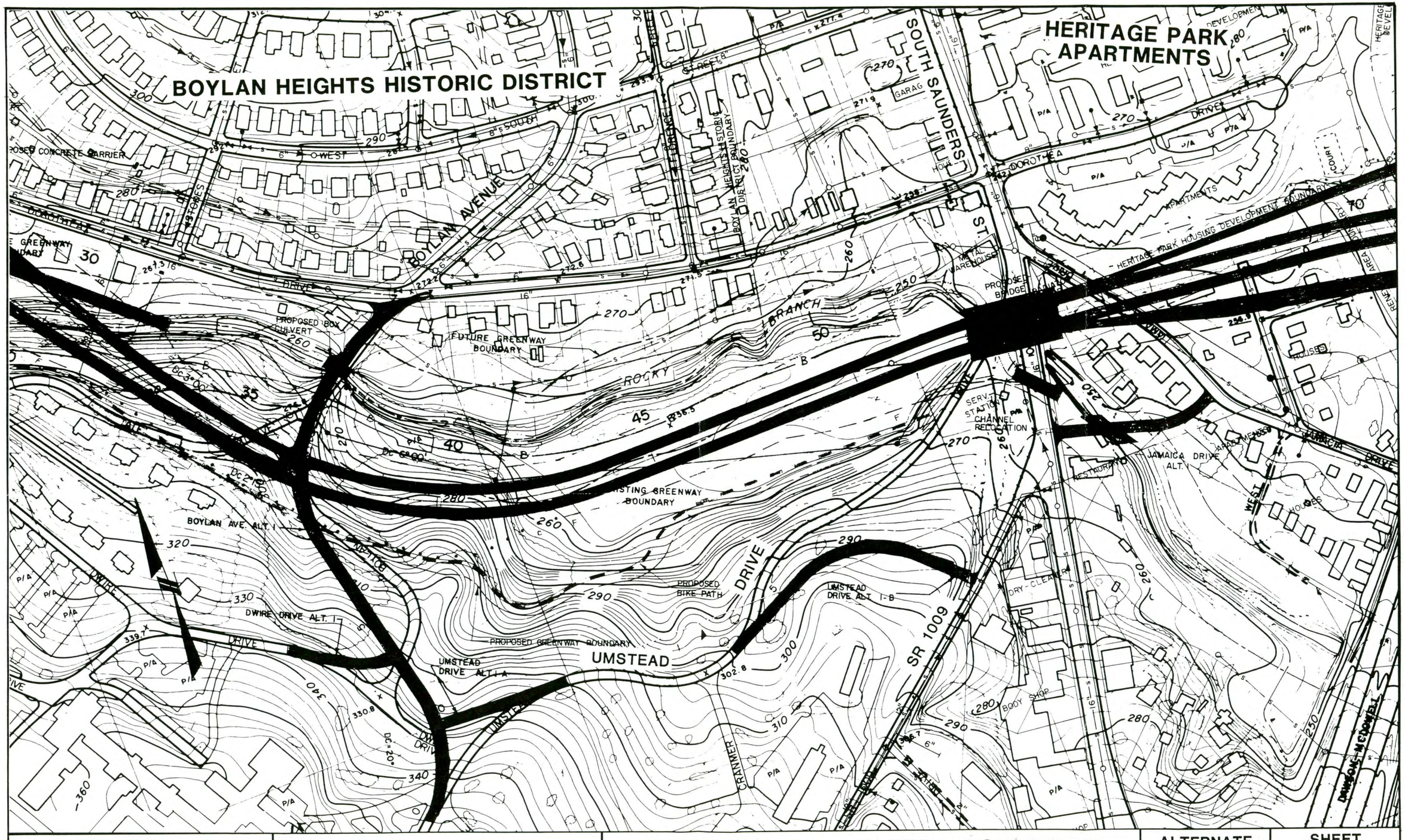
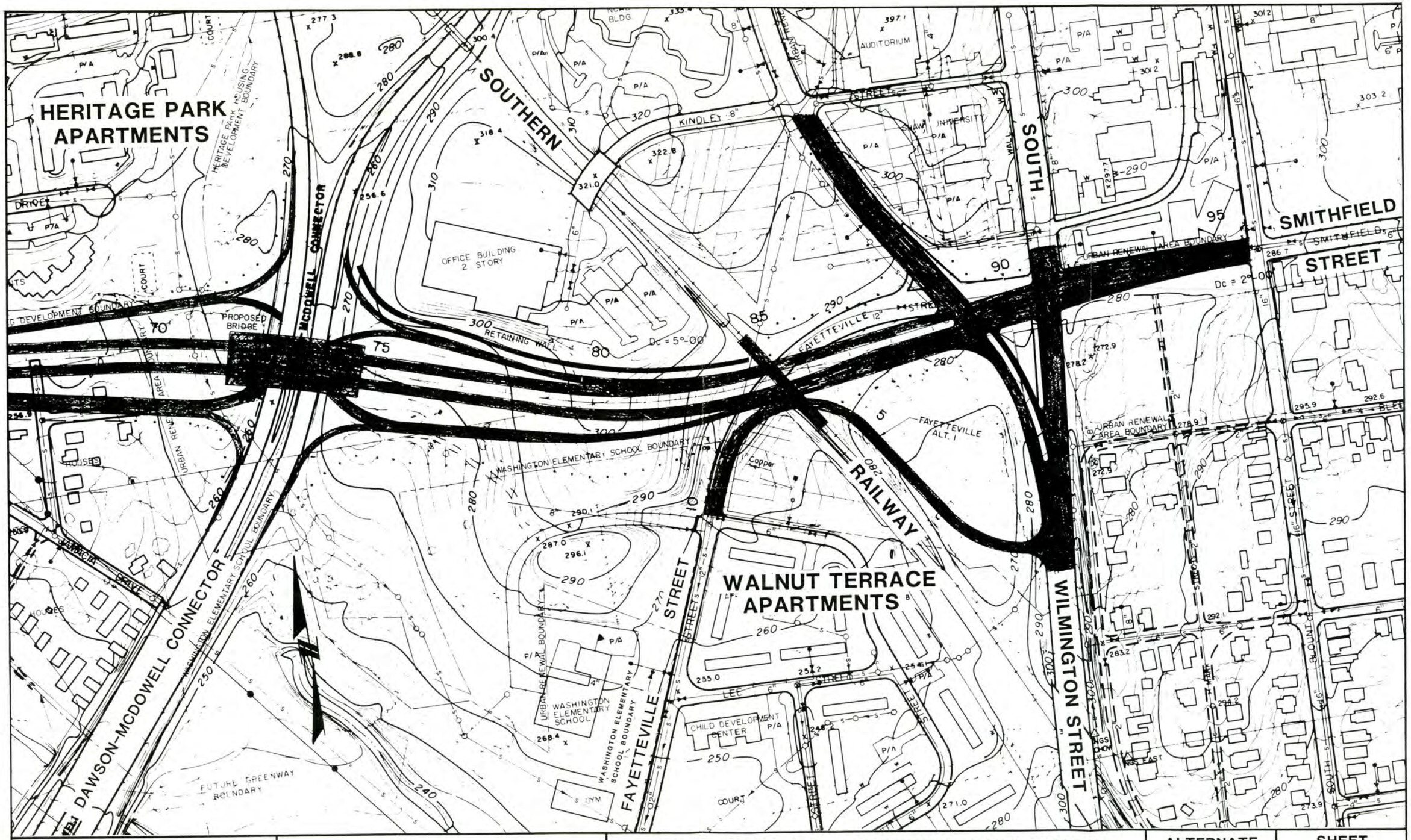


RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	**EXTENSION OF WESTERN BOULEVARD** CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE **A-3** ALIGNMENT	SHEET 2 of 3 EXHIBIT D3



RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	**EXTENSION OF WESTERN BOULEVARD** CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE **A-3** ALIGNMENT	SHEET 3 of 3 EXHIBIT D3

CENTRAL PRISON

WEST CABARRUS ST.

BOYLAN HEIGHTS HISTORIC DISTRICT

WESTERN BOULEVARD (SR 1012)

BEGIN PROJECT
WESTERN BLVD. ALTERNATE A-4

EXISTING GREENWAY BOUNDARY

HUNT DRIVE

TATE DRIVE

BOYLAN AVENUE

DOROTHEA DIX HOSPITAL

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-4 ALIGNMENT	SHEET 1 of 3 EXHIBIT D4

BOYLAN HEIGHTS HISTORIC DISTRICT

HERITAGE PARK APARTMENTS

BOYLAN AVENUE

SOUTH SAUNDERS ST.

BOYLAN HEIGHTS HISTORIC DISTRICT BOUNDARY

FUTURE GREENWAY BOUNDARY

CRABTREE CREEK BRANCH

PROPOSED GREENWAY BOUNDARY

PROPOSED BIKEPATH

EXISTING GREENWAY BOUNDARY

TATE DRIVE

UMSTEAD DRIVE

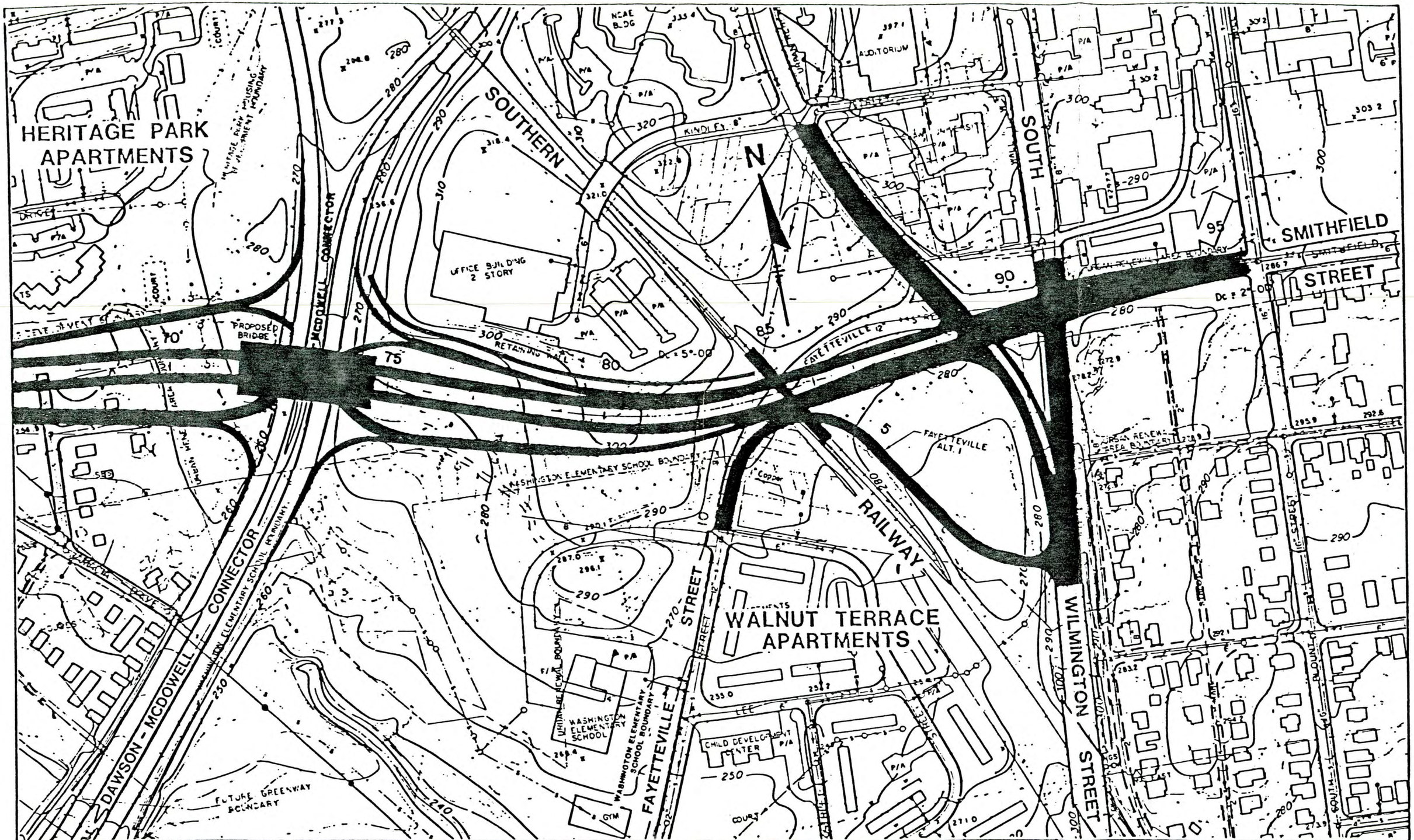
UMSTEAD DRIVE ALT 1-B

SR 1009

CRANMER

JAMAICA DRIVE ALT.

RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-4 ALIGNMENT	SHEET 2 of 3 EXHIBIT D4



RUMMEL, KLEPPER & KAHL Consulting Engineers RALEIGH, NORTH CAROLINA	100 0 100 200 300 400 500 SCALE IN FEET	EXTENSION OF WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST. Raleigh, North Carolina	ALTERNATE A-4 ALIGNMENT	SHEET 3 of 3 EXHIBIT D4

5. Summary

After reviewing the four alternative alignments and their associated impacts, Alternates A-2 and A-3 were eliminated from further consideration for the following reasons:

a. Highest floodplain encroachments.

b. Encroachment on Historic District.

c. Most oak tree impact.

d. Highest encroachment of existing greenway.

e. Poor intersection geometry at Boylan Avenue requiring reconstruction to Dorothea Dix entrance road in order to provide adequate connection.

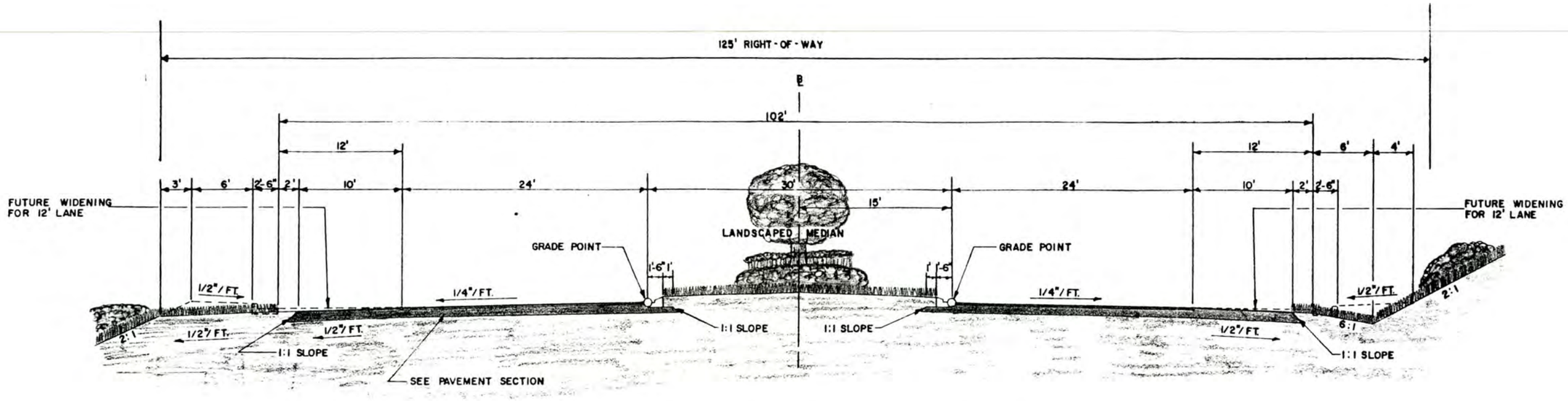
f. The two highest estimated costs.

B. Typical Cross Sections

Based on the alignment constraints and the design criteria established for this project, alternative alignment locations and construction configurations are developed to explore all feasible possibilities. All alternatives considered include construction of a four lane roadway cross-section which would provide two travel lanes in each direction, flanked by paved shoulders, separated by a 30 foot landscaped median. This design provides for ultimate widening for a third travel lane

in each direction or an outside deceleration/turning lane where needed. Details of the proposed roadway cross-section are presented in Exhibit B.

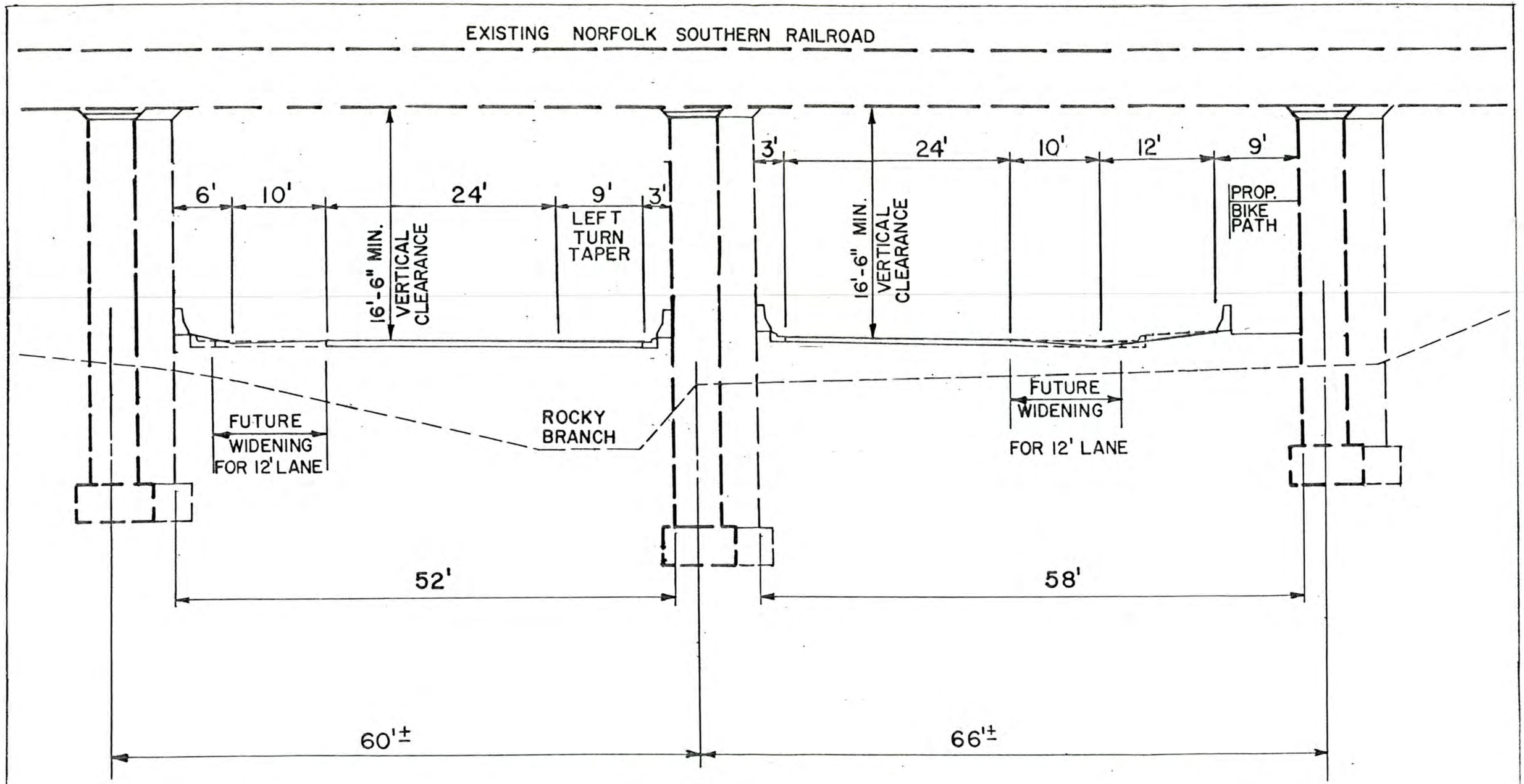
Level of service analyses were performed based on functional intersection capacities for both the four lane and the six lane roadway cross-sections. The results of these analyses indicate that the four lane cross-section would provide a level of service "C" in the design year. Thus, the need for the full six lane cross-section is not predicted to occur until some time beyond the 2008 design year.



TYPICAL SECTION WESTERN BOULEVARD EXTENSION
4 LANE DIVIDED HIGHWAY 30' MEDIAN

WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST		
TYPICAL SECTION		
DATE: 6-1-88	NOT TO SCALE	EXHIBIT
RUMMEL, KLEPPER & KAHL RALEIGH, NC		B

The alignment alternatives are designed to fit the proposed cross-section under the existing Norfolk-Southern Railroad Bridge under Cabarrus Street. The construction plans for the existing railroad bridge indicate that the clearance between the existing substructure elements in the spans to be utilized by Western Boulevard to be 56' 6", and 62'. Accounting for the roadway skew, the proposed cross-section under these spans will leave minimum clearance of 3 feet to the concrete pier. Details of the bridge clearance are indicated in Exhibit C.



SECTION THROUGH EXISTING RAILROAD BRIDGE

(NORMAL TO ROADWAY)

NO SCALE

WESTERN BOULEVARD CABARRUS ST. TO SOUTH WILMINGTON ST		
TYPICAL SECTION		
DATE: 6-1-88	NOT TO SCALE	EXHIBIT
RUMMEL, KLEPPER & KAHL RALEIGH, NC		C

C. Staged Construction

If the project were to be constructed in phases, stage 1 would include construction of Western Boulevard to the Dawson/McDowell Extension, culverts, South Saunders Street Bridge, and two ramps on the west side of the future Dawson/McDowell interchange. This would result in an at-grade connection which would require signalization.

Stage 2 includes completion of Western Boulevard to South Wilmington, Fayetteville Street Relocation, railroad bridge, Dawson/McDowell overpass structure, and two ramps on the east side of the interchange.

Traffic will be utilizing Western Boulevard Extension while Stage 2 is under construction. Traffic will access Dawson/McDowell by two west side interchange ramps built under Stage 1.

III. PREFERRED ALTERNATE COMPARISON

A. Detailed Comparison of Alternate A-1 and Alternate A-4

Alternates A-1 and A-4 exhibit similar characteristics but provide varying impact potential to concerned areas. Encroachment into the prison property located north of existing Western Boulevard may be necessary and can be provided under either alternative,

but the possibility to connect or not connect Western with Cabarrus will be discussed later in this report. The alternates' alignment and design are identical from South Saunders Street east to South Wilmington Street and both require minor relocation of the hospital entrance (Umstead Drive). The alternates maintain access to the properties along Jamaica Road to the east by reconstruction of the existing roadway to connect to South Saunders Street just north of the Umstead Drive connection.

1. Alternate A-1 (Exhibit D1)

Alternate A-1 is located just south of Rocky Branch, encroaching least on the flood plain and Rocky Branch. The existing Rocky Branch and Boylan Crossing is not affected, however, connection of the existing Hospital entrance along Boylan Avenue to the south would require considerable regrading. Some reconstruction of the Hospital roadway system is required to provide addequate connection to Western Boulevard. The vertical and horizontal alignments of Alternte A-1 allows the road to be constructed into the side of the hill on Dorothea Dix property, thus minimizing the noise impact to the hospital. While the location encroaches most on greenways and Dorothea Dix open space, there is

no encroachment into the Historic District. The estimated cost compared to Alternate A-4 is $741,000.00 higher.

2. Alternate A-4 (Exhibit D4)

Alternate A-4 is located north of Rocky Branch closest to Dorothea Drive and aligns with the existing Dorothea Dix entrance on Boylan Avenue at grade. This alignment encroaches the most on the flood plain and requires more extensive stream realignment. The at-grade crossing of Western and Dorothea Dix Entrance eliminates the need to reconstruct Hosptial roads for an adequate connection to Western Boulevard. The Dorothea Dix Entrance north of western is shortened, reducing the car storage capabilities between Dorothea Drive and Western Boulevard. This alternative is associated with the least cost, least impact to the Hosptial property, and least impact on the greenway.

B. Development of Construction Cost

To determine the cost effectiveness for each of the Alternative alignments, 1988 cost estimates based on preliminary construction quantities and current unit construction costs have been developed. In lieu of detailed appraisals, right-of-way costs are based on total square footage of the right-of-way and easement area required, and an average unit cost for residences and businesses. A 25% contingency and engineering cost is included for items not listed.

The alternative cost analyses are developed to indicate total cost for completion of the project in two stages. The first extending from Cabarrus Street to the Dawson/McDowell Extension, and the second stage including the completion of the interchange and Western Boulevard to South Wilmington Street. Analysis of the excavation and embankment quantities for each of the two stages indicates Stage 2 to involve 62,400 cubic yards more excavation than that required for the embankments. The total project costs have been developed to reflect this inequity. The additional costs associated with the staging of the construction, approximately $312,000.00, could be avoided if the project were constructed as a single construction contract. Although detailed cost

analyses were included in the Preliminary Engineering Highway Location Study and Table 1, the total project costs for Alternates A-1 and A-4 are summarized for comparison as follows:

Alternate	Stage 1	Stage 2	Total (1 & 2)	Single-Stage Construction
A-1	9,408,000	6,644,000	16,052,000	15,740,000
A-4	8,667,000	6,644,000	15,311,000	14,999,000

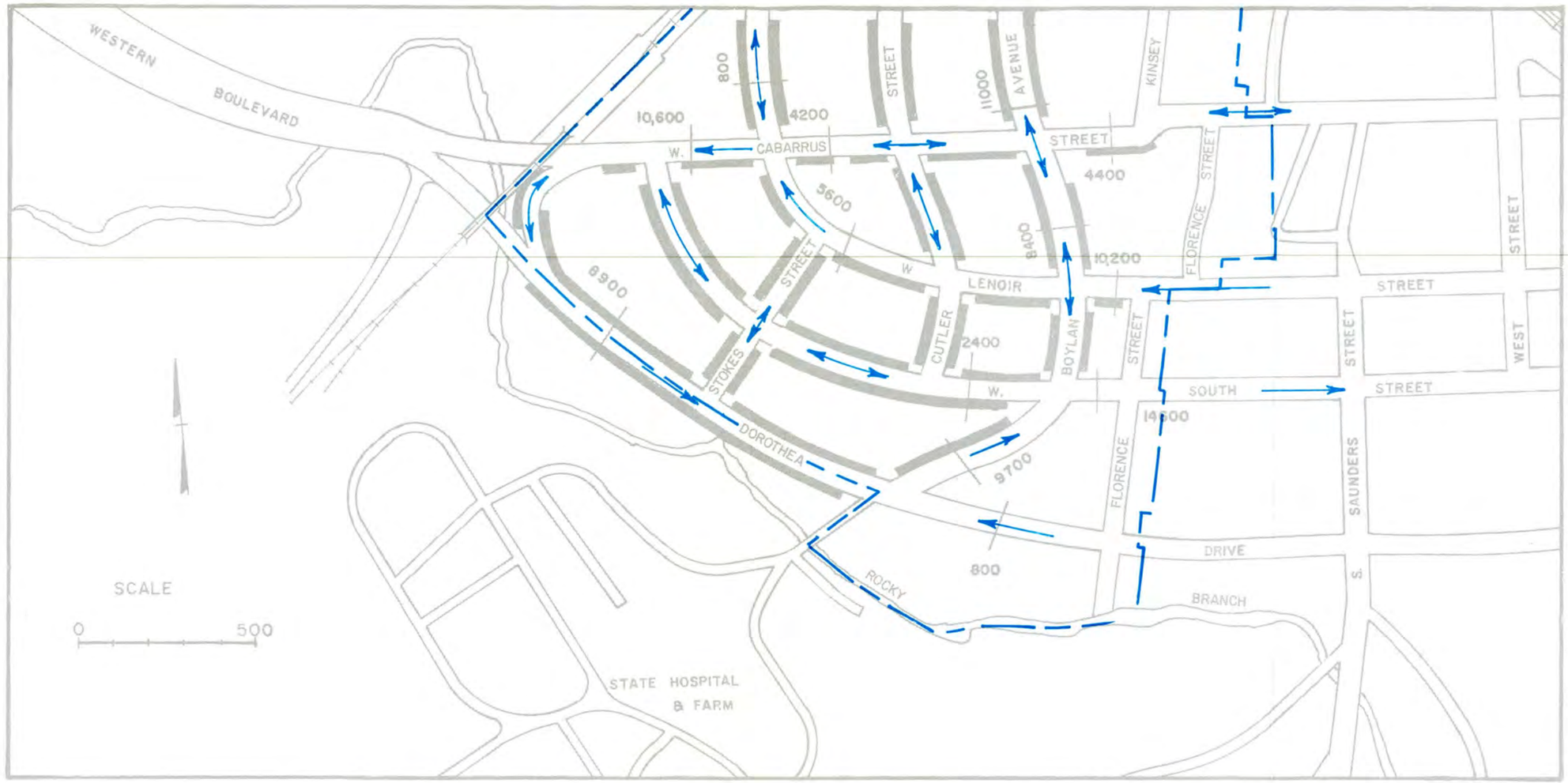
C. Boylan Heights Traffic Evaluation and Impact Analysis

With the construction of Western Boulevard, much of the predicted traffic currently using Cabarrus Street, South Street and Lenoir Street would shift to the new roadway. The comparitive results of this redistribution are indicated in Exhibits E1 and E2. This modification of the traffic pattern allows additional street parking, reduces traffic volumes, and permits conversion of one-way streets to two-way.

The predicted traffic volume distribution are based on analysis of 1988 traffic counts developed by City staff.

IV. CONCLUSION

Both Alternate A-1 and Alternate A-4 address the needs of the East-West corridor, and from an engineering standpoint, provide the same desired results. A choice between the two depends upon



LEGEND

- STREET
- EXISTING PARKING
- NEW PARKING
- ONE-WAY TRAFFIC
- TWO-WAY TRAFFIC
- 1-WAY CONVERTED TO 2-WAY
- HISTORIC DISTRICT BOUNDARY
- 9000 /9000 — ADT (Before Construction) / ADT (After Construction)
- PROPOSED WESTERN BLVD. EXTENSION

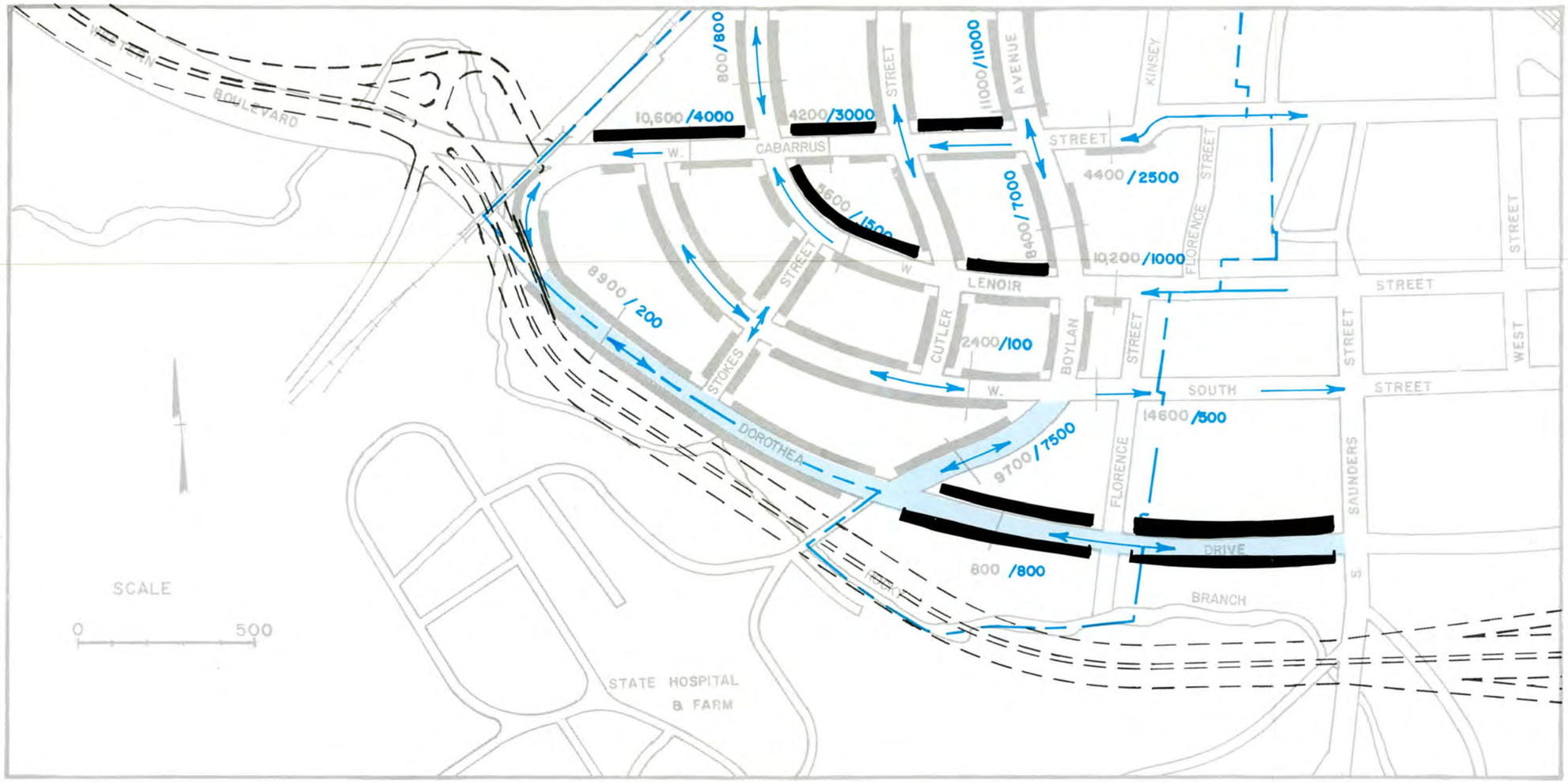
EXTENSION OF WESTERN BOULEVARD IMPACTS

BOYLAN HEIGHTS HISTORIC DISTRICT

PARKING AND TRAFFIC CIRCULATION

- EXISTING

DATE: 1-18-89	SCALE: 1.5": 500'	EXHIBIT
RUMMEL, KLEPPER & KAHL RALEIGH, N.C		E-1



LEGEND

- STREET
- EXISTING PARKING
- NEW PARKING
- ONE-WAY TRAFFIC
- TWO-WAY TRAFFIC
- 1-WAY CONVERTED TO 2-WAY
- HISTORIC DISTRICT BOUNDARY
- 9000/9000 — ADT (Before Construction) / ADT (After Construction)
- PROPOSED WESTERN BLVD. EXTENSION

EXTENSION OF WESTERN BOULEVARD IMPACTS

BOYLAN HEIGHTS HISTORIC DISTRICT

PARKING AND TRAFFIC CIRCULATION AFTER CONSTRUCTION

DATE: 1-18-89	SCALE: 1.5": 500'	EXHIBIT
RUMMEL, KLEPPER & KAHL RALEIGH, N.C		E-2

prioritizing impacts and choosing the alternate which least impacts those priorities. The summary of disadvantages and advantages are listed below and a comparison matrix table is provided:

Alternate A-1 Advantages

a. Least encroachment on the flood plain and Rocky Branch.

b. Existing Rocky Branch and Boylan Crossing are not affected.

c. Minimal noise impact.

d. Historic District boundary is not encroached.

e. Provides natural split for two (2) park areas on north and south side of Western Boulevard.

f. Reduces noise impact to Dorothea Dix Hospital due to location in side of hill.

Alternate A-1 Disadvantages

a. Regrading of the Dorothea Dix Entrance along Boylan Avenue south of Western Boulevard is required.

b. Dorothea Dix roads require reconstruction to provide adequate connection to Western Boulevard.

c. Encroaches on Dorothea Dix's property the most, reducing open park space.

d. Highest greenway encroachment.

e. Vertical alignment decreases views for Boylan Heights residents of aesthetically pleasing Dorothea Dix terrain.

f. Higher cost.

Alternate A-4 Advantages

a. Lower cost.

b. At-grade crossing at Dorothea Dix Entrance along Boylan Avenue eliminates reconstruction of intersection and Hospital roads. Constructability is improved.

c. Least impact to Dorothea Dix property allowing a larger green area for park.

d. Least effect on greenway.

e. Vertical profile allows for an aesthetically pleasing view of Dorothea Dix terrain for Boylan Heights residents.

Alternate A-4 Disadvantages

a. Boyland Avenue between Western Boulevard and Dorothea Drive is shortened, reducing vehicle storage capability.

b. Higher flood plan encroachment.

c. Higher noise impact.

d. Higher stream realignment.

e. Encroaches on Historic District most.

Table 1 provides an alternate comparison matrix between Alternate A-1 and Alternate A-4.

Should the appropriation of construction funds be limited, then construction in two stages will be beneficial. A usuable facility connecting southwest Raleigh to the Central Business District is established and high traffic volumes in Boylan Heights are reduced. The major disadvantage of stage construction is it provides an incomplete facility. The Western Boulevard Extension construction in one stage completes the connection of southwest Raleigh to the CBD via South Wilmington Street, further reduces traffic volumes in Boylan Heights and connects to Martin Luther King, Jr. Boulevard, curretly under construction. The cost of one stage construction is also $312,000 less than the two-stage construction, due to excess excavation generated in stage two. The

Table 1

Western Boulevard Extension
Alternative Comparison Matrix

Alternate Alignments	Alternate A-1	Alternate A-4
Project Length	1.4 Miles	1.4 Miles
Right-of-Way & Easement	31 Acres	31 Acres
1988 Cost Estimate*		
Construction Cost		
Stage 1 Cabarrus to Dawson/ McDowell	$6,194,000	$5,903,000
Stage 2 Dawson/McDowell to S. Wilmington	$5,763,000	$5,763,000
Right-of-Way Cost		
Stage 1	$ 3,214,000	$ 2,764,000
Stage 2	$ 881,000	$ 881,000
Total Cost	$16,052,000	$15,311,000
Floodplain Encroachment Area	5.2 Ac.	7.9 Ac.
Greenway Impact		
Greenway Acquired	5.3 Ac.	4.2 Ac.
Add. Greenway/ Bike Path for Continuity	4.0 Ac.	3.8 Ac.
Noise Impact Potential (No. of residences with predicted noise greater than 67 dBA)	2 Apt. Bldgs. 11 Homes 1 Service Station	2 Apt. Bldgs. 20 Homes 1 Service Station
Relocations Required	12	15
Business	3	3
Residences	9	12
Wetlands		
Stream Enclosed	1030'	1030'
Channel Reloc.	450'	1450'
Oak Tree Impacts		
Southern RR area	Minimized; Skyline Maintained	Minimized; Skyline Maintained
Boylan Ave. Area	Some impact adj. to hospital. Skyline preserved	Some impact adj. to hospital. Skyline preserved
Historic Area Encroached	0 Ac.	2.2 Ac.
Level of Service		
Western Boulevard	C	C
Cabarrus St. Inter.	C	C
Boylan Ave. Inter.	B	B
Dawson/McDowell Inter.	D	D
S. Wilmington/Salisbury Inter.	D	D
Meets Design Criteria	Yes	Yes
Max. Horizontal Curve	9°	9° 30'
Max. Gradient	4.1%	4.1%
Roadway Bridges	2	1
Railroad Bridges	2	1

*Includes $312,000 due to earthwork waste caused by stage construction

estimated project duration is two and a half to three years, and appropriation of the total construction funds could be divided over the construction period.